(No Model.)

2 Sheets—Sheet 1.

H. S. BELDEN.

VAPOR BURNER.

No. 263,840. Patented Sept. 5, 1882.

Fig. 9

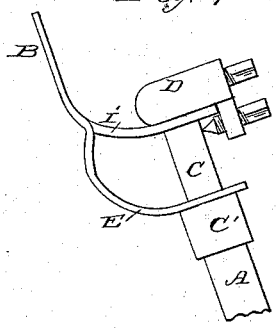


Fig. 11

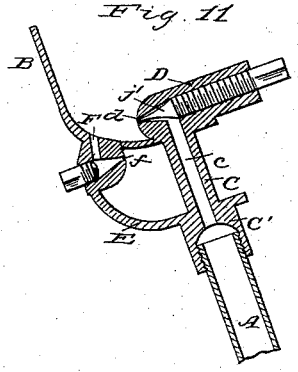


Fig. 8

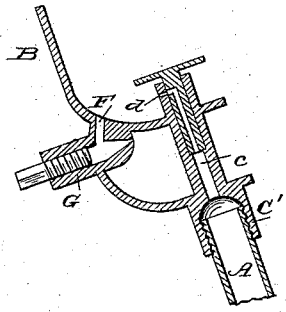


Fig. 10

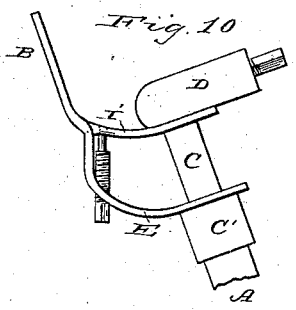
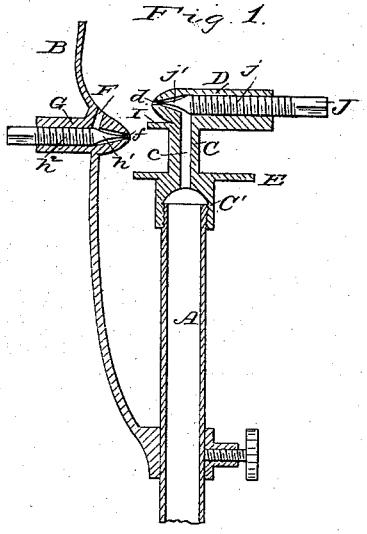


Fig. 1.



Witnesses:

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attys.

(No Model.) 2 Sheets—Sheet 2.

H. S. BELDEN.

VAPOR BURNER.

No. 263,840. Patented Sept. 5, 1882.

Fig. 2.

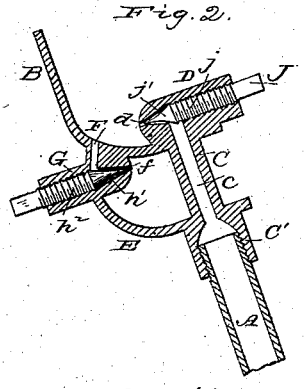


Fig. 3.

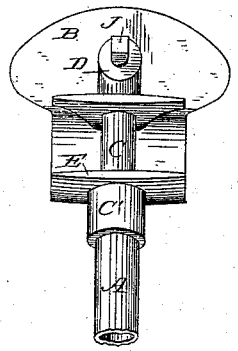


Fig. 12.

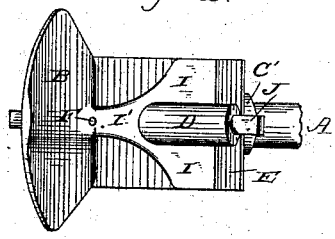


Fig. 4.

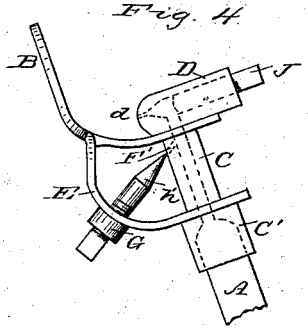


Fig. 6.

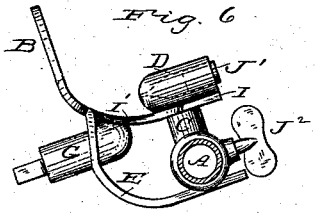


Fig. 7.

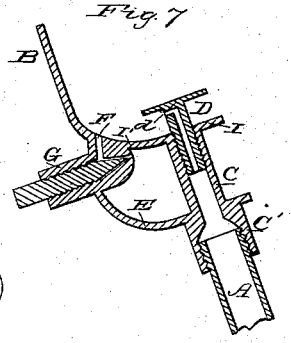
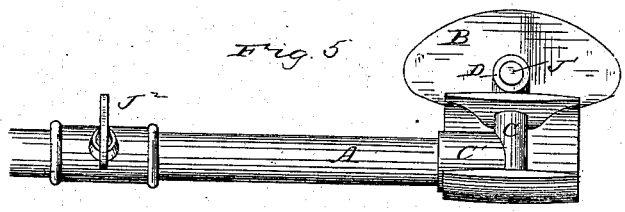


Fig. 5.



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Attys

UNITED STATES PATENT OFFICE.

HENRY S. BELDEN, OF CANTON, OHIO.

VAPOR-BURNER.

SPECIFICATION forming part of Letters Patent No. 263,840, dated September 5, 1882.

Application filed April 10, 1882. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. BELDEN, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Vapor-Burners, of which the following is a specification, reference being had therein to the accompanying drawings.

Heretofore vapor-burners have been made in one or the other of two ways. First, they have been made with a retort in which the oil is vaporized, a chamber in which the vapor escaping from the retort is mixed with air, (there being large orifices for the entrance of the air,) and a burner provided with an elongated slot or escape-orifice similar to that in ordinary gas-burners, these being known as "mixing-chamber burners." From the elongated slot the mingled air and vapor escape under pressure, and this pressure causes the vapor and air to spread through the slot to form the illuminating-flame. The burners of the other class are those having a retort in which the oil is vaporized, a small needle-orifice in the wall of the retort through which the vapor directly escapes into the open air, and a curved plate having a part lying across the path of the jet that escapes from the needle-orifice, so that the jet is caused to impinge upon said plate, which spreads it into the proper shape for the illuminating-flame, these being known as "plate vapor-burners." These have no mixing-chamber for mingling the air with the vapor before it escapes from the illuminating-orifice, and therefore, if the "spreading-plate" were not used, a small cylindrical and practically useless jet would be produced; and, on the other hand, if, instead of the needle-orifice, the elongated slot of the mixing-chamber burner were used, there would result such a decrease of pressure that the jet could not be properly spread or oxidized. The mixing-chamber burners are the more difficult to make, and consequently necessitate greater expense than is desirable in the ordinary burner used in street-lighting, &c., and therefore for such purposes they have been largely superseded by the plate burners. These plate burners, however, I have found to be very inferior, from the fact that as ordinarily constructed it has been impossible to get sufficient heat in the retort to thoroughly vaporize the oil, the spreading-plates having been heretofore relied on entirely to carry heat back to the retort from the illuminating-flame. These plates for some purposes must be made separately from the retort, and for some purposes must be supported entirely independently thereof, and when thus made and supported it is impossible to obtain the requisite heat in the manner heretofore followed in using plate burners.

This invention relates to vapor-burners of the kind known as "plate burners"—that is to say, those in which a plate of metal is used to spread out the jet of vapor or gas generated by the device, the plate being so arranged that the jet impinges upon it at a suitable point.

Figure 1 is a vertical section of a burner embodying my improvements. Fig. 2 is a section of a burner having the plate connected to the vaporizing-chamber. Fig. 3 is a front view of the burner shown in Fig. 2—that is, a view taken from the concave side of the plate. Fig. 4 is a side elevation of a burner having a modified form of the device which I term a "sub-heater." Fig. 5 is a front or side view, showing another method of attaching the feed-pipe and a modified form of the regulating device. Fig. 6 is a view from the side of the burner in Fig. 5, looking endwise of the feed-pipe. Figs. 7 and 8 are vertical sections of other forms of the devices which deliver the main jet. Figs. 9 and 10 show other forms of supplemental heating devices. Fig. 11 shows a burner having a heating-orifice formed in the spreading-plate without any regulating-valve for said orifice. Fig. 12 is a top plan view of the burner in Fig. 2.

In the drawings, I have shown, at A, a portion of a feed-pipe extending, by means of any suitable connections, to a reservoir. It is connected with the burner proper in any suitable way, either by screw-threads, as shown, or by ground joint or brazing.

The parts of the burner proper consist of a spreader-plate, B, a supply-pipe, C, a projection, D, to receive the jet-orifice, and an expanded part, I, immediately below the projection D, or between the same and the supply-pipe C, a passage-way or conduit for a heating-

jet to be applied below the projection D, and a socket, C′, for receiving the end of the supply-pipe A, and a device, E, which shields and guides the heating-jet. It will be seen that there is a passage, *c*, through the part C, whereby the vapor can pass into the upwardly-projecting part D, from whence it escapes through the orifice *d*. From this orifice it is thrown outward against the spreading and deflecting plate B. While passing from the orifice to the plate the vapor is mingled with a sufficient amount of air to permit combustion.

In the drawings I have shown several forms of burners in which my invention is embodied, though others will readily suggest themselves to those acquainted with the art.

In the construction shown in Fig. 1 a portion of the vapor, after it has escaped from the illuminating-orifice, is conducted downward through a passage, F, from which it is carried backward toward the vaporizing-chamber. It escapes through an orifice, *f*, and is ignited to form a flame, which plays against the chamber and the under side of the upwardly-projecting metal D. The spreading-plate B is disconnected entirely from the vaporizing-chamber, and is mounted in such a manner as to be adjustable independently of said chamber and of the burner. The heating-flame, however, provided as above described enables me to heat the vaporizing-chamber much more satisfactorily than it can be by conduction from the spreading-plate. In the other figures the sub-heater is shown combined with a spreader-plate having a metallic connection with the vaporizing-chamber in the ordinary manner, the heating-flame in Figs. 2, 6, 7, 8, 10, and 11 being obtained in substantially the same manner as is shown in Fig. 1. When conducting the sub-heating jet downward and inward in this manner I prefer to have a knot of metal, G, carried by the spreading-plate B, and to form a jet-orifice, *f*, therein, though, as will be readily understood, the plate may be merely thickened at that point, and a curved or other passage-way formed, which will accomplish the same purpose.

In the construction in Fig. 4 I have provided a sub-heater by means of a passage (shown in dotted lines at F′) connecting directly with the interior passage, *c*, in the tube C. Through it a portion of the vapor can escape below the illuminating-jet orifice *d*, which can be ignited for heating the adjacent metal parts to insure vaporization.

With the passage-way and orifice through which the heating-vapor is conveyed I prefer to combine a regulating-valve, which may be of any of the now well-known forms. In Fig. 1 I have shown a needle-valve having a threaded portion, h^2, engaging with a thread in the knot or downwardly-projecting piece of metal, G, and having also a needle-point at h', adapted to both close and clean the orifice *f*, and also adapted to regulate the amount of vapor which escapes at said orifice.

In the construction shown in Fig. 4 I employ a needle mounted in a suitable bearing formed in the piece of metal G, which, in this case, is situated lower than the plate B, and is supported by means of the part E, to be hereinafter more specifically described. The point h' of the needle enters the heating-orifice F′ from the outside, but can be employed in substantially the same manner as is the needle shown in Fig. 1, so far as the heating-jet is concerned.

It will be readily understood that the heating orifice or passage may be located in different positions, both in the device shown in Fig. 1 and in that shown in Fig. 4 without departing from the spirit of my invention. Thus the orifice F′ in Fig. 4 might be situated upon the opposite side of the pipe C and be regulated by a screw having a bearing-piece projecting downwardly from the metal part above, as shown in Fig. 9, or likewise mounted upon either side of the tube at right angles to those above mentioned. When a heating-flame is thus arranged to bear against the metal parts the plate burner can be made much more efficient than can the similar burners heretofore used.

I am, of course, aware that vapor-burners of other classes than the one to which my invention pertains—that is to say, not "plate burners," so called—have been constructed with illuminating-orifices and supplemental heating-jets; but with plate burners, especially those not having mixing-chambers, the principle of construction has been such that the plate itself was, as has been said, relied on to convey sufficient heat. This heat I have found to be insufficient, and therefore I have been led to construct and arrange the parts of a plate burner so that I can assist the heat obtained from the plate by a supplemental heating-jet. When the supplemental heat is applied in the manner I have shown, I prefer to combine with the vaporizing-chamber a shield or wing, I, extending more or less around the supply-pipe and below the orifice projection D. If desired, this shield or wing I may be connected with the spreading-plate by a narrow strip, as shown at I′ in Figs. 2 and 12, as in some cases there may result from this a better guiding of the jet of vapor from the illuminating-orifice. This illuminating-orifice may be left permanently open, if desired, as shown in Figs. 6 and 7, or it may be closed by any of the well-known valves. I have shown in Fig. 1 a needle-valve substantially similar to that shown at h' h^2, having a threaded part, *j*, and a needle-valve point, *j*′. The bearing for the valve can be formed in the piece of upwardly-projecting metal D, a hole being drilled from the end opposite to the orifice *d* and communicating with the passage *c* in the pipe C. This last-mentioned passage *c* is also drilled, the drill being inserted into the tube C from the end opposite to that adjoining the socket part D.

Instead of the needle-valve J *j j'*, a permanent fastening device, J', (shown in Fig. 6,) may be used to close the aperture left by drilling, and a regulating device may be combined with the supply-pipe, as shown in Figs. 5 and 6, if preferred.

Instead of having the upwardly-projecting part D stationary it may be made removable, as shown in Fig. 7. In this case the vapor-passage is drilled first longitudinally and then laterally in this part D, the jet-orifice *d* being related to the deflecting-plate substantially as it is in the construction shown in Fig. 1.

Under some circumstances it will be preferable to connect the supply-pipe A with the feed-pipe or vaporizing portion C laterally. This may be done by forming a socket, C', on the side of the part C, as is shown in Figs. 5 and 6.

I am aware that curved deflecting and spreading plates have for a long time been used in connection with retorts for vapor-burners, and I do not claim, broadly, as my invention such plates or the burners provided therewith.

I am also aware of the fact that mixing-chamber burners have been constructed to have an illuminating jet and flame and a heating jet and flame other than those for illuminating, and I do not claim such devices as my invention; but I believe myself to have been the first to have arranged in the path of the illuminating-jet a plate which receives the vapor directly from the retort through a needle-orifice, which spreads the illuminating-flame, and which conducts heat back therefrom to the retort or oil-conduit, in combination with devices to withdraw a portion of the vapor, in order to provide a flame other than the illuminating-flame for making a supplemental heat—that is, a heat additional to that obtained by the backward conduction of the plate. In the mixing-chamber burners there are no parts equivalent to the spreading-plate of the plate burners, the spreading of the flame with the mixing-chamber burners being produced in entirely another manner, which does not permit of the backward conduction of heat from the flame-spreading devices, as is done in my burner. If the flame of a mixing-chamber burner be caused to impinge upon a heat-conducting device after issuing from the spreading-slot the flame would be practically useless. Therefore this combination of the two means of heating is not practically possible with mixing-chamber burners. In the mixing-chambers of such burners cross bars and plates have been arranged for the purpose of breaking up the jet of vapor and compelling it to mingle intimately with the air, and also for intercepting a portion of said vapor and guiding it out from the mixing-chamber to a conduit for supplying a supplemental flame; but the cross bars or plates thus used do not perform the functions that are performed by the spreading and deflecting plate in my construction, the peculiar province of which is to form the illuminating-flame, which is in no wise affected by the cross bars or plates which have been used in mixing chambers heretofore.

I do not herein claim anything but what is specifically set forth in the following claims, reserving to myself the right to claim all other patentable subject-matter in another application which I am about to file.

I do not in this application claim the features shown in Fig. 1 pertaining to the separation of the spreader-plate from the vaporizing-chamber and mounting it adjustably, as I have made those features the subject-matter of another application.

What I claim is—

1. In a vapor-burner, the combination of the following elements, substantially as set forth, namely: a retort in which is generated the vapor unmixed with air, a needle-orifice from which said unmixed vapor issues under pressure, a plate, B, across the path of the jet to spread the illuminating-flame and conduct heat back therefrom to the retort or oil-conduit, against which plate the jet impinges after reaching the open air, a passage-way through said plate at a point where the plate is struck by the jet of vapor, to conduct a portion of said jet through the plate to provide a heating-flame other than the illuminating-flame.

2. In a vapor-burner, the combination of the following elements, substantially as set forth, namely: a retort in which is generated vapor unmixed with air, a needle-orifice from which said unmixed vapor issues under pressure, a plate across the path of the jet to spread the illuminating-flame and conduct heat back therefrom to the retort or oil-conduit, against which plate the jet impinges, a passage-way through the plate at a point where it is impinged upon by the jet, arranged to conduct a portion of the jet through the plate for providing a supplemental heating-flame, in combination with a regulating device supported by said plate to adjust a portion of the jet which passes through the passage-way in the spreading-plate.

3. A vapor-burner having a deflecting-plate arranged to be impinged upon by and spread the illuminating-jet, a feed-pipe, two plates or wings extending laterally from the pipe, and a heating-orifice arranged to direct a jet toward the vaporizing-chamber between the plates or wings, substantially as set forth.

4. A vapor-burner having a supply-tube, C, the deflecting-plate B, arranged to change the path of the illuminating-jet and spread it, the projecting part D at the end of the supply-tube on the concave side of the plate, and a supplemental heating device arranged to throw a flame in proximity to said projecting part D, substantially as set forth.

5. A vapor-burner having a supply-pipe, a deflecting-plate, the projection D, with the jet-orifice therein, and the shield E, all formed in one piece of metal, substantially as set forth.

6. In a vapor-burner, a retort in which is generated vapor unmixed with air, a needle-orifice from which said unmixed vapor issues under pressure, a concavo-convex plate across the path of the jet to spread the illuminating flame, a passage-way through said plate through which passes a portion of the jet from the concave side of the plate to the convex side, and means for conducting the withdrawn portion of the jet back along said convex side toward the vaporizing-chamber, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY S. BELDEN.

Witnesses:
H. H. BLISS,
J. S. BARKER.