(No Model.)

# J. J. MONTGOMERY.

## PETROLEUM BURNER.

No. 549,679. Patented Nov. 12, 1895.

Fig. 1.

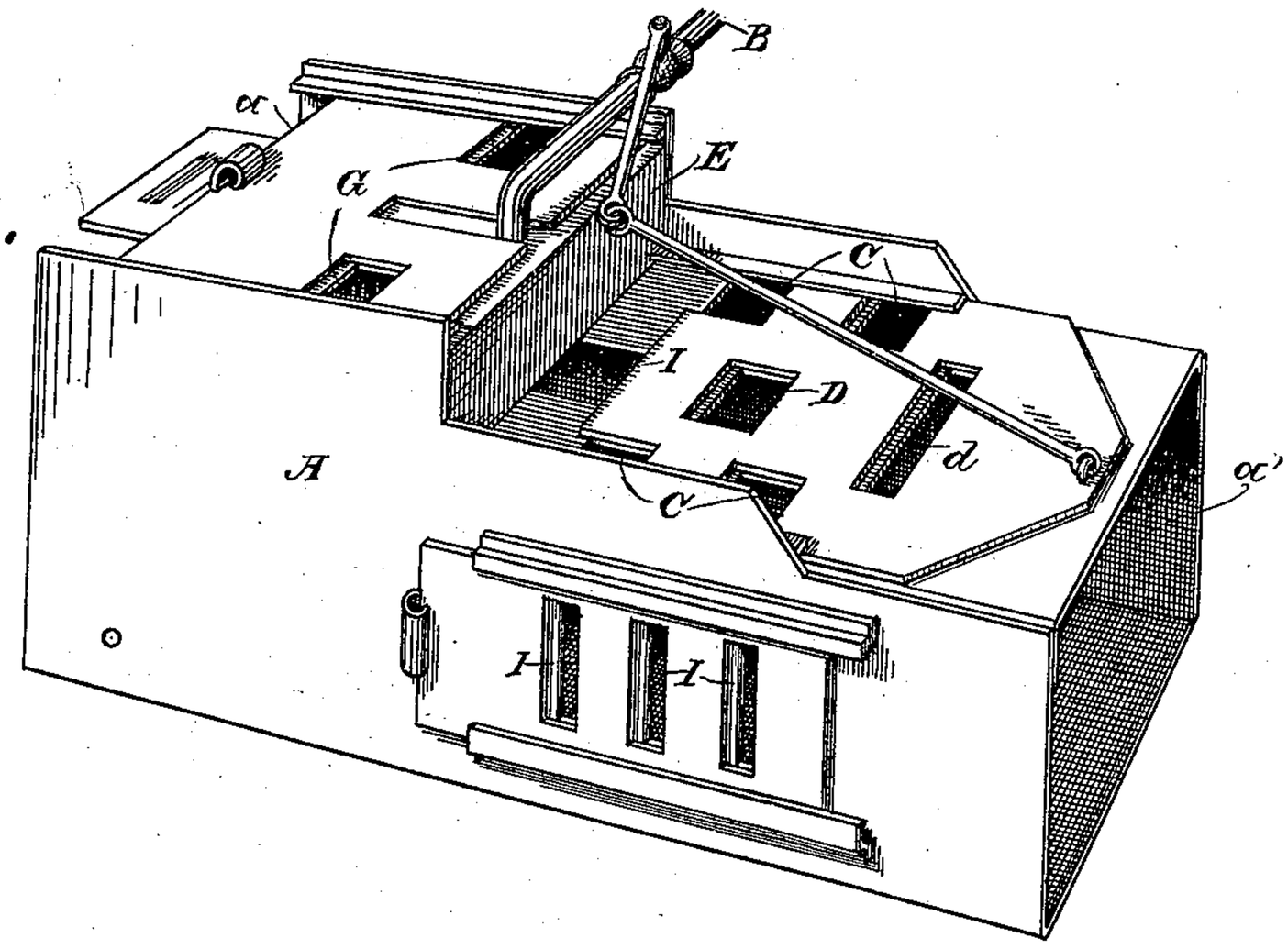
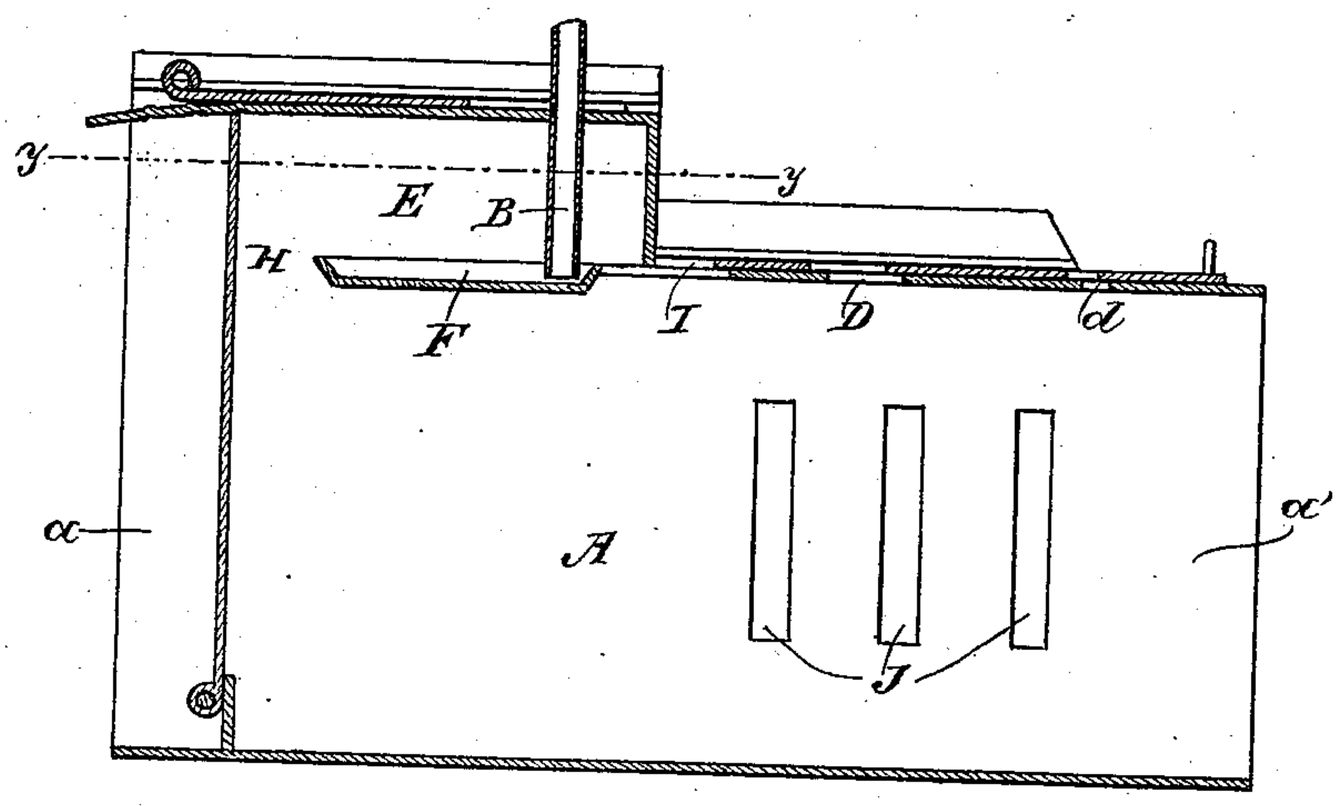



Fig. 2.



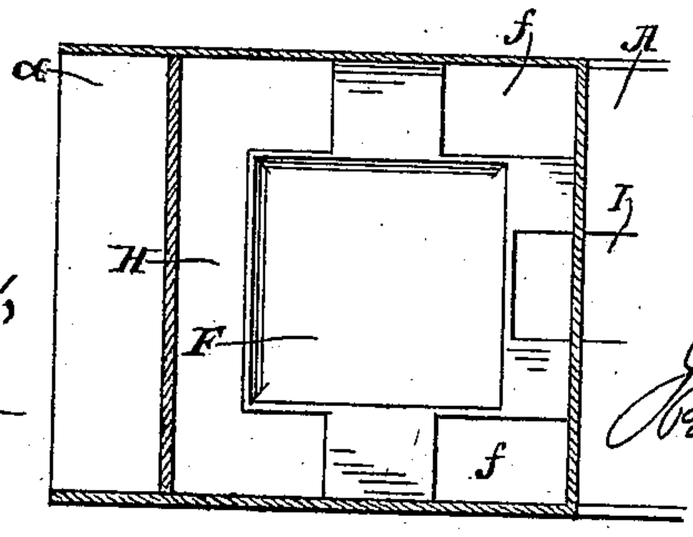




Fig. 3.

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# UNITED STATES PATENT OFFICE.

JOHN J. MONTGOMERY, OF OAKLAND, CALIFORNIA.

## PETROLEUM-BURNER.

SPECIFICATION forming part of Letters Patent No. 549,679, dated November 12, 1895.

Application filed June 25, 1895. Serial No. 554,041. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN J. MONTGOMERY, a citizen of the United States, residing in Oakland, county of Alameda, State of California, have invented an Improvement in Petroleum-Burners; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to the class of burners or furnaces especially adapted for the combustion of petroleum.

My invention consists, essentially, in a chamber to which the petroleum is fed and in which it is ignited, said chamber being closed behind the plane of the oil-feed, whereby all direct draft in the line of flame-exit is cut off, and said chamber having one or more controllable air-inlets at a point or points in advance of the plane of the oil-feed, whereby flame rotations are formed and the flame retarded to effect more perfect combustion of the petroleum.

My invention also consists in the particular location of the several air-inlets, whereby in the best form of the device compound rotations of flame are formed to effect the most thorough combustion; and it also consists in details of construction which I shall hereinafter fully describe.

In order to understand the principles upon which my invention is based, a brief explanation will be in order.

In the ordinary furnace the principal draft is supplied through or over the grate. There is thus formed a direct current from the grate toward the escape or flue.

With most kinds of fuel the heat of the lower fire causes volatilization of the lighter compounds, which partly escape as smoke. To prevent this escape in smoke-consuming furnaces air-passages are inserted, so as to cause a mingling of air with the escaping flame and thus produce perfect combustion. In any furnace involving these principles it is impossible to use heavy oils as fuel with an ordinary draft, for if the oil is allowed to enter the fire-box and is then ignited the direct draft from behind forces the flame from the body of the oil, so as to either extinguish the fire or render combustion so imperfect as to be a practical failure; but if combustion can be continued in such a manner that the flame continually acts upon the oil perfect combustion may result, producing no smoke and leaving no unburned residue. This may be accomplished by cutting off the direct draft and allowing the air to enter in such manner as to produce rotating flames. These objects I shall show are both attained by my construction. There are two general systems of rotation suitable for this purpose. In the first the axis of rotation is parallel with the direction of flame escape or exit, and this is accomplished where the air is admitted in the side or top of the chamber, and it will be observed, further, that if the point of admission of the air be in advance of the plane at which the oil is fed to the chamber the flames will not only be caused to rotate, but will be retarded, so that more perfect combustion is effected. In this form the flames advance with a spiral movement. If air should be allowed to enter at one end of the chamber and behind the plane at which the oil is fed and ignited, it will cause either an extinction of the flame or imperfect combustion. In the second system the rotation is around an axis lateral to the direction of escape, and this is produced by having air-inlets between the oil-supply and the flue-escape which allow the air to enter in streams athwart the escaping flame. There is thus produced, first, a movement of the flame from the air-inlets toward the rear of the chamber, and then a return of the flame toward the escape. Either of these systems may be combined with itself, so as to produce a compound set of rotations, or they may be combined with one another so as to produce a series of double compound rotations.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a general view of my burner. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a horizontal section on the line *y y* of Fig. 2.

A is the chamber of the burner closed at its end *a* and open at its end *a'*, at which latter end it communicates with the escape-flue. The closed end *a* is in the best form a door, as shown, whereby access may be had to the interior, and also a certain adjustment, to be hereinafter described, may be effected.

B is the oil-pipe, by which the petroleum is fed to the chamber. The top of the chamber has air-inlets C on each side. These, it will be seen, are in advance of the plane at which the oil is fed to the chamber—that is to say, they are between the exit and the oil-feed. In practice these inlets C should not be wider than one-fifth the distance across the top, but may vary in length, so as to constitute a slit or a series of square openings. If there be a number of such inlets on each side, their distance apart should not be less than their length. Regarding their dimensions, it is to be observed that their width must decrease as their length increases. In the top of the chamber and in a plane between these inlets C is an air-inlet D, which in practice should not be wider than one-fifth the width of the top. It may be extended, as are the side inlets, so as to form a slit, but should not extend to the rear end of the box. Its relative dimensions come under the same rule as those at the sides. If the dimensions of the side inlets and those at the center are so proportioned as to nearly form squares, they should be placed in alternation, as indicated, so that there will be a succession of alternating rotations from the sides toward the center, and vice versa. If preferred, the last inlet of the center series D may be a lateral slit. (Shown at *d*.) The principal office of such air-inlet is to partially develop a rotation of the second system, in which all the other rotary movements are involved as elements. These several air-inlets are regulated by suitable dampers, whereby the amount of air admitted can be made proportionate to the amount of oil. The combination of these air-inlets serves to develop a progressive series of spiral movements. In some cases an extension-chamber E may be made on the back and above the main chamber, in which is the receiving or drip pan F, to which the oil is supplied from the pipe B. In the top of this extension-chamber are air-inlets G, controlled by suitable dampers. This chamber is practically a repetition of the first, to produce a compound effect. The oil entering falls upon the pan, where it is partially vaporized as it flows toward the rear end.

The damper-regulated openings G admit air, which is partially utilized in causing a series of rotating flames in the upper or extension chamber and partly in producing the same in the lower chamber, passing through the openings *f f* on each side of the pan. The flame from this extension-chamber has three general escape-passages. The first is at H, which is back of the drip-pan and between that and the closed end wall of the chamber. This wall is an adjustable door, as heretofore mentioned, and by its movement to or from the rear of the drip-pan the escape may be varied. The second escape is at the side openings *f f*, and the third is at opening I, made in the top of the main chamber and partly inside the extension-chamber, and the principal office of which is to destroy a disagreeable blowing noise, which is usually produced by this combination of chambers.

In the sides of the main chamber A are inlets J, damper-controlled, and for the purpose of suppressing any noises which the distribution of the top inlets might not sufficiently subdue, and also for the introduction of air to the floor of the furnace, which might not be sufficiently supplied by the top inlets. This modification finds special application in large burners, and should be subservient to the development at the top. It performs its function of silencing the roaring noise by the development of other rotations, which serve to destroy certain synchronous movements which arise from opposing rotations, and which cause an alternating mixture of the air with the vapors, resulting in a kind of explosive sputtering of the flame from the air-inlets. These side inlets, it will be seen, are in series, and should be so used, it being well to use the center one first and then the outermost one and then the one nearest the closed end. It is important that these as well as the other inlets give limited but well-defined currents of air rather than a large supply. The special characteristics of these processes or principles of combustion which distinguish them from the usual processes are the shutting off of direct drafts from the fuel in the line of flame-exit and the introduction of air by means of inlets or passages for the purpose of producing rotations of the flame, simple or compound, according to the principles and systems which I have described, whereby air is supplied, first, to the vaporized oil with sufficient force to produce an intense flame, and, second, to the body of the oil modified in its force by a circuitous path, where it may support combustion without cooling the oil or blowing the flame from it, and whereby, also, there is a retardation of the flame, effecting the continuous volatilization and combustion of the oil and such a perfect admixture of air and flame that there is perfect combustion with a minimum quantity of air. By means of these rotations and the consequent retardation of the flame the rear portions of the chamber are kept filled with rapidly-moving flames. In other words, the flames are crowded in the vicinity of the oil. In its full operation this contrivance does not properly constitute a furnace, but a vaporizer of the oil and an air-mixer, from which the flame emerges as an immense gas-jet, producing its greatest heat after leaving the burner, and is designed especially as a petroleum-burner attachment to the door of any furnace.

Especial advantages of this burner are, first, the burning of crude and heavy oils by the means of ordinary chimney or forced draft without loss from smoke or residue and without the loud roaring usually attendant upon the burning of petroleum by the blast process; second, the production of a clear flame spread over large surface, as op-

posed to the concentrated and intensely-hot flame usually produced by the blast process and so ruinous to furnaces and boilers; third, the utilization of a chimney-draft for the burning of petroleum, whereby its use may be greatly extended; fourth, the perfect ease of starting and regulating, it being only required to ignite some light inflammable material in the fire-box and turn on the oil, and, fifth, the obtaining of perfect combustion with a minimum quantity of air, thus preventing the loss of heat by large quantities of air rushing through the furnace.

The particular objects of the air-inlets D in the top of the furnace-chamber are to produce rotation of the second system and to break up the synchronous movement of the rotations formed by the side inlets in the top, and which, if not broken up, produce a loud, roaring noise. This synchronism may also be prevented by using openings on one side only of the top or by making the openings on both sides of the top disproportionate in capacity. For ease of proportioning the admixture of gas and air it will be found advantageous to connect the damper which controls the inlets C and D with the stop-cock admitting the oil, as I have shown, so that a movement of the latter will produce a corresponding movement of the damper.

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

1. A petroleum burner consisting of a chamber to which the petroleum is fed and in which it is ignited, said chamber being closed behind the plane of the oil feed whereby all direct draft in the line of flame exit is cut off, and said chamber having a controllable air inlet, in advance of the plane of the oil feed whereby flame rotations are formed and the flame retarded, to effect more perfect combustion of the petroleum.

2. A petroleum burner consisting of a chamber to which the petroleum is fed and in which it is ignited, said chamber being closed behind the plane of the oil feed whereby all direct draft in the line of flame exit is cut off, and said chamber having a controllable air inlet in its top in advance of the plane of the oil feed whereby flame rotations are formed and the flame retarded, to effect more perfect combustion of the petroleum.

3. A petroleum burner consisting of a chamber to which the petroleum is fed and in which it is ignited, said chamber being closed behind the plane of the oil feed whereby all direct draft in the line of flame exit is cut off, and said chamber having a controllable air inlet in one side of its top in advance of the plane of the oil feed whereby flame rotations are formed and the flame retarded, to effect more perfect combustion of the petroleum.

4. A petroleum burner consisting of a chamber to which the petroleum is fed and in which it is ignited, said chamber being closed behind the plane of the oil feed, whereby all direct draft in the line of flame exit is cut off, and said chamber having a controllable air inlet in each side of its top in advance of the plane of the oil feed whereby flame rotations are formed and the flame retarded, to effect more perfect combustion of the petroleum, said inlets being disproportioned, so as to destroy the synchronous rotations in opposite directions.

5. A petroleum burner consisting of a chamber to which the petroleum is fed, and in which it is ignited, said chamber being closed behind the plane of the oil feed, whereby all direct draft in the line of flame exit is cut off, and said chamber having controllable air inlets on each side of its top in advance of the plane of the oil feed, whereby flame rotations are formed, and the flame retarded, to effect more perfect combustion, and having also a controllable air inlet in its top located in a plane between the air inlets in each side of the top, whereby the tendency to synchronous rotations is prevented.

6. A petroleum burner consisting of a chamber to which the petroleum is fed and in which it is ignited, said chamber being closed behind the plane of the oil feed, whereby all direct draft in the line of flame exit is cut off, and said chamber having controllable air inlets in its sides, substantially as and for the purpose described.

7. A petroleum burner consisting of a chamber to which the petroleum is fed and in which it is ignited, said chamber being closed behind the plane of the oil feed, whereby all direct draft in the line of flame exit is cut off, and said chamber having controllable air inlets in its top and having also controllable air inlets in its sides substantially as and for the purpose described.

8. A petroleum burner, consisting of a chamber having a raised portion at its back, said chamber being closed at one end, a supply pipe for the oil, a drip pan to which the oil is fed, controllable air inlets in the top of the raised portion of the chamber, and controllable air inlets in the chamber in advance of the plane of the supply-pipe, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand.

JOHN J. MONTGOMERY.

Witnesses:
S. H. NOURSE,
JESSIE C. BRODIE.