(No Model.)

W. S. MORE & J. G. ROGERS.

HYDROCARBON BURNER.

No. 427,595. Patented May 13, 1890.

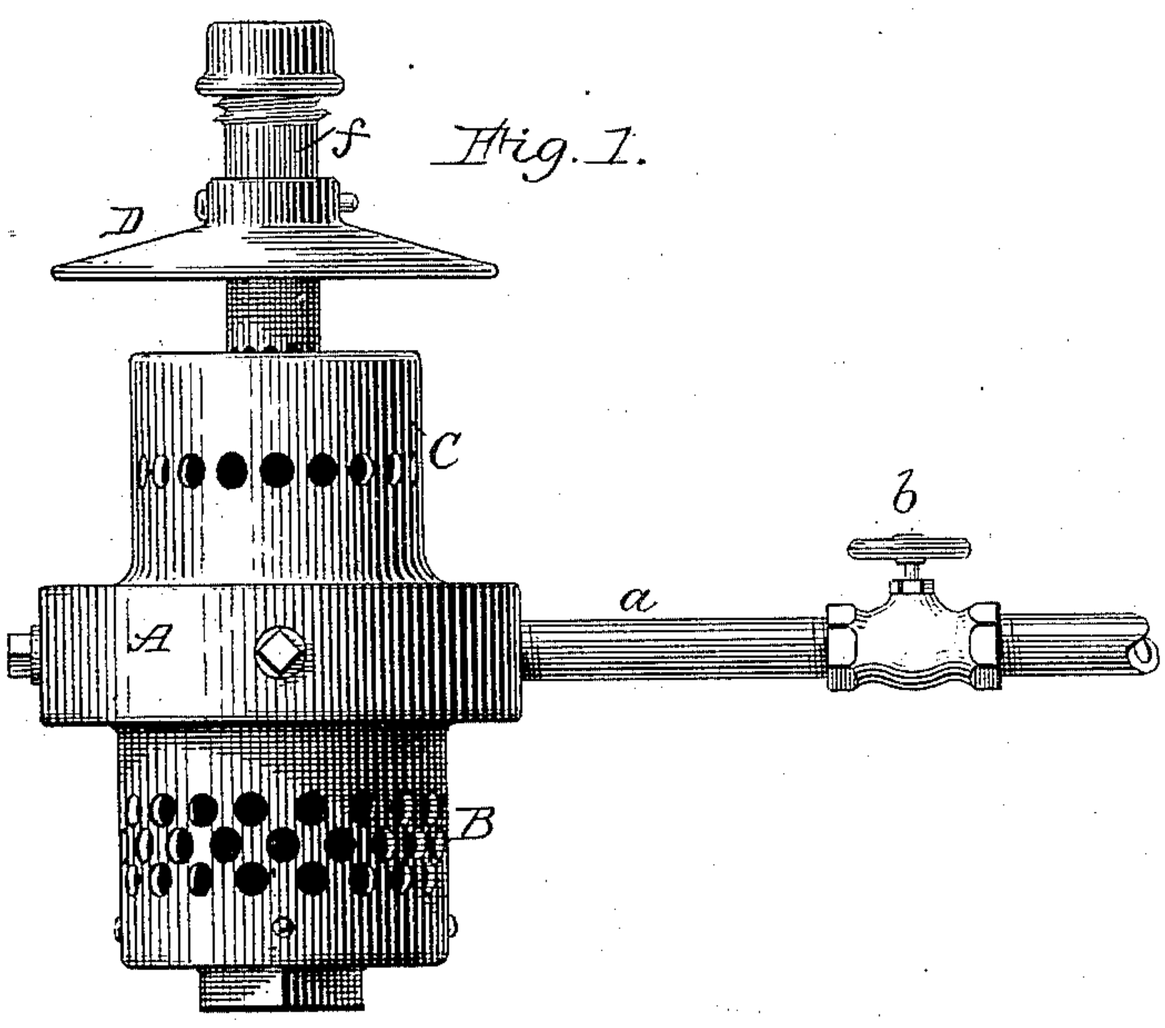

Fig. 1.

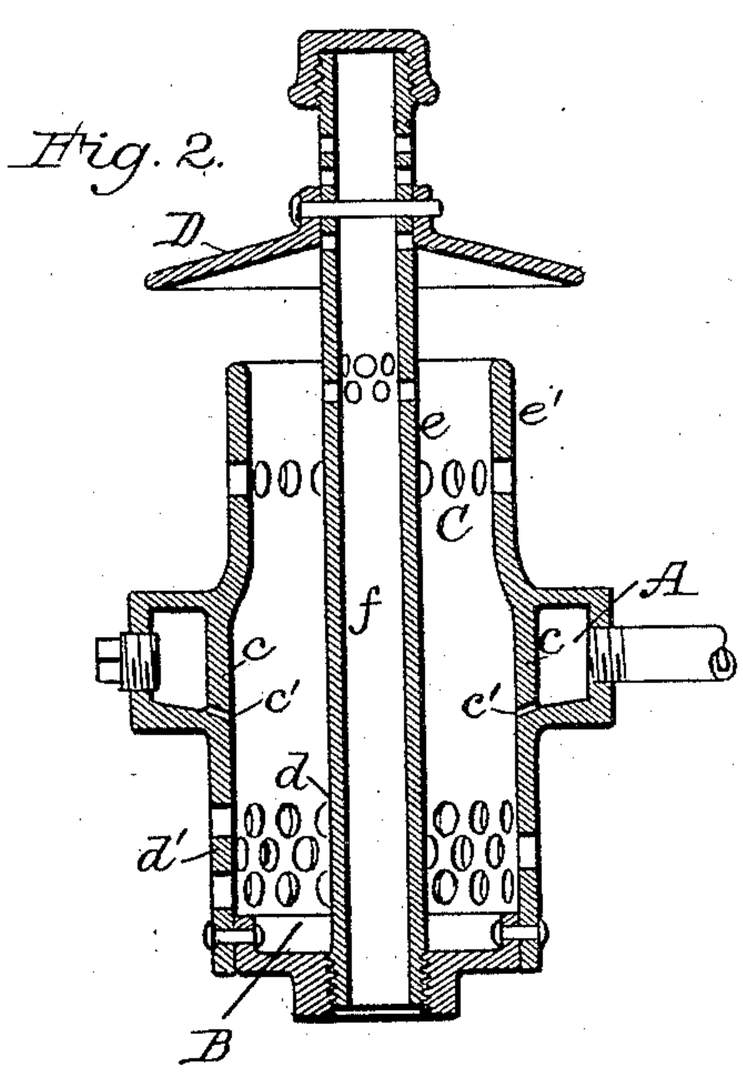

Fig. 2.

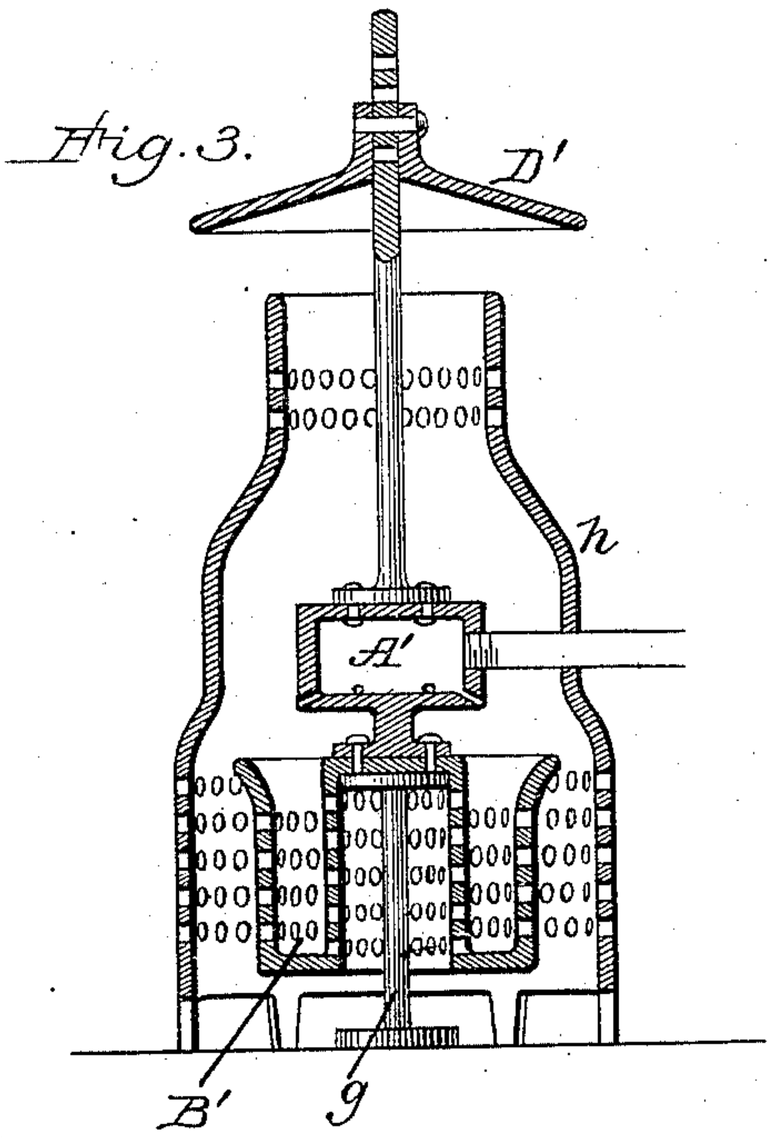

Fig. 3.

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UNITED STATES PATENT OFFICE.

WILSON SQUIRE MORE, OF ELLICOTT, AND JOHN GILBERT ROGERS, OF JAMESTOWN, NEW YORK.

HYDROCARBON-BURNER.

SPECIFICATION forming part of Letters Patent No. 427,595, dated May 13, 1890.

Application filed May 16, 1889. Serial No. 310,957. (No model.)

To all whom it may concern:

Be it known that we, WILSON SQUIRE MORE and JOHN GILBERT ROGERS, residents, respectively, of Ellicott, in the county of Erie, and Jamestown, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Hydrocarbon-Burners; and we 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 of our invention.

The prime objects of our invention are to provide for a practically complete combustion of crude petroleum, whether of the light or heavy varieties, and to do this without the use of water or steam beyond that which may be normally present in the petroleum, and, further, to provide for that purpose a simple inexpensive burner of a durable character and readily operated by unskilled persons.

So far as we know, our burner involves a novel mode of operation, in that said burner is so organized that it eliminates and directly burns the gaseous components of the petroleum at one portion of the burner and continuously discharges from said portion the more solid or tarry matter into another underlying portion of the burner, where it is consumed, the heat and smoke rising therefrom merging with the flames which are supported by the gaseous elements, abundant oxygen being supplied to all interior portions of the burner wherein combustion occurs.

Broadly stated, our burner embodies in combination, first, a retort provided with means by which it may be supplied with petroleum, drop by drop, or otherwise continuously supplied in limited and well-controlled quantities, and also provided with a series of apertures which serve in common as gas-jet burners and educts for tarry matter; second, an underlying fire-pan into which said tarry matter falls and is burned, said pan having perforated walls for securing a plentiful supply of air, and, third, a perforated wall inclosing the space within which the gas or vapor from the retort is projected and burned, and into which the flames and smoke from the burning tar are also delivered, said space being in substance a vertical combustion chamber or flue well supplied with oxygen, so that the gaseous matter from the retort, as well as the tar exuded therefrom, may be efficiently and economically burned.

To more particular describe our invention, we will refer to the drawings, in which—

Figures 1 and 2, in side view and vertical section, respectively, illustrate one of our burners in a simple form, as constructed by us for use in ordinary house-stoves. Fig. 3, in vertical section, illustrates one of our burners as organized for more extensive service.

In the burner shown in Figs. 1 and 2 the retort A is annular in form; or, in other words, it is a hollow ring which may be varied indefinitely as to its cross-sectional contour, and also as to its mechanical characteristics, without departure from our invention. It is provided with an induction-pipe *a*, for supplying the liquid fuel, and as this should be delivered gradually in small quantities, usually drop by drop, it is important that suitable means be provided for graduating the supply of the fuel, and this can well be controlled by the use of an ordinary cock, as at *b*. It is desirable that the petroleum should, as usual, be supplied from an elevated receiver or tank. (Not shown.)

The interior annular wall *c* of the retort is provided with a series of small holes or jet-apertures, as at *c'*, and for securing the best results these holes should be located as nearly as possible to the surface of the bottom of the retort, because these apertures not only serve as gas-jets, after the manner of gas-burners, but also as discharge-ducts for the residual tarry matters developed in the retort, and these liquid matters should be promptly discharged while in a thoroughly liquefied condition, and not retained in the retort and exposed to coking or ash forming.

Below the retort is the fire-pan B, into which the tarry matter is delivered drop by drop as it falls from the apertures *c'* in the retort. This fire-pan is annular in form, corresponding in its contour with the inner wall of the retort, and it has inner and outer walls *d d'*, which are provided with openings or passages for the entrance of air for facilitating the combustion of the tarry matter as it falls in drops in a blazing condition from the retort

into the pan. These side walls *d* and *d'* are not only highly heated by the flaming contents of the pan, but also from above when the burner is in operation, the retort itself being then highly heated and said walls being connected therewith.

Above the retort there is an annular combustion flue or chamber C, having inner and outer side walls *e* and *e'*, and these are well perforated for the free admission of air; and it will be seen that from the bottom of the fire-pan upward there is a free annular space extending through the annular space surrounded by the retort to the top of said flue, and hence the latter is common, not only to the flames and smoke rising from the fire-pan, but also to the flaming gaseous matter, which is directly burned at the jets, through which it is delivered from the retort. In this particular construction of our burner the inner vertical or side wall *e* of the combustion-flue and the inner vertical side wall *d* of the fire-pan are afforded by a tube *f*, open at its lower end and serving as an air-flue for the free admission of air to be delivered through the numerous openings therein into the fire-pan and flue, respectively. In some cases the upper end of this tube or air-flue may be also provided with apertures for discharging air into the center of the flame rising from the combustion-flue.

As a rule, we employ with our burners a deflecting cap or cone D; but the main features of our invention do not depend thereon, as it will be seen that abundant oxygen is supplied to the fire-pan and to the combustion chamber or flue, and under commingling conditions obviously favorable to combustion, and that the smoke rising with the heat and flames from the fire-pan is merged with the mass or masses of flaming gas issuing from the retort; but with the deflector a more complete combustion is assured.

In starting the burner a small quantity of petroleum is admitted to the retort, and it flows from the apertures *c'* therein, dropping into the fire-pan, where it is readily ignited by way of any of its air-openings. In a few minutes gaseous pressure will be developed within the retort, and gas or gaseous vapor is forced therefrom through the several jet-apertures, and being promptly ignited continues to burn as long as the petroleum is supplied to the retort. The volume of heat will be graduated by the quantity of fuel admitted to the retort; but the supply should be graduated according to the gasifying capacity of the retort, and so avoid the undue discharge of any liquid until its gaseous matter has been well eliminated. It will be seen that as tarry matter accumulates on the bottom of the retort (which may be slightly inclined) it will flow to the apertures and be more or less forcibly discharged therefrom by the gas or vapor, which is delivered under considerable pressure through the same jets or apertures; and hence it is seldom, if ever, that said apertures become clogged. After the supply of petroleum has been cut off from the retort the burner continues to operate until its contents are ejected and consumed, and this is so thorough and complete that retorts having been opened after many weeks of regular service have been found substantially as clean within as when first made, and at no time of their service was it necessary to clear out the jet-apertures.

Our burners of the form shown in Figs. 1 and 2 are well suited for the lightest duty ever desired, and their dimensions may be so enlarged as to render them fit for comparatively heavy service. In some cases, however, it is desirable that the retort should be more thoroughly exposed to the action of the flames and heat than when arranged as in Figs. 1 and 2—or, for instance, as illustrated in Fig. 3, wherein the retort A' is drum-shaped (instead of annular) and is supported upon a post *g*, and has the fire-pan B' attached to it and depending therefrom; but the latter has the same annular form as in Figs. 1 and 2, and its side walls are provided with air-ports, and an abundant supply of oxygen is thereby afforded.

Surrounding the retort and fire-pan is a tubular wall *h*, somewhat larger at the bottom than at the top, and this tube is freely supplied with air-passages. The interior space inclosed by this wall *h* from the top of the fire-pan walls to the top of said wall *h* constitutes a combustion tube or chamber, as before described, which is common to the flames rising from the fire-pan and those of the burning gas or vapor issuing from the jets of the retort.

On a post supported by the top of the retort a deflector D' is mounted for operation, as with the smaller burner.

It will be seen that in this burner the flames from the fire-pan are well commingled with oxygen supplied through the side walls of the pan, and that near the base of the retort an annular column of air will be delivered to the annular flame as it reaches the base of the retort, and from thence the volume of heat, flame, and air rises and commingles with the flaming gas or vapor. The whole then rising into the combustion-flue passes therefrom without any visible unconsumed products of combustion. It will also be seen that in this burner the retort, fire-pan, and deflector are so united as to be a complete structure supported at its base, and that the outer wall *h* is independently supported, and hence the latter may be composed of any suitable materials—in some cases of fire-brick—having the air ducts or channels therein, so that as the wall becomes highly heated the air passing through said ducts will be raised to a temperature highly favorable to the best possible results.

It will be readily obvious that while our burners have been specially devised with reference to the successful burning of crude pe-

troleum of even the heaviest grades they can be used for burning the lighter forms of liquid hydrocarbons, and in all cases when the fuel used contains matter which cannot be completely gasified in the retort the practical value of our improvements will be readily recognized.

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

1. In a petroleum-burner, the combination, substantially as hereinbefore described, of a retort having means for supplying it with liquid fuel in graduated quantity, and also having a series of small eduction-apertures which serve both for the delivery of gas or vapor directly burned, as from ordinary gas-jets, and also for the discharge of gradually-developed tarry matters from the retort, a fire-pan for the reception of said tarry matter, located below the retort, and a combustion flue or chamber, which extends below and above the retort, is common to the flaming gas or vapor, and also to the flames and smoke rising from the fire-pan, and is provided with air-induction ports or apertures for affording abundant oxygen requisite for complete combustion.

2. In a petroleum-burner, the combination, substantially as described, of an annular or ring-shaped retort, having in its inner wall a series of small jet-apertures, through which gas or vapor is projected and residual tarry matter discharged, an annular fire-pan below the retort for receiving the falling tar and having perforated side walls, and an annular combustion chamber or flue, which is above said retort, has perforated side walls, and is common to the merged flames rising from the fire-pan and those at the gas-jets of the retort.

3. In a petroleum-burner, the combination, substantially as described, of a retort having small jet-apertures from which gas or vapor and residual tarry matters are forcibly discharged, a fire-pan below said retort for receiving said tarry matter, a combustion chamber or flue which extends from the fire from above the retort and is common to the flames rising from said fire-pan and to flaming gas issuing from the retort, and a deflecting-cone at the top of said flue or chamber.

4. In a petroleum-burner, the combination, substantially as hereinbefore described, of a retort having a pipe for conveying fuel thereto, and having a series of gas-jet apertures closely adjacent to the bottom surface of the retort, and a fire-pan located below said apertures, whereby tarry matters will be promptly ejected by the gaseous pressure developed within the retort and delivered into the fire-pan for combustion simultaneously with the combustion of the gas as it leaves the jet-apertures of the retort.

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