R. F. HUMISTON. 2 Sheets—Sheet 1.

Apparatus for Burning Hydrocarbons.

No. 216,853. Patented June 24, 1879.

Fig. 1

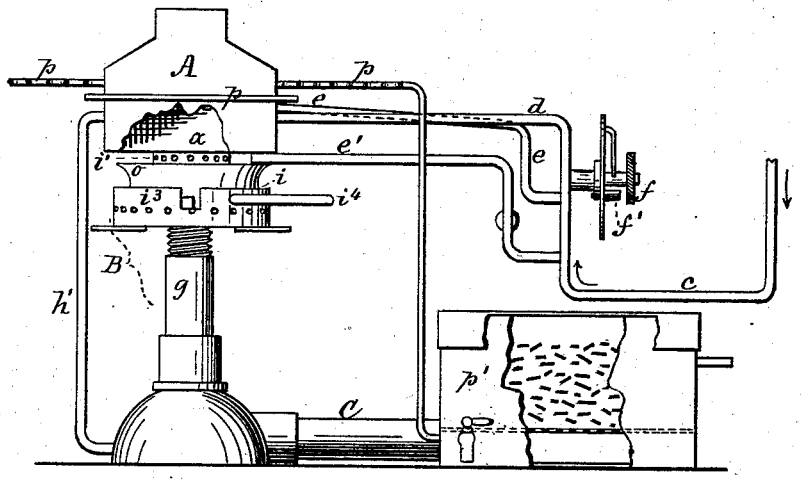
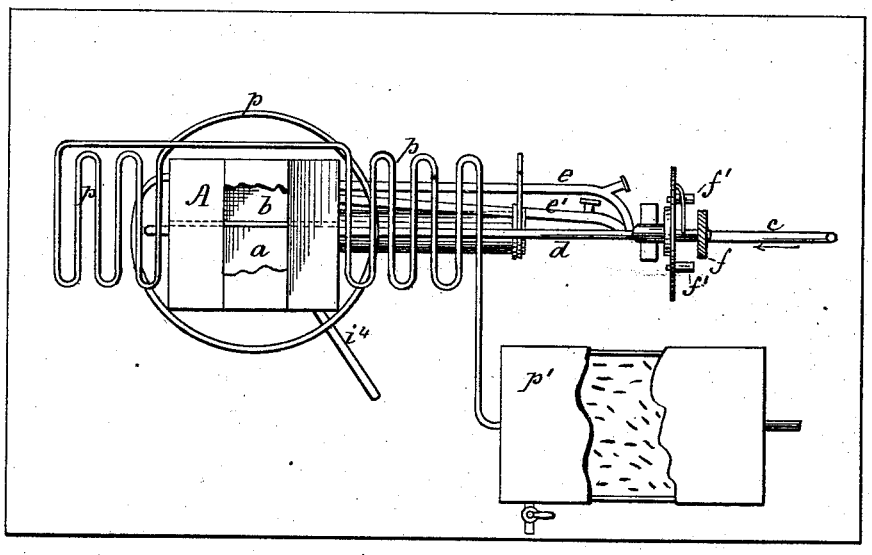


Fig. 2.



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R. F. HUMISTON.

Apparatus for Burning Hydrocarbons.

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Fig. 3.

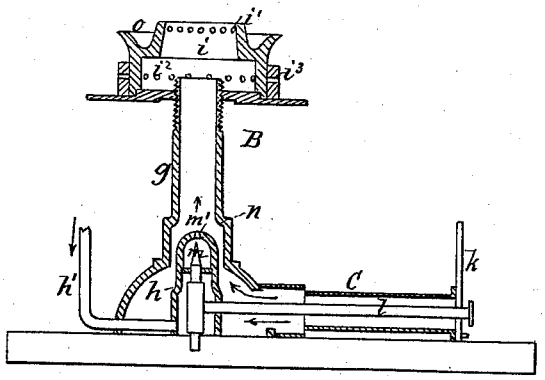


Fig. 4.

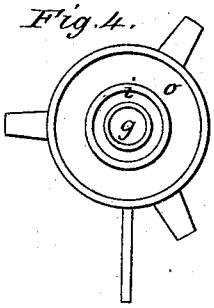


Fig. 5.

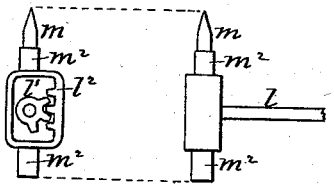


Fig. 6.

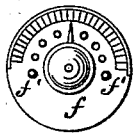


Fig. 7.

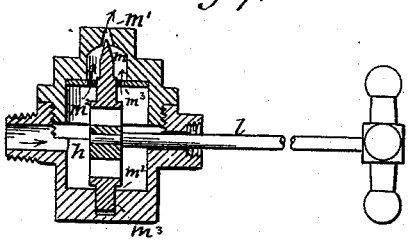
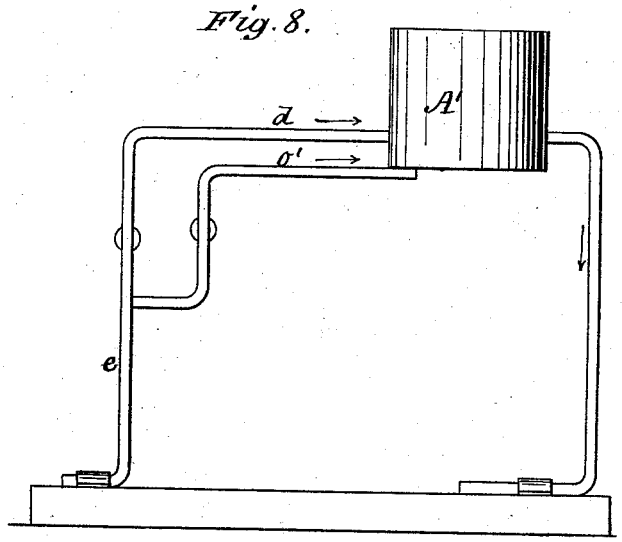


Fig. 8.



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UNITED STATES PATENT OFFICE.

RANSOM F. HUMISTON, OF CLEVELAND, OHIO.

IMPROVEMENT IN APPARATUS FOR BURNING HYDROCARBONS.

Specification forming part of Letters Patent No. **216,853**, dated June 24, 1879; application filed May 22, 1879.

To all whom it may concern:

Be it known that I, R. F. HUMISTON, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Apparatus for Burning Hydrocarbons as Fuel; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description thereof.

My improvements relate to that general class of apparatus in which hydrocarbons are burned in a gaseous condition; and the object thereof is to attain, with an economic consumption of hydrocarbon, a varied capacity for operating either at minimum or maximum grades of heat, or at any intermediate degree, without the aid of water or steam, or the undue accumulation of solid products of combustion upon and adjacent to surfaces directly exposed to the flame.

For the attainment of these ends in burning hydrocarbons on a large scale, my invention mainly consists in the combination, with an atmospheric or "Bunsen" burner, of a retort having a radiating-surface equal to or greater than the area of flame from the burner, located immediately above said burner, and which operates as a complete deflector to the heat and flame therefrom, a pipe connecting the retort with the burner, and a fire-pan below the retort for developing the initial supply of gas to the burner.

The term "atmospheric burner" as used herein by me is not intended to embrace that class of illuminating-burners within which air and gas are mingled prior to ignition, and with which a white or light-giving flame is developed, and which therefore possess value only in proportion as said flame is white and solid; but, on the contrary, I include within the meaning of that term only such burners as operate on what is well known as the "Bunsen" principle, within which air and gas are so mixed prior to ignition that a blue or heat-yielding flame is developed, which is practically deficient in light-yielding properties. These two practically opposite results are due solely to the fact that air is used sparingly in the first instance and freely in the second.

Illuminating-lamps of the so-called "vapor-burner" class have heretofore embodied within the standards thereof a retort, or its equivalent, a burner below it, a pipe connecting the two, and a fire-pan for initial operation; but in none of these could the retort practically operate as a deflector to the flame, for two reasons, viz: The white flame impinging upon the retort would not only unduly develop solid carbon or lamp-black thereon, but it would also so derange and shield the flame that its light-giving properties would be impaired, and still further result in disagreeable odors; neither is it new, broadly, to have a gas-flame deflected by or impinge upon a retort above it in apparatus heretofore embodying a retort, a burner, and a pipe connecting them; but, so far as my knowledge extends, the employment of a blue-flame burner operating on the Bunsen principle is a novelty in that combination, and it is due to that fact only that I can successfully deflect the flame by the retort, and thereby apply the heat directly thereto without the accumulation of carbon thereon and attain the attendant economic results.

In that class of apparatus in which steam is decomposed for attaining a more perfect combustion of the gas or vapor there is but little accumulation of carbon upon the retort during its operation at high temperatures; but if a temperature be desired lower than that competent to decompose steam, imperfect combustion is inevitable, which is attended with the development and accumulation of solid carbon and a consequent waste of fuel. The fire-pan referred to as an element in my combination has been heretofore largely used in various forms.

I am also aware that heretofore hydrocarbon-gas stoves have embodied an atmospheric burner of the Bunsen class, a firing-pan, and a retort located above the burner, so as to be heated by the flame from the burner, and also that in some of said stoves the flame has in part been deflected by the lower surface of the retort; but in all such stoves known to me the main bulk of the flame is utilized for cooking, and the consumption of hydrocarbon is on a small scale, suited only for light cooking operations.

I will here again state that the object of my

apparatus is to attain high temperatures and great volume of heat by burning hydrocarbons on a large scale, and that, therefore, with my apparatus, these pre-existing gas-stoves may be used to advantage in many cases—as, for instance, my apparatus may be located within a hot-air furnace of a dwelling-house containing several suites of rooms, all of which are heated by said furnace. For cooking purposes, each suite of rooms, being connected by pipes with my retort, will admit of the use of hydrocarbon-gas stoves of any of the well-known types, the variable capacity of my apparatus being such that a practically uniform house temperature can be maintained regardless of the additional cooking requirements.

My invention further consists in the combination, with a retort, of an open-topped atmospheric burner, operating on the Bunsen principle, connected with the retort and located below it, so that its bottom operates as a cap to the burner and as a deflecting-plate for the flame, whereby a thin disk-shaped flame is developed through the annular opening between the top of the burner and the retort, and in direct contact with the latter.

My invention further consists in the combination, with a retort and an open-topped atmospheric burner, operating on the Bunsen principle, mounted on a standard below, and connecting with the retort, of means whereby the two may be adjusted in position with relation to each other for graduating the space intervening between burner and retort, and thereby to attain a disk-shaped flame of any desired volume. I prefer that the retort be stationary and the burner movable, as by a cap on its standard, and I therefore mount the cap of the burner by means of a threaded connection with its standard, so that it may be raised or lowered by rotation.

My invention further consists in the combination, with an atmospheric gas-burner operating on the Bunsen principle, and provided with two or more flame-jets, or series of jets, one or more of which can be separately closed and opened, of an air-induction valve, by which the supply of air to the burner may be graduated in proportion to the number of flame-jets required, and the desired quality of flame attained, whether one or more of the jets, or series of jets, are in service.

I do not claim, broadly, flame-jets which can be wholly or partially closed, nor air-induction valves, for I am well aware that these have been heretofore separately employed in illuminating vapor-burners; and I also know that in that same connection a single illuminating flame-jet or single series of jets has been used in combination with an air-induction valve.

The open-topped burner before referred to has been described as capable of being adjusted with reference to the retort for affording a thick or a thin flat circular flame, and it is obvious that this adjustable capacity in that burner renders it the equivalent of a burner having one or more flame-jets or series of jets, which can be separately closed or open, for in both cases the volume of heating-flame can be varied by reducing or increasing the discharging capacity of the burner, and I therefore intend the last-stated feature of invention to include the open-topped burner, adjustable as described, as an equivalent of the burner therein described, whether additional flame-jets be employed or not.

The particular construction of burner preferred by me consists of an annular shell provided with two or more annular series of jets in different planes, in combination with a register-jet valve, which controls one or more of said series, and such a burner constitutes another portion of my invention.

For controlling the passage of gas to the burner I employ a needle-valve, which is provided with guides to assure a truly longitudinal movement, and is operated by a hand-rod, a rack-gear, and a pinion on said rod, and these parts, as a particular combination, constitute another feature of my invention.

I am aware that needle-valves operated by hand-rods with cams and with links have heretofore been employed.

The object of my particular construction is to assure a true coincidence of the valve with its seat and an effective and durable arrangement of parts for operating the valve.

To more particularly describe my invention I will refer to the accompanying drawings, in which—

Figure 1 represents, partially in side view and partially in section, an apparatus embodying my invention adapted to heating purposes and also to the generation of illuminating-gas. Fig. 2 represents a plan of the same with the top of the double retort removed to disclose its interior construction. Fig. 3 represents my burner in central vertical section. Fig. 4 represents the burner in top view. Fig. 5 represents the needle-valve in detail. Fig. 6 represents in end view a graduated dial-plate and a valve-stem, by which the supply of hydrocarbon may be controlled. Fig. 7 represents, in vertical central section, one form of valve-chamber with its needle-valve. Fig. 8 represents, in side view, a retort and its connections adapted to heating purposes only.

A denotes the retort, which in Figs. 1 and 2 is divided into two compartments, *a* and *b*, for respectively generating gas to supply the heating-burner and for illumination.

The hydrocarbon is contained in a receptacle (not shown) arranged for delivering its contents under pressure to the retort, either by reason of its elevation or the employment therewith of an air-pump, in a manner well known in this connection. The hydrocarbon is conveyed by pipe *c* toward the retort, and to the different chambers thereof by branch pipes *d* and *e*, both of which are provided with suitable cocks for controlling the supply of fluid.

A dial-cock, *f*, as heretofore, is used by me

for accurately graduating the supply of hydrocarbon to the chamber *a* of the retort. It is provided with stop-pins *f'*, which limit the movement of the valve. Several pin-holes are arranged at intervals, so that the stop-pins may be set at various points corresponding to the minimum and maximum requirements of the apparatus from time to time.

The heating-burner B is composed of three main parts, consisting of the hollow standard *g*, the hydrocarbon-valve chamber *h* within the standard at its base, and the jet-cap *i*, mounted upon the top of the standard. The interior of the standard, at its base, communicates with an air-induction pipe, C, provided at its entrance with a valve or gate, *k*. Within pipe C is a valve-rod, *l*, which carries at its inner end a segmental pinion, l^1, for engaging with the rack-gear l^2 on the needle-valve *m*, which co-operates with the valve-seat m^1 in the top of the valve-chamber *h*. The stems m^2 of the needle-valve are fitted to guides m^3 above and below the rack-gear, which insures a truly vertical movement of the valve toward and from its seat. The valve-chamber is connected with chamber *a* of the retort by means of pipe *h'*.

The base of the standard is enlarged to afford a capacious air-chamber; but it is contracted adjacent to the valve-chamber, which is also cylindrical, so that the air passes upward through the intervening annular space to a point above the valve-chamber, where it strikes an annular shoulder, *n*, formed by the further contraction of the standard, and is thence deflected toward the center of the standard, so as to be thoroughly mixed with the gas issuing upward from the valve-chamber.

The upper guide for the valve *m* consists of a disk freely perforated for the upward passage of the gas.

The upper end of standard *g* is provided with an external screw-thread, by which the jet-cap *i* is mounted on the standard, whereby it may be raised or lowered, if rotated, it being provided with radial arms for convenient manipulation.

The jet-cap *i* is open at its top, and is provided with an upper series of radial flame-jets, i^1, and a lower series of flame-jets, i^2, these latter being controlled by a register-valve, i^3, provided with a suitable handle, i^4. Surrounding the jet-cap, and mounted thereon, is a fire-pan, *o*, for the initial heating of the retort, and it is supplied with hydrocarbon from the main supply-pipe *c* by way of branch pipe *o'*, which is provided with a suitable cock.

The portion of the apparatus adapted to the generation of fixed illuminating-gas, consisting of chamber *b* of the retort, the heating or gas-fixing coil *p*, and condenser *p'*, is substantially as heretofore, and constitutes no portion of my invention, it being herein shown merely to illustrate the adaptability of my apparatus to general heating purposes, in conjunction with the generation of illuminating-gas for domestic and other uses.

In Fig. 8 of the drawings I show a single chambered retort, A', for heating purposes only, and it is to be understood that the pipes therewith shown correspond to those previously described in connection with the supply to retort and fire-pan, and for conveying gas from the retort to the burner.

It will be seen that the burner is located beneath the retort, so that the bottom of the latter deflects the flame and heat so as to extend them over considerable area, and also that when the jet-cap is raised into contact with the retort its upper end will be closed, leaving only the upper and lower series of flame-jets for service. If the lower series of flame-jets be closed, then only the upper series will be in service, and the apparatus working with a minimum temperature, the air-induction valve being so set as to produce a blue flame. The valve of the lower series being opened, the flame-jets promptly ignite from above, and the air-induction valve is still further opened to secure a blue flame from both series of jets, whereby the apparatus will be operated with a medium capacity. For higher temperature the jet-cap is lowered to such an extent as will afford a space between it and the retort, whereby a disk-shape flame will be developed of any required thickness and diameter, its volume being governed by the pressure of gas in the retort, and, as said pressure increases in proportion to temperature, the volume of this disk-shaped flame can be increased to an almost unlimited extent. The air-induction valve should then be nicely adjusted to such a point as will result in the highest development of the blue or colorless flame. When used for domestic purposes, an entire apparatus, substantially as shown, and modified only in form and construction, so as to meet special requirements, may be placed within a set range for baking or boiling, or within a heating stove or furnace.

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

1. In an apparatus for economically burning hydrocarbons on a large scale for attaining high temperatures, the combination, with an atmospheric burner operating on the Bunsen principle, of a retort having a radiating-surface equal to or greater than the area of flame from the burner, and which operates as a complete deflector to the flame therefrom, a pipe which connects the burner with the retort, and a fire-pan below the retort for developing the initial supply of gas to the burner, substantially as described.

2. The combination, with a retort, of an open-topped atmospheric burner, operating on the Bunsen principle, connected with the retort, located below it and adjacent thereto, to enable the bottom of the retort to operate as a cap to the burner and as a deflecting-plate, substantially as described.

3. The combination, with a retort and an open-topped atmospheric burner, operating on

the Bunsen principle, mounted on a standard below the retort and connected therewith, of means for adjusting the burner with relation to the bottom of the retort, substantially as described, whereby the space intervening between burner and retort may be graduated to afford a thick or thin disk-shaped flame, as set forth.

4. The combination, with an atmospheric burner operating on the Bunsen principle, provided with two or more flame-jets or series of jets, one or more of which can be separately closed and opened, of an air-induction valve for graduating the supply of air to the burner in proportion to the number of flame-jets required, substantially as described.

5. A hydrocarbon-burner consisting of an annular shell provided with two or more annular series of jets in different planes, in combination with a register-valve for controlling one or more of said series, substantially as described.

6. The combination, with a hydrocarbon-burner and needle-valve, of the hand-rod, its pinion, the rack-gear on the needle-valve, and guides for said valves, substantially as described.

RANSOM F. HUMISTON.

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