(No Model.)

T. B. WILLSON.

LAMP BURNER.

No. 337,102. Patented Mar. 2, 1886.

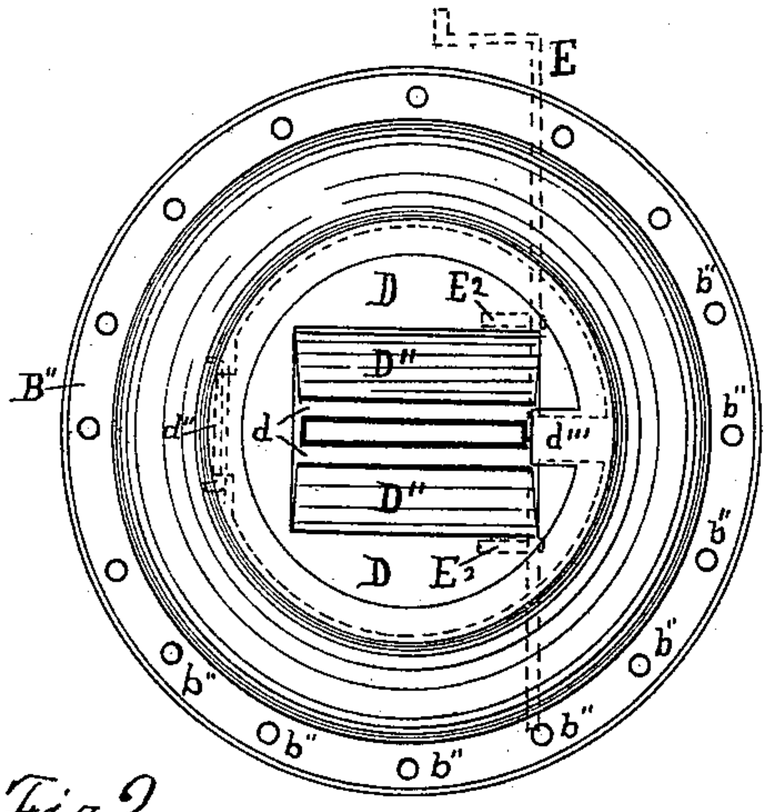

Fig. 2.

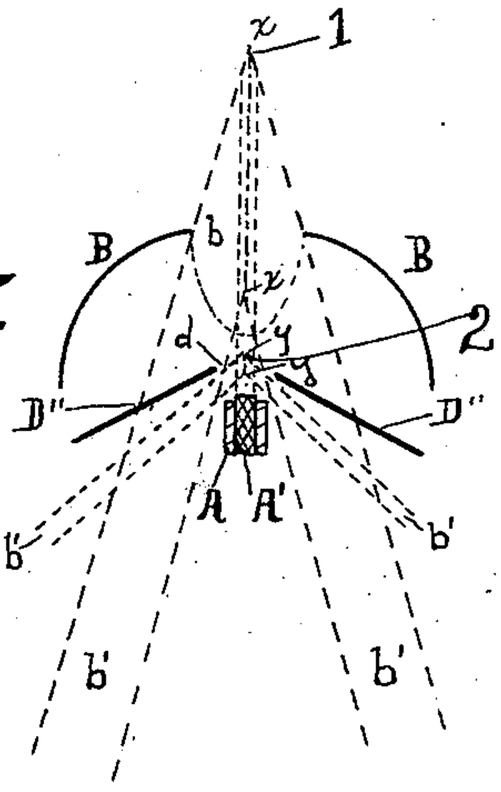

Fig. 5.

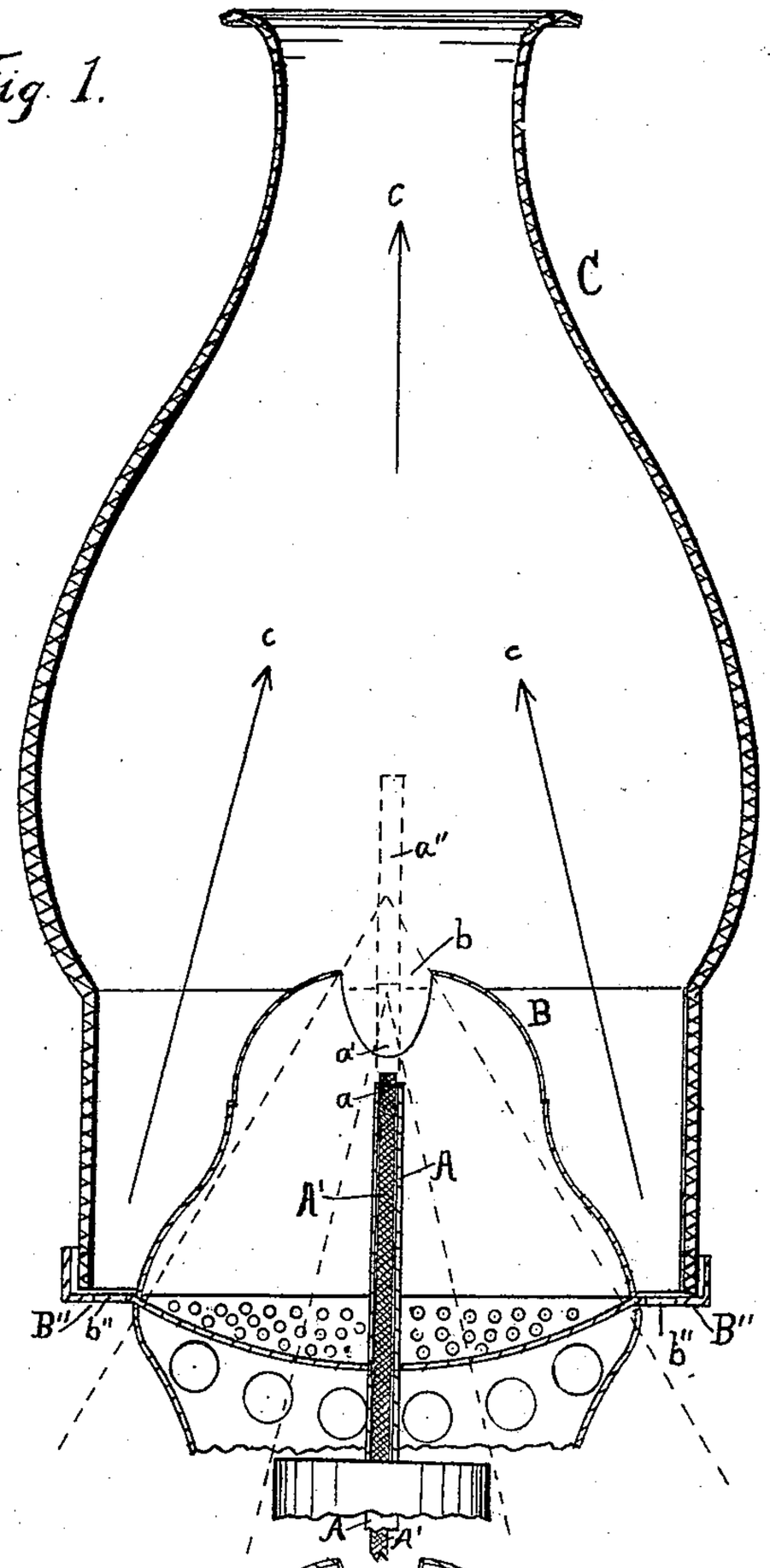

Fig. 1.

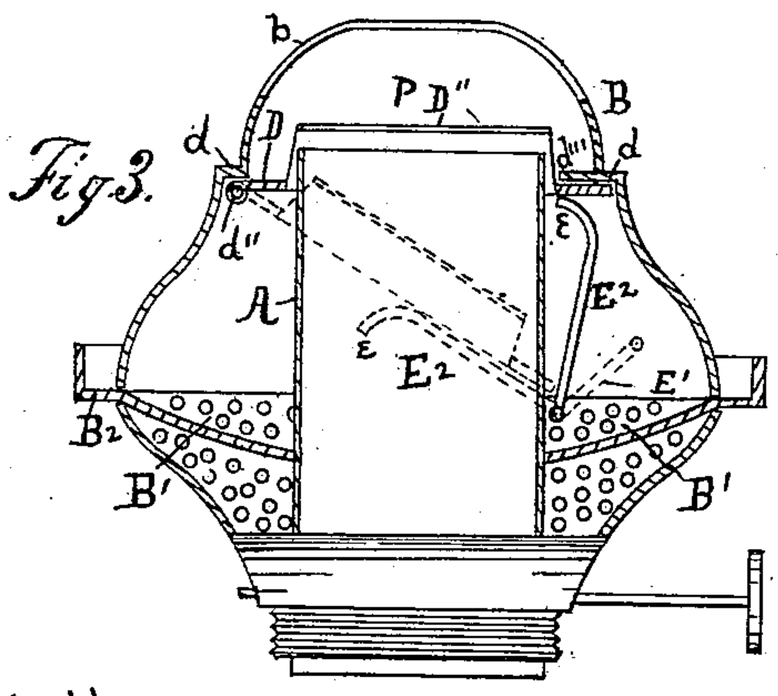

Fig. 3.

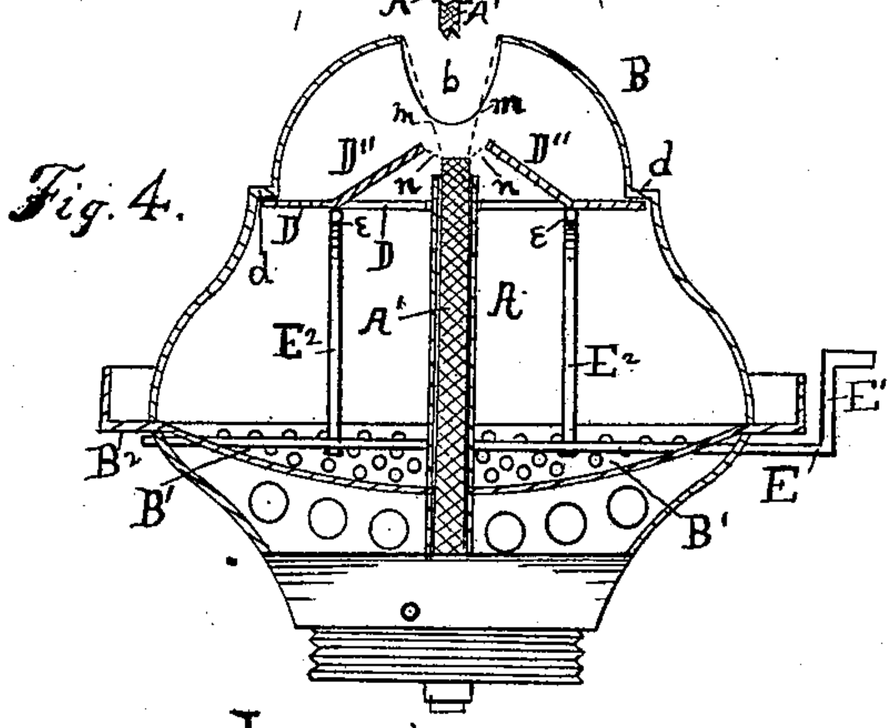

Fig. 4.

Witnesses:
L. O. Rigg
W. L. Parker.

Inventor:
Theo. B. Willson
by Chas. S. Burton
his attorney.

UNITED STATES PATENT OFFICE.

THEODORE B. WILLSON, OF CHICAGO, ILLINOIS.

LAMP-BURNER.

SPECIFICATION forming part of Letters Patent No. 337,102, dated March 2, 1886.

Application filed March 23, 1885. Serial No. 159,800. (No model.)

To all whom it may concern:

Be it known that I, THEODORE B. WILLSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Lamp-Burners, which is fully set forth in the following specification.

The purpose of this invention is to provide a burner for a lamp, or a device in connection with such burner, by which a low flame, affording diminished light, may be maintained without causing the vaporization and incomplete combustion of the oil, which produces the disagreeable odor resulting from a "turned-down" lamp-wick in many forms of lamp-burners now in use, and in carrying out this purpose to apply a new method of regulating the flame of a lamp, whereby reduction of the flame shall cause corresponding reduction of the amount of oil consumed and cause no increase of offensive odor or sooty deposit of unconsumed carbon or other results of incomplete combustion.

It consists in restricting and adjusting the draft-aperture about the flame in accordance with the principles hereinafter explained.

In the application of my invention to the specific purpose first above stated, I prefer the mechanical devices hereinafter set forth, which comprise, first, a subsidiary dome or cap located within the principal or ordinary dome or cap of the burner, and having a more restricted flame and draft aperture than the principal dome, and adapted to be moved to a suitable position to affect the flame and removable at will to a position where it will not affect the flame; second, mechanical means for supporting and adjusting the subsidiary dome.

In the drawings, Figure 1 is a vertical section of a lamp-burner with sundry draft-passages indicated, to illustrate the principle and mode of action of my devices, and the method of regulating flame, which constitutes my invention. Fig. 2 is a top view of a common form of lamp-burner with a device involving my invention applied to it, the principal dome being removed to disclose the subsidiary dome within. Fig. 3 is a vertical section breadthwise of the wick-tube; and Fig. 4 is a vertical section crosswise of the wick-tube, both showing both the principal and the subsidiary domes, and the latter in position to affect the flame and effect the purpose for which it is provided. Fig. 5 is a diagram illustrating the direction of the draft-currents as affected by the size and position of the flame-aperture of the dome.

The oil drawn by capillary force through the wick may be considered as a flowing current, the difference in degree of saturation of the wick at different parts corresponding to difference in height of liquid in different parts of a connected circuit, the flow being from the point of greater to the point of less saturation. The vaporization of oil at the exposed end of the wick renders that part constantly undercharged and causes the oil to constantly flow into it. A draft of air continuously directed upon this exposed part of the wick hastens the vaporization of the oil at that part and causes consumption of the oil, whether it be ignited and made to yield flame after being vaporized or not, and the more rapid the draft-current, other conditions being unchanged, the more rapid the consumption of oil. To insure the most perfect combustion of the oil thus vaporized, the air of the draft current or currents must be thoroughly intermixed with the vapor of oil with which it is to combine chemically to produce flame, and such intermixture must be effected at the point and instant where and when there is the necessary heat to effect the chemical action called "burning."

The method of regulating the flame, which constitutes this invention, depends upon the following principles, which are deducible from the foregoing considerations, viz: First, that a diminution of the air-currents which induce vaporization will diminish the consumption of oil, (without change of the extent of exposed surface of the wick;) second, that to retain the same intensity of heat, and consequent perfection of combustion with such diminished quantities of air and oil vapor, the area of intermixture of said air and vapor—which is the area of possible flame—must be correspondingly diminished; third, that the area of intermixture depends upon the rapidity of convergence of the line of draft—the angle of confluence of the air and vapor currents.

For the further understanding of these statements reference may be had to Fig. 1, wherein A represents the wick-tube; A′, the wick

therein; *a*, the current of oil drawn through the wick; *a'*, the vaporized portion of oil at the exposed end of the wick; *a''*, the burning portion of such vaporized portion. B is the dome; *b*, the flame-aperture therein; C, the chimney; *c*, the upward current through the chimney; *b' b'*, the draft-currents within the dome. B'' is the perforated marginal flange about the dome; *b''*, the perforations therein.

In Fig. 5, *b' b'*, being the draft-currents, and *a'* the vapor-current, are represented as converging at different angles in positions 1 and 2, and thereby producing different area of intermixture and of flame. It will be apparent that the force of the current *c*, which is dependent upon the height of the chimney C and the heat of the flame, will be exerted to draw its supply from the directions and sources where least resistance is encountered, and if the flame aperture is restricted, or the passage to it tortuous or abrupt in its changes of direction, so that the draft-current through it is much impeded, a larger proportion of the air which forms the current *c* will be drawn through the apertures *b''* outside the dome, and a correspondingly less proportion will be drawn through the aperture *b* in the currents *b' b'*, which feed the flame *a''*; also, that the confluent currents *b' b'* will be more thoroughly intermixed with the vapor at the end of the wick if they are directed into it from opposite or nearly opposite directions than if directed more nearly parallel to it; and from inspection of Fig. 5 it will be apparent that the area of intermixture and of combustion represented by the lines *x x* and *y y* will be diminished and its heat intensified as the angle between said confluent currents *b' b'* is increased. Any structure therefore which restricts and shapes the draft-passages about the flame to diminish the amount and converge more obtusely the currents through said draft-passages, and to cause them to impinge upon each other and upon the flame from directions more nearly opposite, will tend to the results sought, provided always that such restriction is made with due regard to the extent of exposed surface of the wick, volatile character of the burning-fluid, and consequent minimum quantity of air necessary to effect combustion.

In the structure illustrated in Figs. 1, 2, 3, 4, and 5 I have provided means for applying the method of regulation above described to produce two degrees of light only—a high or full light and a low or partial light—these being in practice the only degrees required, the former in the ordinary use of the lamp and the latter when the lamp is used as a "night-lamp," or "turned down," to retain the lamp lighted but not in use. The full light is produced by the ordinary burner in its ordinary use, and my invention is applied only in producing the low or turned-down light.

A is the wick-tube. B is the principal dome; C, the chimney. B' is the perforated floor or base of the burner, having the annular portion B'' outside the dome, but within the chimney. These parts constitute the ordinary burner.

D is the subsidiary dome, having the flame-aperture *d* more restricted than the aperture *b* of the principal dome B.

d' is an annular ledge or shoulder secured to the principal dome B, which operates as a stop for the subsidiary dome D, and as a convenient means of attaching the latter to the former, as by the hinge *d''*.

d''' is a tongue projecting from the ledge *d'* nearly to the edge of the wick-tube A, and serving to cover and close the end of the rift which constitutes the flame-aperture *d*, that rift being extended to allow the subsidiary dome D to be swung down out of action, but being preferably limited when the subsidiary dome is in action to a length but little if any greater than the breadth of the wick-tube. The position of the ledge *d'*, and the consequent position of the dome D, is such that the upturned lips D'' D'' of the subsidiary dome begin a little below and terminate a little above the horizontal plane of the upper end of the wick-tube A. The point of beginning is of less consequence, however, than their termination, which should be as stated, even though the dome should be so shaped and arranged that the lips should extend farther down and back from the wick-tube. The flame draft-aperture is the entire space through which air or gas currents can pass between the end of the wick and the boundary of the flame-aperture—*b* in the principal dome, and *d* in the subsidiary dome. This flame draft-aperture—b^2 in the case of the principal dome, and d^2 in the case of the subsidiary dome—is measured by the dotted line *n n* in the first case, and *m m* in the second case, and depends not only upon the size of the flame-aperture *b* or *d*, as the case may be, but upon the distance of the aperture from the end of the wick. The position of the dome and its flame-aperture affects the direction as well as the quantity of the draft-current; hence, for a given size of aperture there is but one position adapted to produce the best results; hence I have indicated only one position for the subsidiary dome. Just what is the best position with a given aperture can readily be determined by experiment, the only rule to be stated being that already indicated—the larger the flame-aperture the higher the dome may be placed, and in consequence the larger the area of flame produced.

To raise the subsidiary dome into operative position, I provide the rock-shaft E, having the crank-arm E' outside the burner and the lever-arm E^2 within the burner, and adapted to extend under and behind the subsidiary dome D and swing it up as the rock-shaft is rocked. The crank-arm E' may be weighted and bent at such angle that the weight shall be thrown over the center in raising and dropping the subsidiary dome D, whereby the weight will hold the dome in operative position when

properly set, as illustrated in the dotted outline in Fig. 3; or the lever-arm E^2 may be bent at the end which articulates against the under surface of the subsidiary dome into a course slightly eccentric, whereby at its upright position it shall crowd the dome up against the ledge, and be held in position by the friction between it and the dome, due to the tension of dome, which is slightly sprung by lever crowding it into position.

I claim—

1. In combination, substantially as hereinbefore set forth, the principal dome and wick-tube, a subsidiary dome within the principal dome, constituting a transverse partition therein complete and continuous, except as to its flame-aperture, and above all draft induction-apertures in said principal dome nearer the end of the wick-tube, and having a more restricted flame-aperture than said principal dome and removable from said position at will.

2. In combination, substantially as hereinbefore set forth, the principal dome and wick-tube, a subsidiary dome within and having a smaller flame-aperture than the principal dome, hinged or linked to said principal dome, interiorly fitting the same, and extending across and constituting a horizontal partition therein, and a removable support for the same.

3. In combination, substantially as hereinbefore set forth, the principal dome and wick-tube, a subsidiary dome within, and having a flame-aperture narrower than that of the principal dome and longer than the breadth of the wick-tube, and hinged to the principal dome, the axis of its hinge being at right angles with the breadth of the wick-tube, a removable support for the subsidiary dome, and a tongue extending from the wall of the principal dome to the edge of the wick-tube, to close the end of the flame-aperture in the subsidiary dome.

4. In combination, substantially as set forth, the principal dome and wick-tube, a subsidiary dome within the principal dome, near the top of the wick-tube, and a removable support for the same, the principal dome being provided with a ledge about its interior wall to form a stop above said subsidiary dome.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Chicago, Illinois.

THEO. B. WILLSON.

Attest:
CHAS. S. BURTON,
MERRITT STARR.