(No Model.) 2 Sheets—Sheet 1.

W. STONE, C. RALSTON, J. GREGG & W. A. HOLMES.

VAPOR LAMP.

No. 554,039. Patented Feb. 4, 1896.

Fig. 1

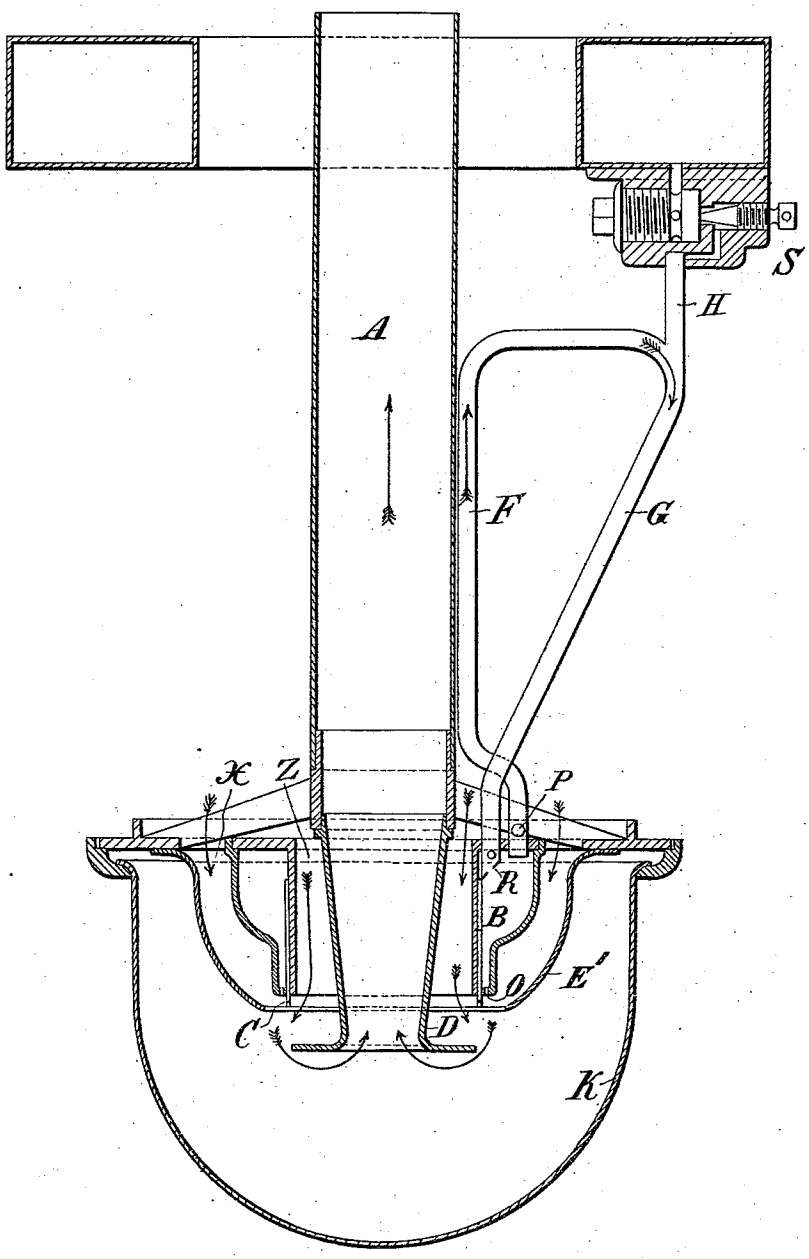

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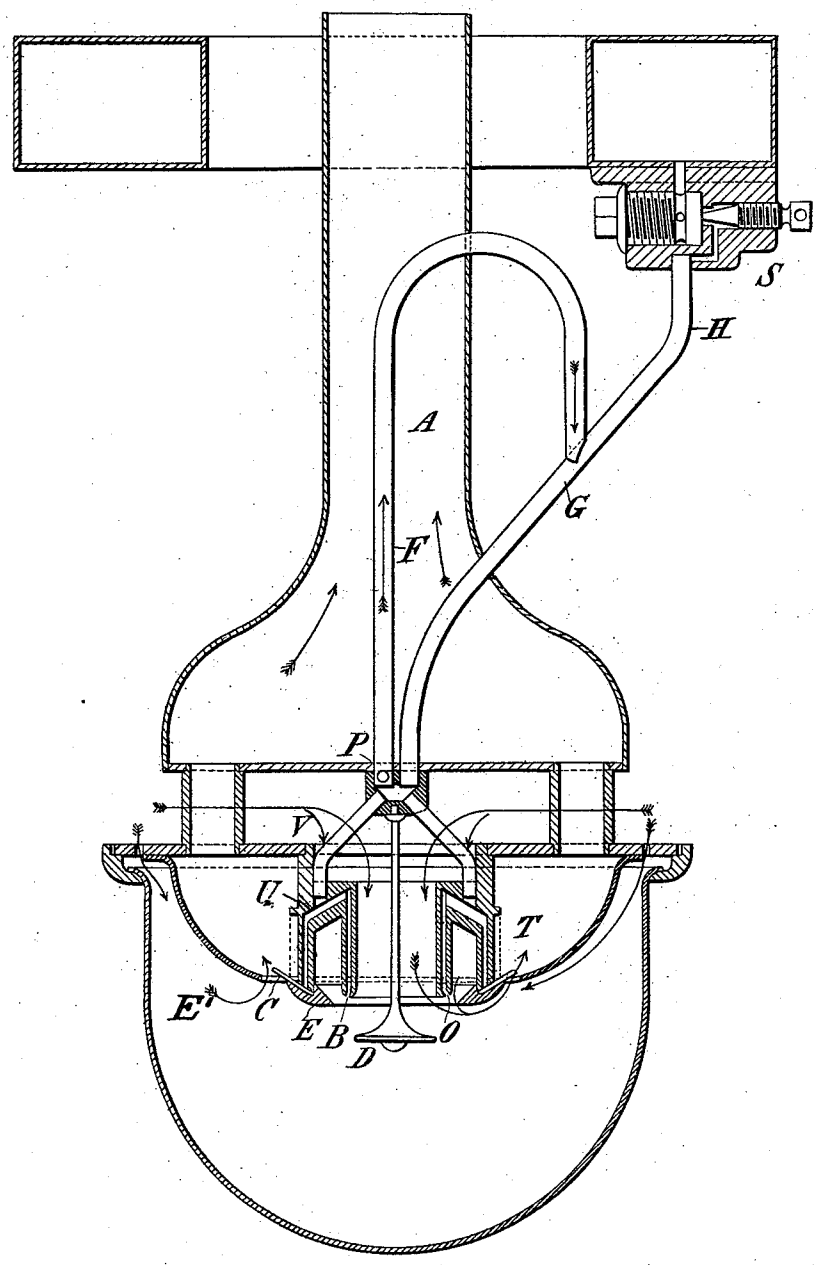
Fig. 2



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UNITED STATES PATENT OFFICE.

WILLIAM STONE, OF ST. KILDA, CHARLES RALSTON, OF ARMADALE, JAMES GREGG, OF ELSTERNWICK, AND WILLIAM ALFRED HOLMES, OF PARKVILLE, VICTORIA.

VAPOR-LAMP.

SPECIFICATION forming part of Letters Patent No. 554,039, dated February 4, 1896.

Application filed March 9, 1893. Serial No. 465,249. (No model.) Patented in Victoria January 5, 1893, No. 10,241; in South Australia January 6, 1893, No. 2,389; in New South Wales January 7, 1893, No. 4,211; in New Zealand January 13, 1893, No. 5,994; in England February 11, 1893, No. 3,059; in India April 24, 1893, No. 26; in Canada May 23, 1893, No. 43,014, and in Queensland June 14, 1893, No. 2,277.

To all whom it may concern:

Be it known that we, WILLIAM STONE, of St. Kilda, near Melbourne, CHARLES RALSTON, of Armadale, near Melbourne aforesaid, JAMES GREGG, of North Road, Elsternwick, near Melbourne aforesaid, and WILLIAM ALFRED HOLMES, of Parkville, near Melbourne aforesaid, in the British Colony of Victoria, all subjects of the Queen of Great Britain and Ireland, have invented certain new and useful Improvements in Vapor-Lamps, of which the following is a specification, for which we have obtained the following Letters Patent: in Victoria, Patent No. 10,241, dated January 5, 1893; in New South Wales, Patent No. 4,211, dated January 7, 1893; in South Australia, Patent No. 2,389, dated January 6, 1893; in New Zealand, Patent No. 5,994, dated January 13, 1893; in Queensland, Patent No. 2,277, dated June 14, 1893; in Great Britain, Patent No. 3,059, dated February 11, 1893; in Canada, Patent No. 43,014, dated May 23, 1893, and in India, Patent No. 26/1,893, dated April 24, 1893.

This invention relates to that class of lamps which generate and consume the vapor of petroleum or other liquid hydrocarbons.

According to this invention the vapor of petroleum or other liquid hydrocarbon is produced in a generating device which is so constructed as to cause in a novel manner a current of air to pass over the surface of the liquid hydrocarbon in the generator. This said generating device is at first heated by the process of ignition hereinafter described or by the application of heat from any suitable exterior source, the liquid being admitted to the generating device at the required rate in any convenient manner. The air in its passage over the interior surface of the generating device, on which surface the illuminating material is spread, insures the evaporation of the illuminating material at a uniform rate, the evaporation taking place under these conditions at a part of the generating device when its temperature is less than the boiling-point of the illuminating material used. By these means the illuminating material is vaporized without ebullition or boiling, and the mixture of vapor and air is supplied to the burner in a perfectly regular manner. In order to cause this current of air to pass over the surface of the liquid hydrocarbon, we apply heat to the generating device, (preferably by arranging a portion of said device either within or else close to the chimney of the lamp, as hereinafter described,) so as to heat and thereby rarefy the air, and thus induce a current within the generating device, which current is directed or caused to flow over the surface of the liquid hydrocarbon to be vaporized and from thence to the burner where it is consumed.

An important feature in this invention consists in so arranging the igniting-burner relatively with the vapor-burner and the other parts of the lamp that the natural draft of the chimney produces a current of air on each side of the wick and insures efficient combustion of the illuminating material. The supply-pipe and burner are so arranged that the illuminating material will pass to the incombustible wick while in the liquid state, but on being vaporized it will issue from the main or vapor burner and be ignited by the flame at the wick.

Our invention may be adapted to many of the existing forms of lamp or lamps of similar type, and therefore may be used for any of the purposes for which lamps are specially designed. We purpose using it mainly for what are known as "regenerative" lamps.

Two ways of adapting our invention to regenerative vapor-lamps will be clearly understood from the following description, reference being made to the accompanying drawings, wherein—

Figure 1 is a diagrammatic sketch illustrating one way in which our invention may be adapted to inwardly-burning lamps, and Fig. 2 is a similar view illustrating the application of this invention to outwardly-burning lamps.

The following part of the description refers in particular to Fig. 1.

The chimney which produces the requisite

draft and carries off the products of combustion is shown at A. The vapor and ignition burners are shown at B and C, respectively. The deflectors which cause the incoming air to impinge on the flame are shown at D and E′. The generating device is shown at F and G, and the pipe through which the illuminating material is supplied is shown at H.

K indicates the position of the glass dome. The generating device is here shown in the form of a bent tube, both ends of which are in open communication with the vapor-burner. One branch, F, of the bent tube is run in close proximity to the chimney, and may if desired be attached to it. The other branch, G, of the bent tube is situated at a greater distance from the chimney and has the tube H communicating with it near the upper end. An aperture for the admission of air is made in the pipe F or burner B at or near their point of junction, as shown at P. In the drawings the vapor and ignition burners are shown combined. C is a wick, of asbestos or other suitable material, which is placed as shown, so that its lower edge protrudes from the burner and forms a narrow annular band at which the illuminating material may be ignited in the usual manner by means of a match or other suitable source of heat. The apertures which form the vapor-burner are shown at O.

The operation of the lamp is as follows: The valve S is opened to the desired extent and allows the illuminating material to flow down the pipes H G to the burner B and onto the ignition-wick C by means of the inclined plate R, which is attached to the lower end of the tube G. The illuminating material spreads over the ignition-wick C, and may be lighted at the lower edge of the wick which protrudes from the burner. On lighting the illuminating material at the wick C the flame rises up round and heats the chimney A, thus causing an upward current of air in the chimney. The flame is by this means drawn downward into the glass, and the products of combustion then pass up the chimney and maintain the requisite draft to effect the complete combustion of the illuminating material. A part of the heat given out by the flame at the ignition-burner C rapidly finds its way by conduction and radiation from the flame and chimney to the burner and tubes F and G. The tube F, owing to its closer proximity to the chimney, will be more intensely heated than the tube G. The air, or mixture of air and vapor in the tube F, will be expanded and rendered less dense than that in the cooler tube G. Hence a circulation will result, the direction of which is indicated by the arrows. The air in its passage over the heated interior surface of the tube G, down which the illuminating material is flowing, will accelerate its vaporization and cause it to be effected at a part of the tube G where the temperature is below the boiling-point of the illuminating material used.

By reference to the drawings it will be readily seen that the generating device, which also serves to effect the thorough mixing of the air and vapor, compels the whole of the material which is in circulation to pass through the vapor-burner, and thus maintains a constant supply. As soon as this mixture of air and vapor starts to form it will issue from the vapor-burner, and be ignited by the flame which still exists at the igniting-wick C, and as the two burners are close to each other and pointing in the same direction the flames of the ignition-burner will have a tendency to produce an induced current at the vapor-burner, thus aiding circulation in the generating apparatus during the early stages of the operation of the lamp. As the temperature of the lamp continues to rise, the complete vaporization of the illuminating material will be effected, thereby causing the flame at the wick C to die out, and the lamp is then in full operation.

The circulation, which is effected in the generating device F G, is assisted by the vaporization of the illuminating material, which by its evaporation tends to keep the tube G at a lower temperature than the tube F, and also adds to the density of the mixture in the tube G.

As the heated products of combustion ascend in the chimney A a strong draft is produced, which causes fresh air to flow in through the spaces X and Z on each side of the igniting-burner C and vapor-burner B. These currents of air are made to impinge on each side of the flame by means of the deflectors D and E′. The incoming air produces a slight sucking action at the vapor-burner B, which is sufficient to draw the vapor through the holes O and maintain a steady supply of vapor for combustion. As the vapor is thus drawn from the burner B a small quantity of air enters at the aperture P, owing to the aforementioned sucking action at the vapor-burner, and would, if this circulation did not exist, enter the burner B directly. As, however, the generating device is capable of putting a greater volume of gaseous material into circulation than the quantity of air which enters at P, it is evident that the whole of the air will be carried by means of the circulation up the tube F, and will not reach the burner B till it has passed through the vapor-generating tube G and become thoroughly mixed with the vapor of the illuminating material.

It is evident that as both ends of the bent tube F G, which here constitutes the generating device, open into the burner B, no alteration of the absolute pressure in the burner can in any way influence the circulation.

Referring to Fig. 2, A is the chimney which carries off the products of combustion and produces the requisite draft. B is the vapor-burner in the form of an inverted Argand. C is the igniting-burner, which is here shown not directly combined with the vapor-burner

B, but it may, if desired, be combined directly with the vapor-burner B, as shown in Fig. 1. The deflectors D and E direct the incoming air so that it will impinge on the flame and produce efficient combustion.

E′ is a deflector, and the arrows placed in its vicinity in Fig. 2 indicate what directions the currents of air will assume owing to its configuration.

The generating device is shown at F, G, H, and P, indicating the inlets through which the illuminating material and air are respectively admitted. The inlet P for the purpose of drawing air into the generating device passes through the outer casing of the burner.

The plate T is perforated when the ignition-burner C is arranged as shown in Fig. 2, the object being to admit the necessary quantity of air to the inner side of the igniting-flame as it rises from the burner C; but if the ignition-burner C is placed in conjunction with the vapor-burner B between the deflectors D and E the plate T would not be perforated.

If the igniting-burner be combined with the vapor-burner B, whether it be situated either outside B or inside B, the operation of the lamp will be the same as previously described with reference to the lamp shown in Fig. 1, the only differences being that the cross-tubes U in the burner will slope downward and inward, instead of as shown in Fig. 2, so as to carry the illuminating material to that position of the igniting-burner, and the flame will turn outward. If, on the other hand, the igniting-burner is situated as shown at C in Fig. 2, the operation of the lamp will be as follows: On opening the valve S the illuminating material will flow down the generating-pipe G, reaching the burner by the branches V. On reaching the cross-tubes U it will flow down to the burner C, where it may be ignited at the edge of the wick. It will be evident from an inspection of the drawings that while the illuminating material is in the liquid state it will not flow into the burner B. After the illuminating material has been burning for a few minutes at the ignition-burner C the generating device will become sufficiently heated to partly vaporize the illuminating material, and circulation will be produced, as previously described, in connection with Fig. 1. As the vapor forms and is carried to the burner by the circulation it will issue from the holes O in the vapor-burner, and as it is carried by the natural air-currents over the flame at the igniting-burner C it will be lighted and the flame will pass back to the burner B. As the temperature of the lamp rises the illuminating material will be completely vaporized and the flame at the igniting-burner C will die out. The lamp is then in full operation.

Notwithstanding the fact that the ends of both the pipes F and G are open to the vapor-burner the vapor will not escape from the burner through passage P, because the draft of the lamp caused by the chimney draws air in at that opening and does not allow anything to escape from it, while the heating of the pipe F causes a current to circulate upward within it and thence down the pipe G, as indicated by the arrows. To sum up, the draft of the lamp draws in the air and the heating of pipe F causes it to circulate through the generating device.

In the drawings we have shown the generating device so placed with respect to the other portions of the lamp that the illuminating material will flow through it in obedience to the law of gravity. In some forms of lamps, however, it may be convenient to use some other motive power to effect the necessary transfer of illuminating material from the reservoir, which may even be situated below the burner. In such cases capillarity, the force due to springs, compressed air, or any other of the well-known mechanical expedients may be adopted.

In the same way we do not confine ourselves to the exact details of the igniting-burner, as shown in the drawings, but may, if desired, make it in segments instead of a complete annulus, and if preferred it can be made movable. The wick may be serrated or divided in any suitable manner without departing from the spirit of our invention. In Fig. 1 the igniting-burner C is shown in close proximity to the vapor-burner B, and the two are really combined; but it is manifest that the igniting-burner might be separated by a suitable space from the vapor-burner B, the necessary connection for the supply of illuminating material being effected by pipes or channels to any desired part of the generating device or chambers connected thereto. It may in some cases be convenient to arrange the ignition-burner C outside and concentric with the vapor-burner B, in either inwardly or outwardly burning lamps; or again, in outwardly-burning lamps the igniting-burner C might be supported between the deflectors E and K, so that air would have access to both sides of the flame without perforating the cylinder T; or it may even be attached to the deflector K, in which case the deflector K would require perforating in order to give the requisite supply of air to effect the combustion of the illuminating material. In special cases the igniting-burner might be supplied with any sort of fuel from a separate reservoir.

We claim as new and desire to secure by Letters Patent—

1. In combination with a lamp and its chimney, a reservoir, an ignition-burner, a vapor-burner, and a generating device interposed between the vapor-burner and the reservoir and including a return-tube comprising a branch forming an air-tube, and a branch supplied from the reservoir having its branches placed at different distances from the chimney, substantially as set forth.

2. In combination with a lamp, a reservoir, an ignition-burner, a vapor-burner, a gener-

ating device interposed between the reservoir and said burners and comprising a tube supplied from the reservoir having both of its ends connected with a chamber communicating with the vapor-burner and the ignition-burner, one of said ends serving as an air-inlet and the other as an outlet from said reservoir, substantially as set forth.

3. In combination with a lamp, a reservoir, an ignition-burner and a vapor-burner, an ascending air-pipe, as F, and a descending oil-pipe as G, both communicating with each other, with the reservoir and the burners, both such passages being located within the heating-sphere of the lamp, substantially as set forth.

In witness whereof we have hereunto set our hands in presence of two witnesses.

WILLIAM STONE.
CHARLES RALSTON.
JAMES GREGG.
WILLIAM ALFRED HOLMES.

Witnesses:
EDWARD WATERS,
WALTER SMYTHE BAYSTON.