2 Sheets—Sheet 1.

U. P. SMITH.

Apparatus for Burning Naphtha.

No. 213,845. **Patented April 1, 1879.**

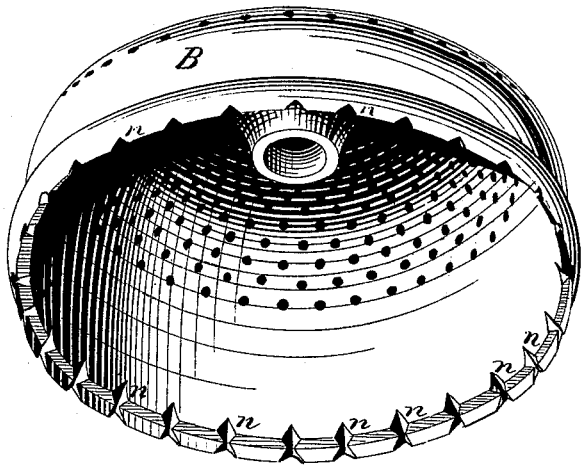
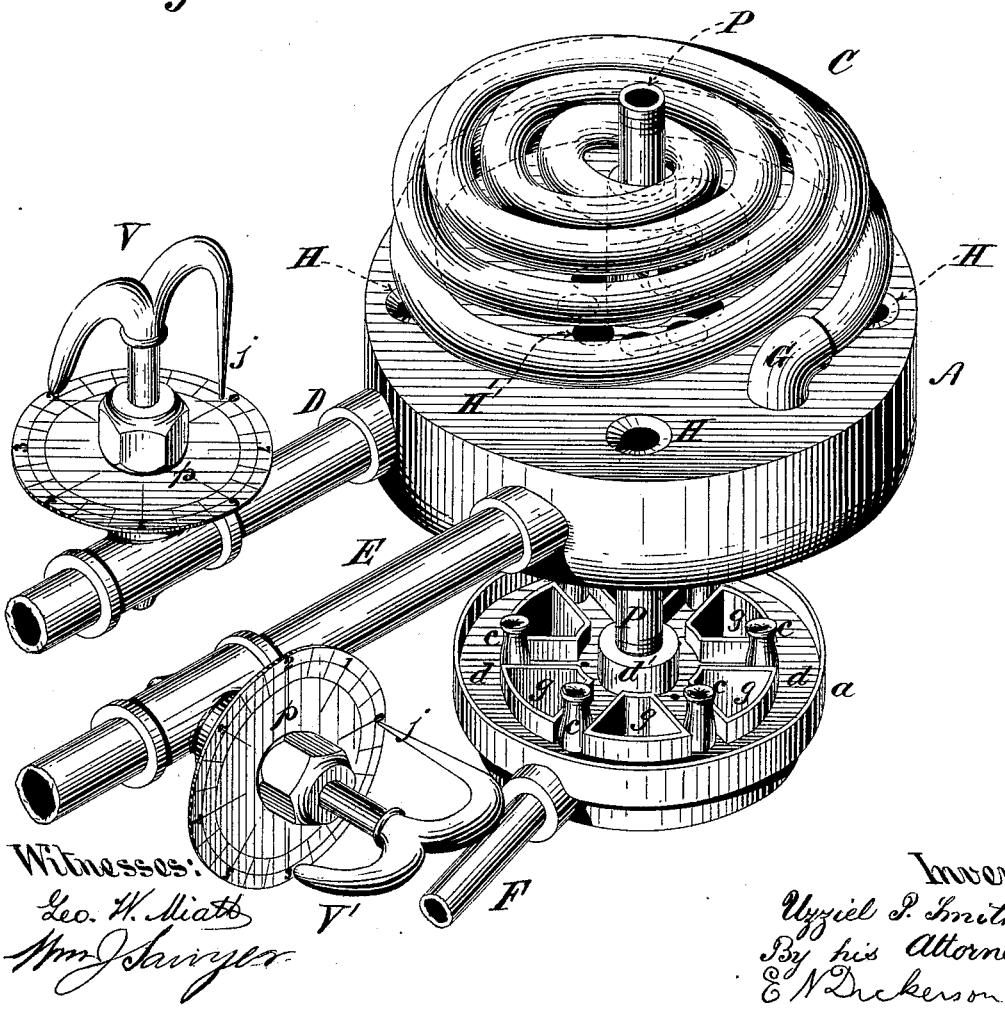


Figure 1.



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U. P. SMITH.

Apparatus for Burning Naphtha.

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Figure 2.

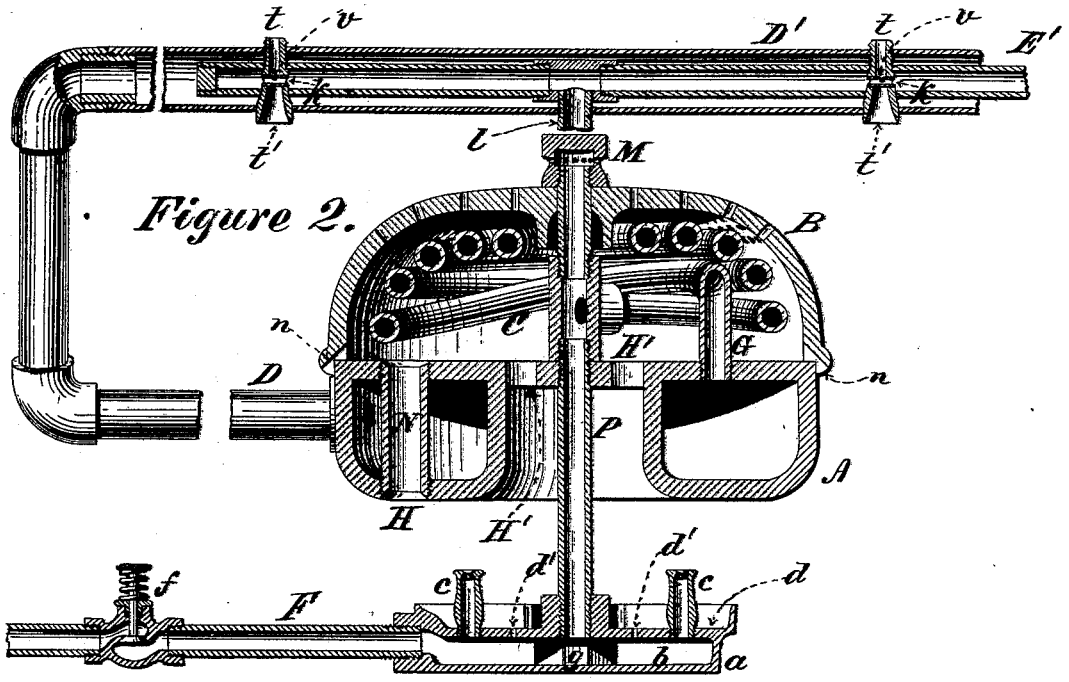
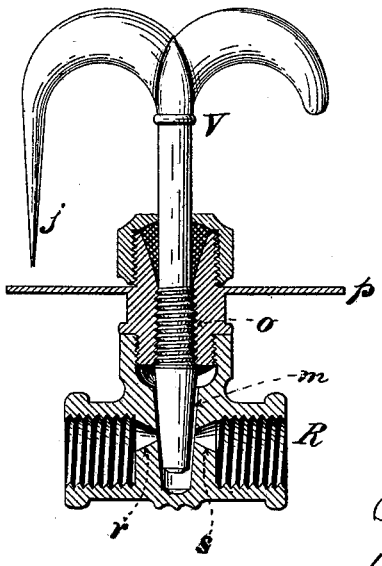


Figure 3.



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UNITED STATES PATENT OFFICE.

UZZIEL P. SMITH, OF NEW YORK, N. Y.

IMPROVEMENT IN APPARATUS FOR BURNING NAPHTHA.

Specification forming part of Letters Patent No. **213,845**, dated April 1, 1879; application filed September 6, 1878.

To all whom it may concern:

Be it known that I, UZZIEL P. SMITH, of the city, county, and State of New York, have invented a new and useful Apparatus for Burning Naphtha and other Hydrocarbons, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

The object of my invention is to consume thoroughly the vapors and gases arising from heated oils. This I do by uniting with the vapors which are produced from heated naphtha a sufficient quantity of steam, which combination of steam and naphtha is afterward passed through a heated coil, where the vapors of water and naphtha are converted into fixed gases, and are afterward burned in the intimate presence of a sufficient quantity of air.

My invention consists in apparatus consisting of an annular retort and coil for passing the vapors of naphtha and water which pass from this annular retort through a coil of considerable length situated above the retort and exposed to the same flame which heats it; also, of a burner and connections.

By this means all deposition of carbon is prevented, and, the motion of the vapors and gases all being upward and in the same direction, the apparatus becomes very effective.

Many attempts have before now been made to thoroughly burn the vapors of naphtha, but in none, so far as I know, has this result been satisfactorily accomplished except in my invention.

It is my opinion that the successful combustion produced by my machine is due to the mechanical breaking up or separation of the naphtha or naphtha vapors into very minute portions, which are then highly heated in the immediate presence of the oxygen liberated by the decomposed water.

My apparatus is also provided with valves, by means of which the relative flow of the naphtha and water supplied to it can be exactly regulated, and by means of which the extent and quality of the fire can be determined, and also with a peculiar burner, by means of which a sufficient quantity of air can be introduced into the gas at the point of combustion.

My apparatus, as shown, is suitable for a heater in a stove or similar household-heating contrivance, or for use under a boiler or other situation where large quantities of heat are required.

My invention will be clearly understood from the accompanying drawings, in which Figure 1 represents a perspective elevation with the perforated cap removed; Fig. 2, a section through the center of the same with my improved burner added; Fig. 3, a section through the graduated supply-valves.

My apparatus consists of an annular chamber, A, into which the water and naphtha are primarily delivered by means of the pipes D and E, controlled by valves V and V′. This chamber is pierced with a series of holes, H, provided with tubes N, for the purpose of allowing the flame of the burner to pass through it. The flame of the burner passes up likewise through the center of the annulus through holes H′.

Communicating with the annular chamber A is the coil C, which begins at the elbow G and terminates in the vertical tube P, with which it communicates by a T-joint. Covering the coil C is the perforated cap B, which is provided with a series of air-passages, *n*, for the purpose of admitting air beneath it, and thereby facilitating combustion.

The pipe P terminates at its upper extremity either in a burner, M, or it may be connected with the burners *t*, presently to be described. The lower portion of this pipe P is connected with the burner *a*, which burner consists, generally, of a horizontal chamber, *b*. A double series of holes, *c* and *d′*, are pierced through the top of this chamber, the outer series being provided with burners, as shown. The holes *d′* deliver into a pan or dish-shaped vessel, which serves the purpose of retaining the naphtha while burning.

The burner *a* is provided with air-passages *g* through its bottom, for the purpose of sustaining the air-supply.

Connected with the chamber *b* is the supply-pipe F, provided with a spring thumb-valve, *f*, which serves to admit the naphtha when the machine is first started. The valves V are shown in section at Fig. 3. The naphtha or water passes through the tube R by means of the small openings *r* and *s*, which open into a conical valve-seat. The screw-valve V is provided with a conical valve or plug at its lower

extremity, and with a screw-thread, *o*, by means of which the conical valve *m* can be raised or depressed. One arm of the thumb-screw is provided with an index-finger, *j*, which travels over the surface of an index-plate, *p*. By means of this index it is possible to regulate the opening of the valve very exactly.

By experiment I determine the relative quantities of water and naphtha which are required by a fire of any particular size, and I then mark upon the index-plates corresponding figures, so that if the thumb-screws are turned to the proper corresponding figures the proper relative amounts of water and naphtha will be admitted to supply a fire of the size required.

In case it is desired to carry off the gas produced by my apparatus and burn it elsewhere, I prefer to use the burner shown at D′, Fig. 2. The burner M is unscrewed, and the pipe *l* is connected to the pipe P. The pipe *l* communicates with the pipe E′, which is surrounded by a larger pipe or jacket, D′, which communicates with the water or steam supply pipe D.

Burners *t* are provided, which pass through both the interior pipe, E′, and the exterior pipe, D′, but connect only with the interior pipe. These burners are vertical tubes, provided at their bottom with flaring mouths *t′* for the purpose of admitting a supply of air. Passing through them are the horizontal pipes *k*, communicating with the pipe E′. These pipes *k* open into the burners *t* by apertures *r*, through which gas passes from the supply-pipe E′.

The operation and uses of the parts described will be now explained.

The pipe E is put in communication with the naphtha supply, and in case compressed air is available it is advisable to place such supply of naphtha under a pressure of air, thereby preventing undue evaporation, and enabling the supply-tank to be placed at a lower elevation than the retort into which it is to be driven. I thereby render the naphtha-tank safe from explosion. The pipe D is put in communication with the water or steam supply. In case steam is available, it should be put in communication with the steam. In case a burner similar to the one shown in Fig. 2 is employed the pipe D should be put in communication with the steam-space of a boiler. The pipe F communicates likewise with the naphtha-supply. The valves V and V′ and *f* are here shown in the neighborhood of the retort, but should be placed at some convenient situation beyond the reach of the flame of the retort. By pressing upon the spring-valve *f* naphtha is allowed to flow into the pan or burner *a*, where it is ignited and burns in the pan *d*, thereby heating the retort A. After this retort has been sufficiently heated to vaporize and convert water and naphtha into fixed gas, the pressure is removed from the valve *f*, which thereby closes, and the valves V and V′ are opened, thereby passing into the annular retort-chamber corresponding amounts of water and naphtha. This water and naphtha is therein vaporized, and, passing through the coil C, enters the pipe P, where some of it ascends and burns at the burner M or the burners *t*, as the case may be. The other portion descends and is forced out through the apertures *d′* and the burners *c*. There it is met by the current of air ascending through the draft-holes *g* and rushing in from the surrounding atmosphere. This flame, therefore, rises through the retort, passing through it by the apertures N and H′, thereby heating it; then passes into and through the converting-chamber formed by the cap B and the retort beneath, and escapes through the apertures in the cap. In its passage through the decomposing-retort it is further supplied with air by the air passages *n*.

In case it is desired to carry off the gas flowing upward through the pipe P and burn it elsewhere, it is advantageous to introduce into the eduction-pipe a current of air somewhere above the coil C. This current of air should be fored into the gas in the direction in which such gas is moving. The gas may then be carried off through the pipes *l* and E′ to burners *t*, entering such burners through passages *k* and apertures *r*. In these burners it is further supplied with air through the flaring mouths or funnels *t′*.

By surrounding the pipe E′ with the jacket it is protected from the disintegration resulting from the high heat. By passing the steam or water through this jacket D′ the steam is superheated or the water vaporized, and a more advantageous result is obtained in the vaporizing-retort.

It is plain that the burner *a* might be connected with the coil C by a pipe extending outside of the retort-chamber instead of through it, which might be an advantage where strength of apparatus was a necessity. A waste-cock might also be attached to the converting-retort A, drawing off from it any residuum.

It will be observed that in my apparatus the gas is constantly advancing with an accelerated velocity. As it passes forward from the retort into the coil it is thoroughly heated, and thereby expanded, so that a greater volume of gas escapes through the end of the coil than went into the beginning. After leaving the coil a further volume of air is forced into it, which causes it to advance with still greater velocity, so that when the gas reaches the burners it escapes with great force, making, as it were, a blast, and I have observed that the greater the force or velocity of the escape the better the results are.

By introducing the water and naphtha into one vaporizing-retort I succeed in keeping this retort and the coil connected with it entirely free from lamp-black, which has been one of the difficulties with this class of machines.

The heavier oils of naphtha are also carried up by the escaping steam of the water, and pass through the coil and burn at the burn-

ers, which oils would be apt to lodge at the bottom of a vessel into which naphtha only were supplied.

It is plain that several forms of apparatus might be devised other than that here shown, and still be in accordance with my invention; but I believe the present form to be the one most advantageous and suitable for the purposes described.

I find it advantageous to insert in the mouths of my naphtha and water supply tubes a netting for the purpose of spraying the water and naphtha supply, or dividing it into fine drops, obtaining thereby a more steady result.

I am aware that many attempts have before now been made to burn naphtha and steam together, and that they have sometimes been introduced into one vessel and burned together, and I do not claim this idea, broadly.

I am aware of the patents of A. J. Griffin, April 16, 1867, G. W. Coleman, November 27, 1877, and L. Stevens, April 14, 1868, and October 11, 1870, and do not claim anything there shown.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In combination with a single receiving-chamber, into which both naphtha and either water or steam are caused to enter before they are heated, a superheating or converting coil exposed to the flame, which heats the retort, and serving to convey and convert the vapor of the retort into the gas consumed at the burner, substantially as described.

2. In combination with a retort for vaporizing naphtha and water together, which consists of a single chamber, into which steam and water enter, and a coil connected therewith, through which the vapors of steam and naphtha pass after they have been formed in the retort, and in which they are superheated and converted, a heater connected both with the decomposing-chamber and with the naphtha-supply, whereby naphtha can be supplied to the burner previous to the operation of the retort for the purpose of heating said retort, while subsequently the flame of the burner is supplied by the retort itself, substantially as described.

3. The combination of a retort provided with apertures for the passage of flame, a coil connected therewith, and situated above such retort and inclosed by a perforated cap, and connected with a burner beneath, whereby the flame from such burner is passed first through the retort and then through the coil, substantially as and for the purposes described.

4. In combination with a naphtha-burner, a jacketed pipe consisting of an interior and exterior tube, and burners connecting with the interior tube and with the atmosphere, thereby admitting an additional supply of oxygen at the point of combustion, substantially as described.

5. The herein-described firing-pan, which is provided with a chamber for receiving and passing the naphtha-gas formed in the retort above, and burning it in the burners thereto attached, and with a pan for receiving a certain amount of naphtha from the naphtha-supply, and there consuming it, and with air-passages passing through the pan and the gas-chambers, thereby securing a plentiful supply of air, in combination with the converting-retort, substantially as described.

6. The herein-described naphtha-burner, which consists of an annular retort surrounding a central tube, which tube is connected to the retort by a superheating coil, and is also connected at one extremity with a burner for producing the heat required in the formation of steam, or other purposes for which the machine may be employed, and at the other with a burner for heating the retort and the coil, substantially as described.

7. A naphtha-burner provided with two supply-tubes, one connected with the water-supply and the other with the naphtha-supply, and provided with independent graduated valves, and a firing-pan provided with an independent naphtha-supply tube, which tube is provided with an automatically-closing spring-valve, substantially as and for the purposes described.

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