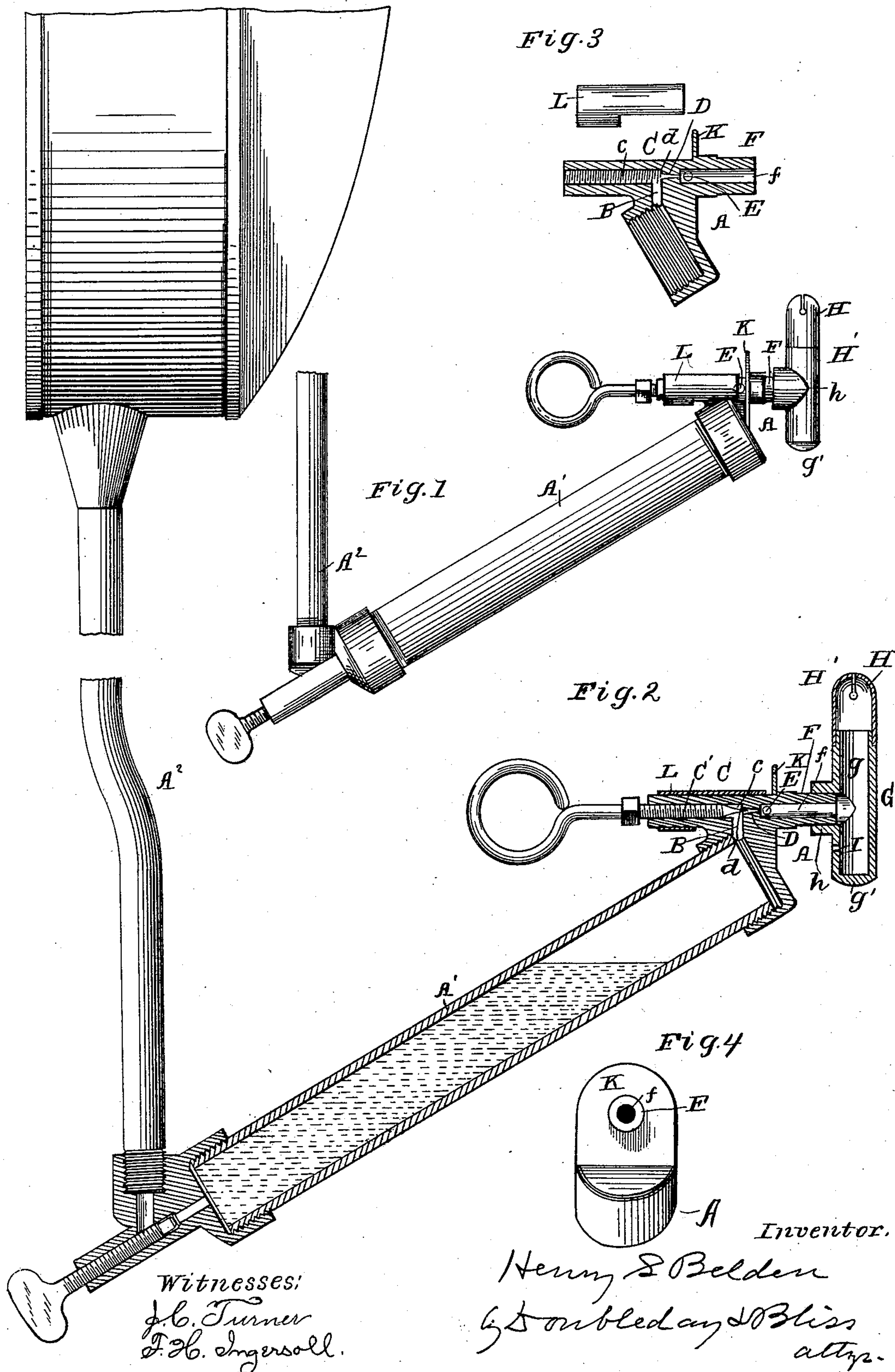


(No Model.)

H. S. BELDEN.  
VAPOR BURNER.

No. 407,632.

Patented July 23, 1889.





# UNITED STATES PATENT OFFICE.

HENRY S. BELDEN, OF CANTON, OHIO.

## VAPOR-BURNER.

SPECIFICATION forming part of Letters Patent No. 407,632, dated July 23, 1889.

Application filed May 23, 1887. Serial No. 239,093. (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.

Figure 1 is a side view of a burner and the devices for supplying it embodying my improvements. Fig. 2 is a vertical central section. Figs. 3 and 4 show some of the details separately.

I have shown in the drawings a vapor-burner of one of the forms which can be constructed so as to contain the features of the present invention; but it will be understood that in several respects there can be modifications without departing from the essential features of the invention.

In the drawings, A represents the retort or a part thereof wherein the vapor is initially formed from the oil. This part A is shown as a cap-piece secured to the end of a tube or pipe A', which is so arranged that when in use it is situated longitudinally on lines inclined to the horizon, (being preferably at about thirty to forty-five degrees thereto,) and at the lower end is connected to the down-pipe A<sup>2</sup>, through which the oil descends from the reservoir. So far as concerns the down-pipe A<sup>2</sup>, the pipe A', and the coupling A<sup>3</sup> the construction shown is substantially similar to that shown in my former patent, No. 354,300. The pipe A' is of a diameter considerably larger than that of the downpipe A<sup>2</sup>, and when in use is partly filled with vapor, the latter as it is generated exerting a backward pressure upon the oil to such an extent as to produce an equilibrium. I herein refer to this pipe or tube A' as being "unpacked," and mean thereby that it does not contain any of the ordinary packings—such as emery, sand, cotton, and wire—but is entirely unobstructed, the body of oil within the pipe A' being itself depended upon as a packing to prevent recoil either of vapor or flame to the reservoir.

Extensive experience with devices of the character shown in my said patent, No. 354,300, has led me to material improvements upon the construction therein shown.

In the present construction the aforesaid

cap A is cast with a horizontally-arranged tube C, with a chamber *c* therein, through which passes the needle-valve C', the latter being also arranged horizontally.

B represents the passage-way or duct by which the chamber in cap A connects with that in tube C. With these parts A C there are also cast a shield K and an extension F, with a horizontal passage-way *f* therein. It is not essential that these parts A, C, K, and F shall be cast integrally; but I prefer to so form them, as they can be in that way produced cheaply and conveniently, and the device as a whole is simple in character. The valve-seat is at *d*, there being a passage-way D, through which there is communication from the chamber *c* to that at *f*.

E E represent the orifices through which air enters, they communicating with the vent or passage-way D, and this air becomes thoroughly mixed in the chamber at F with the vapor which passes from the parts A and C. The tube F is joined to the burner proper, (generally indicated by H',) it having the lower part G, with a chamber *g*, and at the top having the burner-tip H. The bottom of the burner is closed, as shown at *g'*. It is joined to the part F by a lateral extension *h*, adapted to be fitted upon said part F. Near the bottom of this part of the burner there is formed a horizontal orifice I, to supply vapor for the heating-jet. This orifice is so arranged as to cause the heating-jet to impinge directly upon the cap A of the retort and upon the extended shield K. The heating-jet in such a construction is thus brought to bear upon all of the parts wherein the vapor is generated and through which it is conducted to the burner-tip.

L represents a sleeve which is fitted to the tube C, this sleeve being adapted to cover more or less of the air orifice or orifices E, and by means of it the quantity of air admitted can be readily controlled. The quantity of vapor allowed to pass to the burner is regulated by the valve C', as will be readily understood.

It will be not only seen, as above set forth, that the heating-jet from the orifice I impinges directly on the mixing-chamber F, the gas-holder G, the shield K, and the cap A, but also that the air orifice or orifices E are im-



mediately adjacent to the shield or wing K, and that consequently the air will be highly heated before it can enter said orifices. This is a matter very desirable in vapor-burners containing mixing-chambers, and after the air and vapor have been brought together they are superheated as they pass through the chambers *f* and G and are caused to thoroughly intermingle, the needle-orifice for the vapor at D being in this construction at the hottest part of the device, so that the vapor initially and the air and vapor subsequently are subjected to great and continuous heat from the time they escape at B until they are inflamed at H and I, perfect combustion being attained by this arrangement of parts.

It is well-known that several requirements must be met in order to attain success with burners of this class.

First. The heating-jet must be in the closest possible proximity to both the needle-valve orifice and the air-orifices, and at the same time the whole burner must be compact and simple in construction.

Second. Air must not only be introduced at the hottest part, but the quantity must be under easy control. An excess of air over the hydrocarbon vapor causes the flame to be blue and not luminous, and, on the other hand, an insufficiency of air in proportion to the vapor produces a reddish and smoky flame. Heretofore it has been the custom to attempt, when the burners are initially made, to form the orifices for the vapor and the air of such relative sizes that the material shall be introduced in proper proportions; but when the burners are in use the vapor-orifices become too large in relation to the air-orifices, and it is necessary to enlarge the air-orifices from time to time to prevent the burner from smoking. In the present construction the air-orifices are initially made larger in proportion to the vapor-orifices than is at first necessary; but by combining therewith the sleeve L the air-opening can be so reduced as to admit the proper quantity, and after this adjustment has been once effected the parts can be allowed to remain in position until an oil of another quality is used, or until the vapor-passages have become enlarged, after which another adjustment can be made.

In another respect this burner differs from those heretofore in use—namely, in this, that the vapor does not pass directly upward from the air-orifices of the mixing-chamber, but it first passes through the mixing-chamber in a horizontal direction, and then into a chamber or holder G, which is transverse to the mixing-chamber. In burners of the ordinary sort the vapor is constantly pulsating in its movements to the burner-tip, producing an irregular flame, whereas in one of the character herein described the flow of the vapor is checked, and it is taken into an enlarged chamber, where it is turned from the course which it followed when under the most press-

ure, so that it escapes at the tip with uniform motion.

Vapor-burners are very liable to form and gather deposits of sediment, incrustations, &c., and in those where use is made of a number of narrow long passages there is a constant clogging of the latter, and they can be kept in an operative condition only with great inconvenience and at considerable expense, especially where they are used in large numbers by one and the same party—as, for instance, in the lighting of streets.

One of the objects of the present invention is to simplify the parts and so arrange them that much of the annoyance, trouble, and expense incident to the cleaning is done away with. The vapor is taken from the top of the enlarged retort A through a short wide passage-way immediately to the jet-orifices. When the valve C is moved, it loosens any incrustations or foreign material, and the latter falls by gravity into the large tube A', where it can accumulate in considerable quantities without causing serious inconvenience, and from which it can be readily withdrawn.

What I claim is—

1. In a vapor-burner, the combination of the downpipe, the burner and unpacked retort-chamber enlarged relatively to the downpipe and inclined substantially as set forth, whereby the top surface of oil in the retort-chamber can be enlarged and a body of oil can be utilized to prevent recoil, a vertical vapor-passage, as at B, extending up from the retort, a horizontally-arranged needle-valve above the retort, a valve-chamber therefor on top of the retort, and an air-mixing chamber between the needle-orifice and the burner, substantially as set forth.

2. In a vapor-burner, the combination, with the retort, of a horizontally-arranged needle-valve above the retort, the valve-chamber therefor, the horizontal mixing-chamber communicating with the valve-chamber, the vertical gas holder or chamber transverse to the mixing-chamber, the burner-tip above the gas-holder, and the jet-orifice in the wall of the gas-holder, substantially as set forth.

3. A vapor-burner having a burner-tip with an orifice for an illuminating-flame, a mixing-chamber with an orifice for admitting air to the mixing-chamber, and a heating-orifice supplemental to the illuminating-jet orifice and formed on a line converging with the line of the said air-orifice, whereby it is adapted to direct a jet of vapor against the metal surrounding said air-orifice, substantially as set forth.

4. A vapor-burner having a burner-tip with an orifice for an illuminating-flame, a gas-chamber directly below said tip, a horizontally-arranged mixing-chamber communicating with the gas-chamber, an orifice for the admission of air to the mixing-chamber, whereby the air and vapor are mingled prior to entering the vertical gas-chamber, and a heat-



ing-jet orifice or duct leading from the gas-chamber and directed toward the metal around the air-orifice, substantially as set forth.

5 5. A vapor-burner having a burner-tip with an orifice for an illuminating-flame, a gas-chamber directly below the burner-tip, an orifice for the admission of air to the gas-chamber, and a heating-orifice supplemental  
10 to the illuminating-orifice and situated below the air-orifice, whereby the flame from the heating-orifice rises and bears against the metal around the air-orifice, substantially as set forth.

15 6. A vapor-burner having a burner-tip with an illuminating-jet orifice, a mixing-chamber, a vapor-orifice communicating with the duct in said mixing-chamber, an air-orifice for admitting air to said duct, a gas-chamber having a duct for the mingled vapor and air situated at an angle to the duct in the mixing-chamber, and having a heating-jet orifice supplemental to the illuminating-jet orifice, and  
20 directed to throw the heating-flame into immediate proximity to both the aforesaid vapor-orifice and air-orifice entering the mixing-chamber, substantially as described.

7. In a vapor-burner, the combination of the supply and retort tube A, the vertically-  
30 arranged duct B, the burner G H upon one side of said duct, the air-orifices E between the burner G H and the wall of the said duct B, the valve-chamber extending from the said duct B in the direction opposite to that of the burner, and the sleeve L, extending from the  
35 said air-orifice along the outside of the valve-chamber to a point on the opposite side of the duct B, and adapted to slide loosely on said valve-chamber, substantially as described.

40 8. The combination, with the downpipe, of the unpacked pipe A', of larger diameter than the downpipe, whereby an enlarged surface of oil is presented and recoil is prevented, the air-mixing chamber on the top of said pipe  
45 A' and arranged horizontally, and a vertically-

arranged gas-holder with its wall situated transverse to the said mixing-chamber and having a heating-jet orifice, and a burner-tip at the upper end of said gas-holder having an illuminating-jet orifice supplemental to the  
50 heating-jet orifice, substantially as set forth.

9. The combination of the downpipe, the unpacked pipe A', inclined to the horizon and enlarged relatively to the downpipe, the horizontal mixing-chamber, the duct B, extend-  
55 ing upward from pipe A', the needle-valve arranged on a line diverging from the axis of pipe A', the vertical gas-chamber communicating with the horizontal mixing-chamber, and the burner-tip at the top thereof, substantially as set forth.

10. The combination, with the inclined unpacked pipe A', adapted to hold a body of oil in its lower end and a body of vapor in the upper end, of the cap-piece for said pipe, 65 formed with a mixing-chamber having air-orifices and the valve-chamber, the walls of the said valve and mixing chambers being cast integrally with the said cap and situated above and inclined to it, substantially as set  
70 forth.

11. In a vapor-burner, the combination, with a horizontally-arranged mixing-chamber, a horizontally-arranged needle-valve and valve-orifice, and a vertically-arranged vapor-  
75 holder with a vertically-arranged burner-tip at the upper end, a closed lower end, and a heating-jet orifice supplemental to the illuminating-orifice, said parts being arranged substantially as set forth, whereby the vapor is  
80 forced from the valve-orifice on one line through the mixing-chamber and on another line through the vapor-holder to the burner-tip, substantially as set forth.

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

HENRY S. BELDEN.

Witnesses:

HARRY FREASE,

HARRY W. HUNTER.