3 Sheets--Sheet 1.

E. E. RICE.

Method and Apparatus for Burning Oils.

No. 168,782. Patented Oct. 11, 1875.

Fig 1

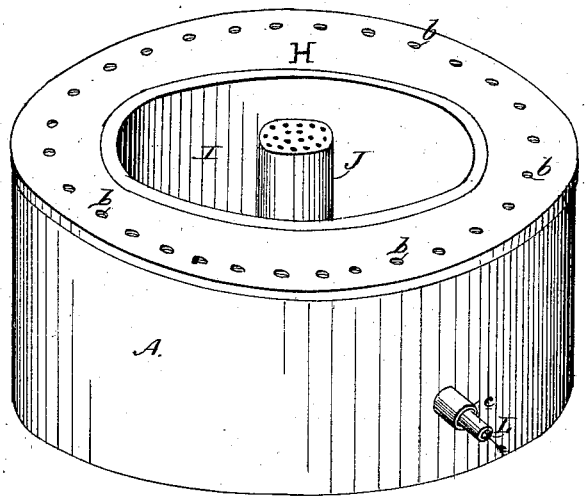


Fig 2.

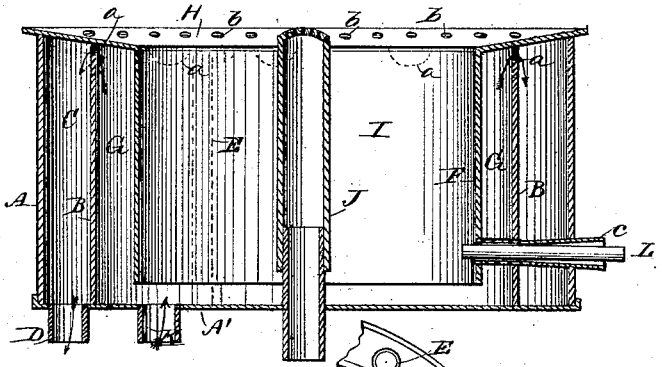


Fig 3

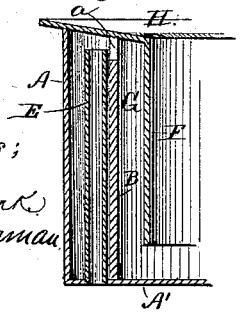
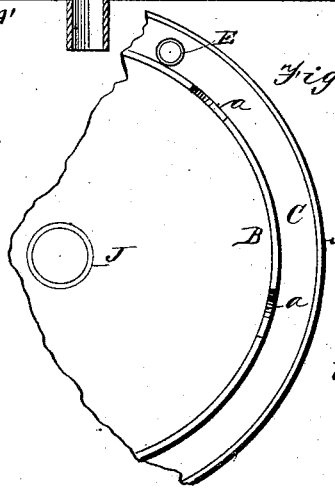


Fig 4



Witnesses;

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his Attys

E. E. RICE.

Method and Apparatus for Burning Oils.

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Fig 5

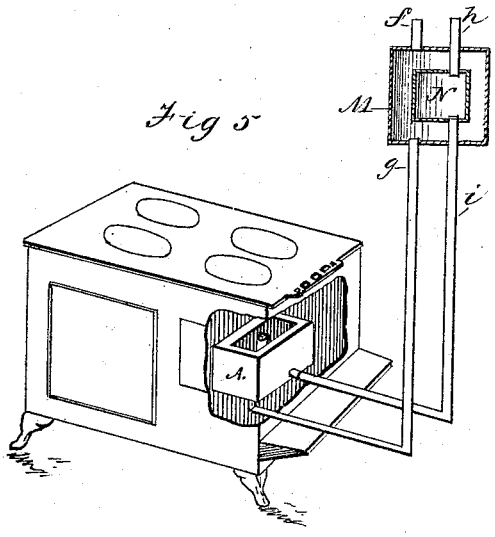

Fig 7

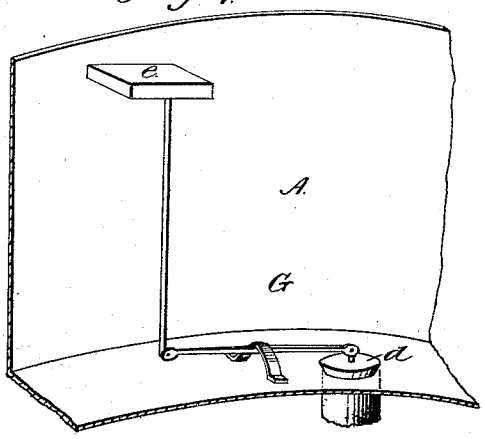

Fig 6.

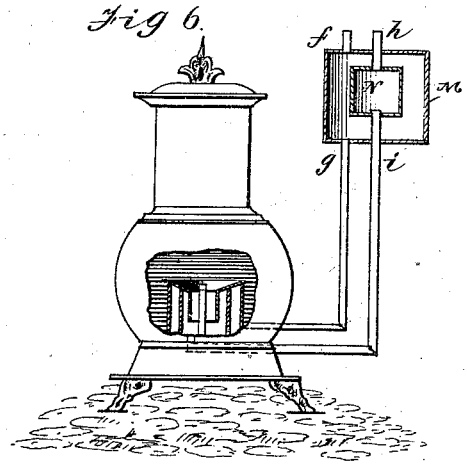

Fig 8

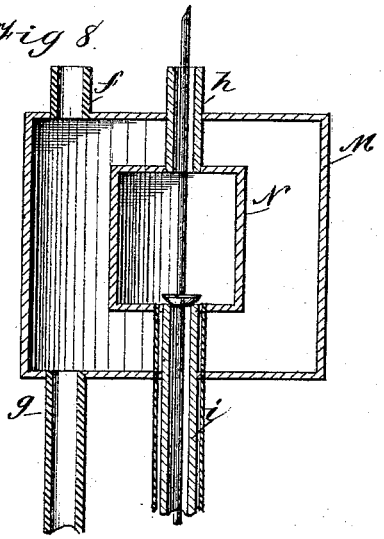

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Fig 9

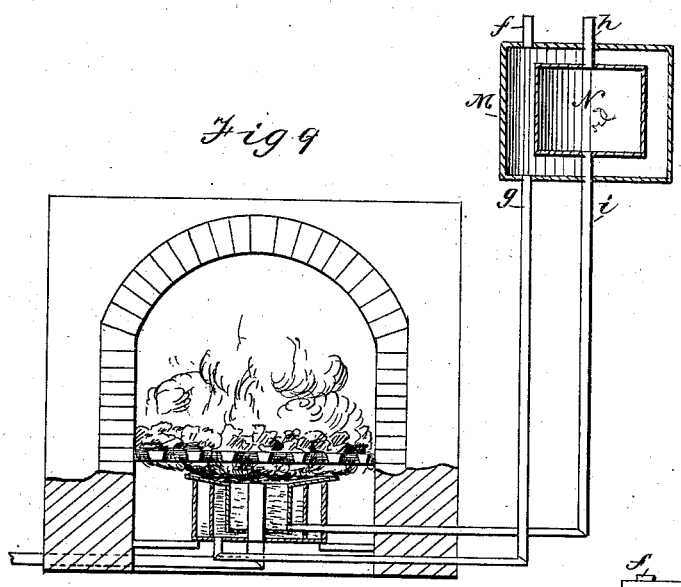


Fig 11.

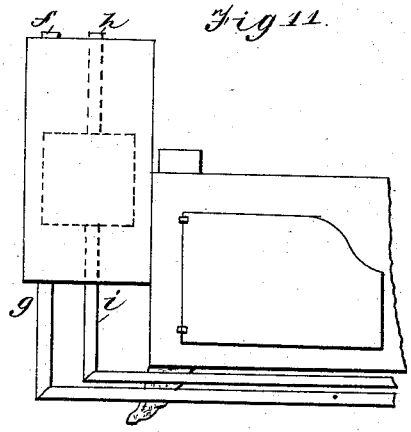
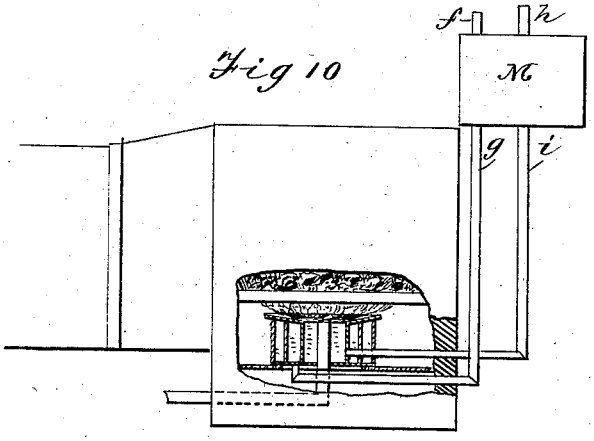


Fig 10



Witnesses

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UNITED STATES PATENT OFFICE

ELISHA E. RICE, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-FOURTH HIS RIGHT TO GEORGE W. DYER, OF WASHINGTON, D. C.

IMPROVEMENT IN METHODS AND APPARATUS FOR BURNING OILS.

Specification forming part of Letters Patent No. **168,782**, dated October 11, 1875; application filed September 16, 1875.

To all whom it may concern:

Be it known that I, ELISHA E. RICE, of San Francisco, in the county of San Francisco and State of California, have invented a new and useful Method and Apparatus for Burning Oils for Heating Purposes; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon.

The object of my invention is the production of a safe, easily-regulated, convenient, and effective method of burning oils for heating purposes, and of an apparatus in which said method may be employed; and my invention therein, so far as relates to the method, consists principally in causing the oil to rise upon the surface of a body of water, and in burning the oil in a thin film upon such body of water, which is so placed and arranged that the water is limited in the height of its column, and serves as a protection and safeguard from explosion or excessive combustion; also, in introducing into the flames of the burning oil currents of heated air, for the purpose of using the heat from the combustion of the oil more conveniently and effectively in heating stoves, furnaces, cooking-stoves, ranges, and like purposes; also, in introducing into the flames of the burning oil, at a point a little above the surface of the oil, currents of steam, for the purpose of using the heat from the combustion of the oil more conveniently and effectively in steam-boilers, smelting-furnaces, and like purposes; also, in returning the water heated by the burning of the oil upon it to the boiler as heated feed-water.

My invention therein, as to the apparatus, consists in the various operative parts and their proper combinations essential to make effective the above named methods.

In order to enable those skilled in the art to employ my methods and to make and use my apparatus, I proceed to describe both, for convenience taking the apparatus first.

In the drawings making a part of this specification, Figure 1 is an elevation, partly in perspective, of my apparatus. Fig. 2 is a vertical central section of the same; Fig. 3, a broken section of Fig. 2, showing the location of an air-pipe; Fig. 4, a broken plan of a portion of the bottom, showing a portion of the jacket-section of the apparatus; Fig. 5, a view of a cooking-stove, with a portion of the front broken out to show the application of the apparatus to a cooking-stove; Fig. 6, a similar view, showing the application of the apparatus to a heating-stove; Fig. 7, a broken section of the jacket-section of the apparatus, showing a float-valve to the water-pipe; Fig. 8, a vertical section of the water and oil tanks to supply the apparatus, the oil-tank having a regulating-valve; Fig. 9, an elevation of a furnace to show the application of the apparatus to a furnace; Fig. 10, an elevation of the fire-box to a steam-boiler, showing the application of the apparatus; Fig. 11, a view of a reservoir cook-stove, with the tanks connected with the hot-water reservoir of the same.

Like letters denote corresponding parts in each figure.

The apparatus, as shown in the drawing, is cylindrical in form; but it is evident that it may be made rectangular, or, indeed, of almost any other form.

A represents the outer shell, A′ its bottom, and B an inner shell, all of which conveniently for most purposes may be cast in one piece, but for other purposes may preferably be made of wrought metal. Between the outer shell and that next to it there is an annular chamber, C, and in it a drip or overflow pipe, D, tapped through the bottom A′. There is in this chamber also an air-pipe, E, passing through the bottom, and extending up almost to the top of the shell B. Another shell, F, is placed within the shell B, leaving an annular chamber, G, which serves as a water-jacket, which shell does not extend quite down to the bottom A′, leaving a space between the same and said bottom; or, if no such space is left, there should be openings in the lower part of the shell F. The top or cover H of the apparatus is firmly secured to the top of the shell F, and, when cast metal is used, may conveniently be cast with it in one piece. This top or cover mentioned fits with a tight joint to the top of the shells B and A, except where the top of the shell B is

cut away, as at *a a a*, for overflow of water, and has a series of openings, *b b b*, near its outer edge. Of course, in place of these cut-away portions, pipes may be substituted, if need be. There is then left upon the inside of the shell F a cylindrical chamber, I, up through the center (preferably) of which passes a pipe, J, which, for convenience, may have a telescopic joint, so that it may be raised or lowered at pleasure, which pipe extends up to a point a little above the surface of the burning oil, where it terminates in a perforated cap of any incombustible material. Into this same chamber I there is tapped through the bottom thereof a water-pipe, K. An oil-pipe, L, passes through all the shells, and terminates in the chamber I, having a water-jacket, *c*, around it from the point where it leaves the water-reservoir, hereafter described, to the point where it enters the chamber I. Within the chamber G is placed a valve, *d*, operated by a float, *e*, so that when the water rises to the desired height, the action of the float will cause the valve *d* to cover the opening of the water-pipe K. Connected with the apparatus is a tank, M, for the reception of water, which tank should be elevated above the burning apparatus, and may be placed at any convenient point within the room or building where the burning apparatus is placed, or in another room or building, or wholly out of doors. This tank has a filling-pipe, *f*, and an exit-pipe, *g*, which communicates with the pipe K. Within this tank M is held in any proper manner, so that it may be surrounded by water, an oil-tank, N, having a filling-pipe, *h*, and an exit-pipe, *i*, which communicates with the oil-pipe L. This pipe *i* has at its point of junction with the tank N a regulating-valve, preferably such as is used in the "student's lamp," as shown in Fig. 8.

In the application of this apparatus, as shown in Fig. 5, to a cooking-stove, the device is shown of a rectangular form, and occupying the space usually taken by the fuel, with the tanks to the front or on one side.

In the modification as shown in Fig. 11, the tanks occupy the position usually assigned to the hot-water reservoirs of stoves.

In the application of my contrivance to a heating-stove, as shown in Fig. 6, the burning apparatus is placed in the ash-pit, or a little above, and the tanks wherever it will be found most convenient to place them.

In the application to a smelting or other furnace, as shown in Fig. 9, and to a steam-boiler, as shown in Fig. 10, the drawing shows plainly the location of the burning apparatus and the tanks, and also the location of the steam-pipe, which should, in the last instance, connect with the boiler, so as to receive a constant supply of live steam, and in the first instance with a separate boiler, (not shown,) which will provide the requisite supply of steam.

These various applications are shown by the way of illustration, it being evident that such applications may be very numerous, and quite dissimilar, without affecting the main principles of my apparatus or its methods of operation.

The method or methods of operation are as follows, the burning apparatus being employed in the heating-stove shown in Fig. 6: The proper tank being filled with water, the same flows into the chambers I and G, filling them to the top, and also to the overflow-openings, at which point of time the float-valve operates and cuts off the further supply of water. The oil-tank being filled with oil, this, in turn, flows through its proper pipe, enters the chamber I, and passes up through the water in the same, being purified largely in such passage, and floats upon the top of the water in a thin film. Fire being applied to this oil, it burns freely, imparting a certain amount of heat. By reason of this combustion of the oil the water supporting it becomes heated, and communicates heat to the central pipe J, by means of which currents of air begin to ascend in such pipe and discharge themselves into the flames, causing combustion of the gases there generated, and largely increasing the heat. If the water flows too fast it is self-regulated by the float-valve, and in no instance can it do any harm, as it escapes by the waste-pipe. If the oil flows too fast, and is not sufficiently regulated by the lamp-valve in the tank, it can be regulated by a stop-cock (not shown) in the oil-pipe; but in no case can it do any harm or overflow, as its height depends on that of the water supporting it, which cannot go beyond a certain limit regulated by the overflow.

If the burning apparatus is applied to the cooking-stove shown in Fig. 11, the operation is the same, with the particular advantage, in that instance, that the water-tank serves as a hot-water reservoir.

If the apparatus is applied to a steam-boiler, the air-pipe is employed as such until steam is created in the boiler, when the same is admitted into the air-pipe, and issues out of the orifices in its top, and increases vastly the intensity of the flames. In connection with this use it is obvious that the hot water in the chamber I and G may be used to supply the boiler with hot feed-water.

If the apparatus is used in connection with a furnace for smelting, where steam is taken from a separate boiler, it will be found of advantage to employ a fan-blower to force air through the pipe E, from which, by means of the openings *b b* in the top or cover of the apparatus, the result of which will be that the flame will be converted into a blast.

The advantages of my method and apparatus consist in the fact that they can employ crude petroleum, notoriously one of the cheapest of heat-making substances; that such use can be made by unskillful persons with perfect safety; and that the apparatus can be used in portions of the country, particularly in mining

regions, where transportation is difficult and expensive, and where the ordinary fuels are enormously dear.

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

1. The method, substantially as described, of regulating the height of oil burning upon the surface of water, by means of connecting the chamber containing the water which carries the oil, by passages or openings at its bottom, with a water-chamber entirely around the first-named chamber, and with suitable overflow pipes or passages at its top, leading into a third chamber entirely around the second, from which last-named chamber the water has free outlet.

2. The method, substantially as described, of increasing the combustion of oils burning in a thin film upon the surface of water, by introducing vertical jets of air into the center of the fire above the water by a central vertical pipe with a perforated top.

3. The method, substantially as described, of converting the flame of oils burning in a thin film upon the surface of water into a blast, by introducing vertical currents of live steam into the center of the flame by a central vertical pipe with a perforated top.

4. The method, substantially as described, of converting the flame of oils burning in a thin film upon the surface of water into a blast, by introducing vertical central currents of live steam into the flames, and at the same time introducing radial currents of air entirely around the periphery of the flames.

5. In the apparatus described, the combination of the chamber I, provided with water and oil inlet-pipes, and the chamber G, provided with overflow pipes or passages at its top, connected by openings or passages at the bottom with the chamber I, substantially as and for the purposes set forth.

6. In the apparatus described, and in combination with the chamber I, the central steam or air pipe J, with a perforated top, and adapted to be raised a little above the surface of the water and oil contained in said chamber.

7. In the apparatus described, and in combination, the chamber I, connecting by passages at the bottom with the chamber G, the chamber G, having overflow-passages at its top, leading into the chamber C, and the chamber C, having outlet D, all substantially as and for the purposes set forth.

8. In the apparatus described, and in combination, the air-pipe E in the chamber C, the top cover H, having an annular series of openings, *b*, and a central steam-pipe, J, substantially as and for the purposes described.

9. In the apparatus described, the combination of the tanks M and N, with connecting-pipes *g i*, and the chamber I, substantially as and for the purposes set forth.

This specification signed and witnessed this 13th day of September, 1875.

ELISHA E. RICE.

Witnesses:
R. N. DYER,
W. T. JOHNSON.