3 Sheets—Sheet 1.

A. W. & J. F. PAULL.

Lantern.

No. 208,421. **Patented Sept. 24, 1878.**

Fig. 1

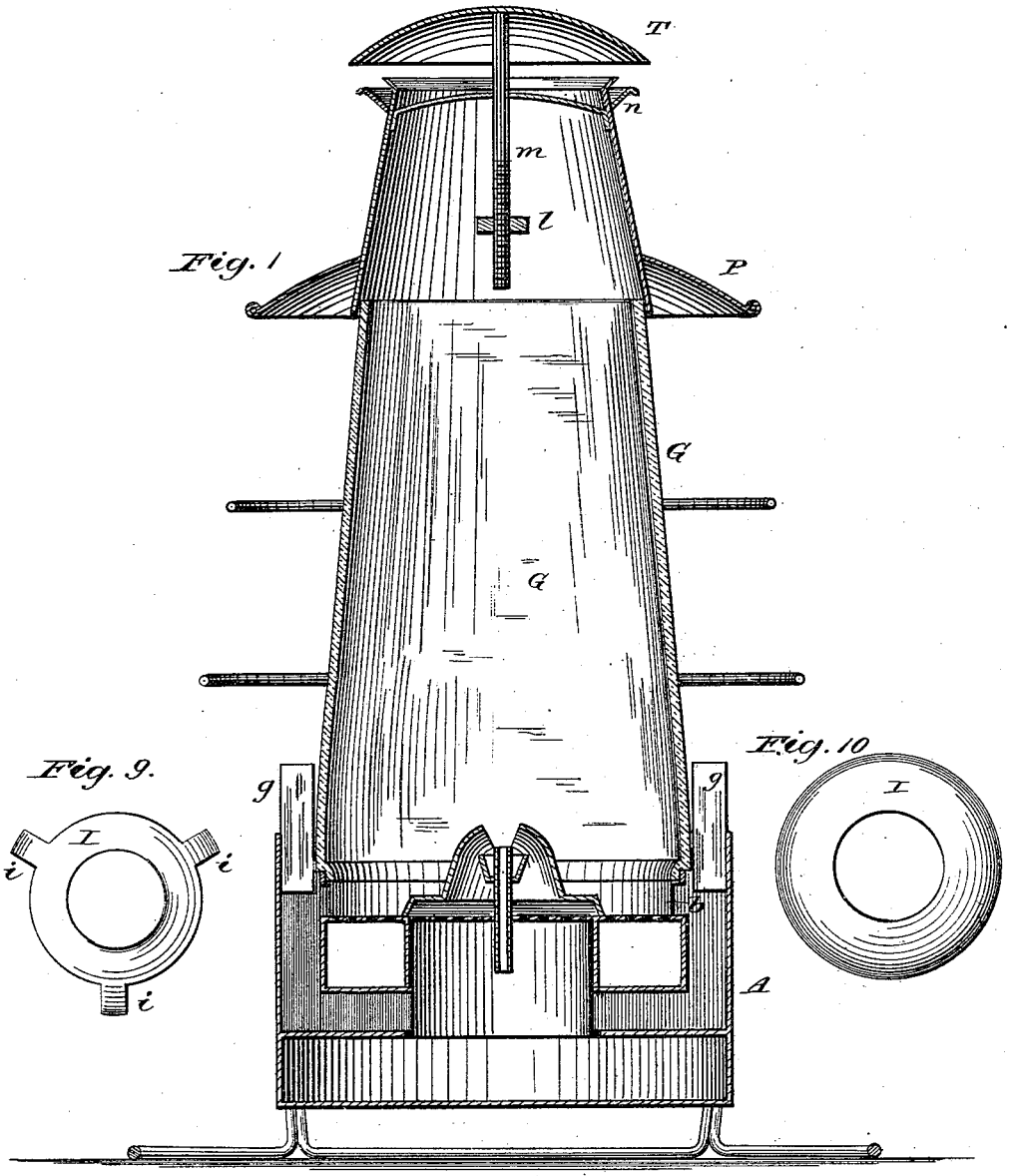


Fig. 9.

Fig. 10

Attest
Fred. G. Dieterich
W. N. Wood

Inventors
A. W. Paull &
J. F. Paull.
by Wood & Sayord
Atty.

A. W. & J. F. PAULL.

Lantern.

No. 208,421. **Patented Sept. 24, 1878.**

Fig. 2

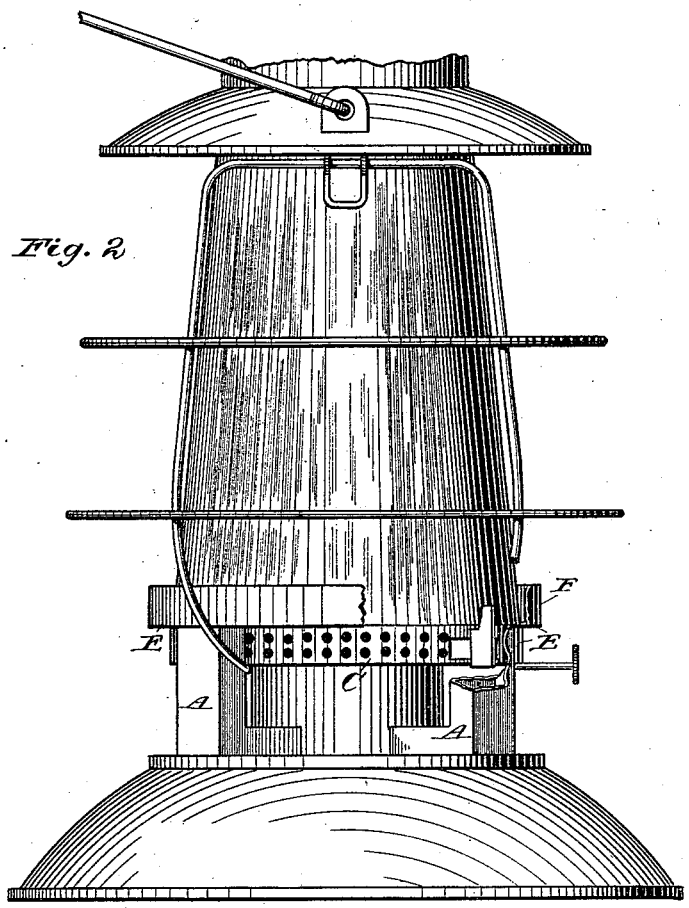


Fig. 3

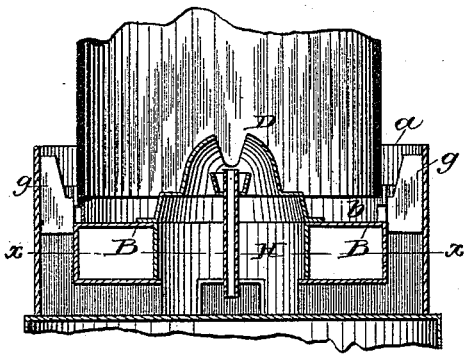
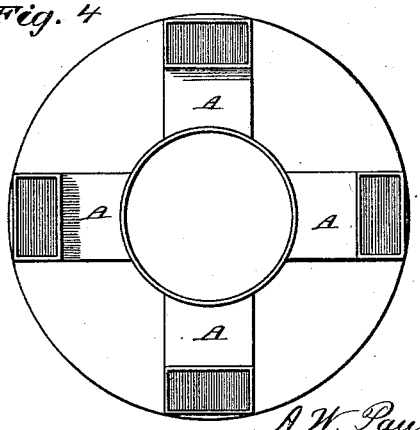


Fig. 4



Attest:
Chas. R. Searle
W. J. Murphy

A. W. Paull &
J. F. Paull
Inventors.
By Morris Osgood,
Attorney.

3 Sheets—Sheet 3.

A. W. & J. F. PAULL.

Lantern.

No. 208,421. **Patented Sept. 24, 1878.**

Fig. 5.

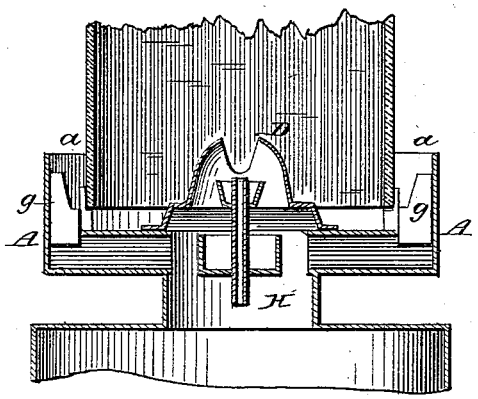


Fig. 6

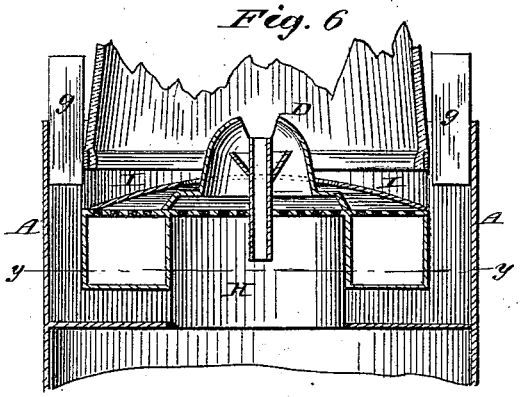


Fig. 7.

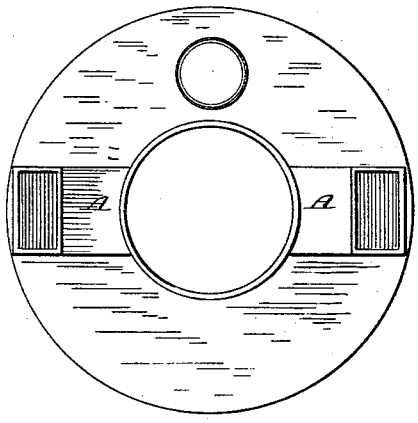
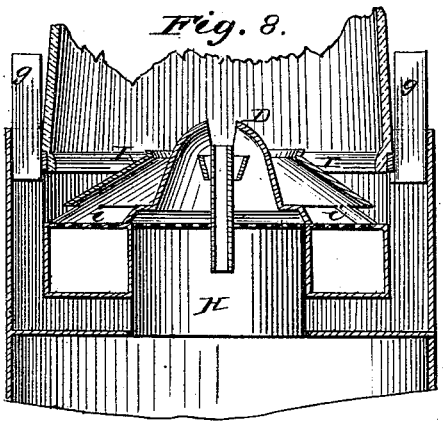


Fig. 8.



Witnesses
Fred G. Dieterich
W. N. Wood.

Inventors
A. W. Paull
J. F. Paull.
by: Wood & Aspinwall
Atty.

UNITED STATES PATENT OFFICE.

ARCHIBALD W. PAULL AND JOSEPH F. PAULL, OF WHEELING, W. VA.

IMPROVEMENT IN LANTERNS.

Specification forming part of Letters Patent No. **208,421**, dated September 24, 1878; application filed August 30, 1878.

To all whom it may concern:

Be it known that we, ARCHIBALD W. PAULL and JOSEPH F. PAULL, of Wheeling, county of Ohio, and State of West Virginia, have jointly invented certain new and useful Improvements in Lanterns, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Figure 1 is an axial section of a lantern constructed in accordance with our improvements. Fig. 2 is an elevation or side view, a portion of the vertical rim and gutter and one of the air-conducting tubes being broken away the better to illustrate the position and arrangement of one of the air-deflecting strips. Fig. 3 is an axial section through the operating parts shown in Fig. 2; and Fig. 4 is a horizontal section through line *x x* of Fig. 3, showing four air-conducting tubes. Fig. 5 is an axial section, showing a modified means of conducting air to a burner-cone, the horizontal portions of the air-conducting tubes being located directly under the bottom plate of the lantern and extended so as to form a single chamber thereunder. Fig. 6 is an axial section, showing the application of an auxiliary air-deflecting plate around the cone of the burner, and Fig. 7 a horizontal section through line *y y* of Fig. 6, showing only two air-conducting tubes. Fig. 8 is a section similar to Fig. 6, showing a different form of air-deflecting plate; and Figs. 9 and 10 are respectively plan views of the air-deflecting plates shown in Figs. 6 and 8.

Like letters in all the figures indicate corresponding parts.

Our invention has relation to that class of illuminating apparatus (particularly hand-lanterns) wherein the ascending and descending currents of air with the globe or flame-chamber are counterbalanced by reverse currents either from within or without the globe, and especially to that class in which the counterbalancing currents are conducted through tubes or channels located beneath the region of the flame, as fully explained in the patent granted to A. W. Paull, No. 206,478, dated August 17, 1878.

The object of our joint invention is to improve upon the lantern shown in the aforementioned patent to A. W. Paull, rendering the counterbalancing effects therein alluded to still more certain, easy, and effective, as well as more perfect; and to this end our invention consists essentially in a novel and useful method or means of protecting the mouths of the air-conducting channels, regulating the amount of draft through the chimney or globe, and in certain relative arrangements or combinations of parts, all of which will be hereinafter first fully described, and then pointed out in the claims.

In the well-known tubular lantern, either in the form having exterior tubes or that having tubes made as a part of the globe, the counterbalancing currents of air enter their respective conduits at a point at or near the top of the globe, necessitating in the first form the use of tubes, which intercept more or less light, and in the second form a globe or chimney requiring, in addition to the long tubes therein, certain short tubes beneath the base of the globe, and leading to some form of air-chamber.

In previous illustrations of the class of lanterns to which the present invention relates, now come to be denominated "anti-tubular lanterns," the counterbalancing currents of air have been received by the tubes below the globe, at points either wholly without the globe, thus employing fresh air entirely to counteract the effects of the descending currents, or at points wholly within said globe, whereby only heated air could be admitted for like purposes. These previous arrangements each have their special advantages, the first in affording an abundant supply of fresh air, and the second in affording a like supply of heated air, which, though deprived of some of its oxygen, maintains the surrounding parts of the device at a nearly uniform temperature, and further affords a counterbalancing current of nearly the same density as the current intended to be balanced.

As clearly illustrated in Figs. 1, 2, 3, 5, 6, and 8, the air-tubes A, which are located below the region of the flame, are each provided with two inlets, one, *a*, leading from the flame-chamber or interior of the lantern, and the other, *b*, leading from a point wholly without

the globe G. The tubes A lead either directly or indirectly to a point beneath the cone D, and their operation is such as to supply a quantity of mingled warm and cold air, thus affording for the counterbalancing current the requisite amount of oxygen, as well as the desired temperature, whereby the several advantages of the forms previously mentioned are combined in the one device.

The operation of the arrangement of tubes to prevent extinguishment of the flame or undue flickering, and to promote steadiness and increased brilliancy, may be understood from the following: When an ordinary lantern is at rest and not subjected to air-currents the flame burns steadily, the same as that of a lamp under like conditions. Whenever the lantern is moved about or subjected to drafts or gusts of air, there are two principal causes which affect the steadiness of the flame—first, the tendency of the outside currents may be such as to cause the air within the globe to rapidly ascend, and the flame will flicker, because the supply of air for combustion is not sufficient and the density of air within the globe is diminished; and, second, the supply of air within the globe may be excessive, being forced downwardly from the top, and of necessity a part of it must find its way out through the flame-slot in the cone. That current which passes through the flame-slot tends to draw the flame with it, and consequently renders the light unsteady.

By the arrangement of air-tubes shown, whenever the air in the flame-chamber has an upward tendency the air in the vertical portions of the air-tubes must have a like tendency, and since these two currents are opposed to each other—that is, one tending to draw air out at the top of the globe and the other tending to draw it out at the bottom—the two currents must counterbalance each other, and the supply of air for combustion is admitted to the flame precisely as if there were no unusual currents.

Whenever a current of air tends to descend within the globe, a counterbalancing current must enter the mouths of the tubes and be carried up beneath the burner-cone. The counterbalancing current meets or crosses and opposes the other, preventing too great disturbance of air at the flame-slot in the cone, and thus obviating the objectionable flickering.

When the inlet and outlet openings are proportioned substantially as shown in the drawings, the flame is found to remain remarkably steady, and practically the only effect of a sudden gust of wind against the lantern, as when it is swung violently or suddenly arrested after being dropped from the hand, is to brighten the flame materially. This effect is probably due to a slight increase in the amount of oxygen or a slightly-increased density of air in the region of the flame, which takes place almost instantly, and without permitting the formation of any stronger currents than are necessary for the proper and uniform combustion.

As shown in Figs. 2 and 3, the bottom B is made imperforate and the globe G elevated slightly upon a ring, C, through which the requisite supply of air is furnished to support the flame. So far as the double-mouthed tubes are concerned, this bottom may obviously be perforated, as indicated in Figs. 1, 6, and 8. Whenever the lantern is suddenly elevated a strong current from without enters the open mouths of the tubes, and this entrance is facilitated by the ledge E and vertical ring F, forming an annular channel or gutter about the base of the globe. The ring F also operates in a measure to prevent the injurious effects of a horizontal blast of air, and the vertical division-strips *g*, extending into the open mouths at about their central points, serve to deflect any horizontal current downwardly into the tubes, as well as prevent the admission of too great a quantity of air in case the current be unusually strong. Similar vertical strips may be advantageously applied at other parts of the gutter than at the mouths of the air-tubes. If the air-conducting tubes be arranged symmetrically about the base of the globe, substantially as indicated, they will conduct an equal quantity of air to the under side of the cone, no matter from which direction the air-blast may strike the globe or in which way the lantern may be swung. The ring F is regarded as a valuable adjunct to the other parts of the lantern, though it may be omitted, provided the tubes be properly arranged with their division-strips.

The mere outline of the tubes or the location of the air-chamber H, which leads up to the base of the cone, are in no way essential to the operation of the device. The chamber H may be replaced by one covering the entire imperforate bottom, substantially as in Fig. 5, in which event the tubes A may be made much shorter.

In order to more perfectly direct the incoming currents of air we find it advantageous to surround the burner-cone by a plate, I, as shown in Figs. 6, 8, 9, and 10. This plate has a central perforation a trifle larger than the cone, and it is inclined upwardly from its base toward its center and occupies a position about as indicated. The air which enters the globe from beneath and exterior to the cone strikes the under side of plate I, and is deflected against the solid-walled cone, thus forcing a greater quantity of air into contact with the flame, by means of which more perfect combustion is effected and increased brilliancy produced.

In Figs. 6 and 10 the plate is shown so constructed as to deflect all the incoming currents which find their inlet at the base of the lantern and outside of the ordinary cone, for which purpose it extends out to the edge of the bottom plate; but in the particular class of lanterns herein specially referred to we find it desirable to provide a compara-

tively free passage for air around the edge of the secondary cone, and this we accomplish by cutting away portions of the plate, leaving three or more legs, as *i i*, but leaving a sufficient surface to deflect the required quantity of air. This construction will afford an increased area for the escape of air from the globe in case of a necessity for such escape, and the same effect may obviously be produced by perforating the plate I more or less, as will be readily perceived. No special claim is herein based upon this secondary cone, inasmuch as it has heretofore been employed in illuminating-burners for directing air-currents.

It is found desirable to provide means by which the quantity of air capable of being admitted or discharged at the top of the lantern may be regulated at pleasure to meet the requirements of the various conditions under which the lantern may be required to be used. For instance, in a high wind the draft-opening might advantageously be made small rather than large, and for a large and bright flame this opening should obviously be varied from the size required for a small flame. That the variations may be easily and quickly made, we mount the top T upon a screw-threaded shaft, *m*, which projects through a correspondingly-threaded stationary cross-piece, *l*. By simply turning top T the vertical distance between it and the stationary walls of the dome will be varied, and consequently the size of the draft-opening may be regulated at pleasure. The same result could be accomplished by making the top vertically adjustable by other means; but those shown are preferred on account of their extreme simplicity and their little danger from accident or liability to get out of order, as well as on account of the ease and nicety with which the desired regulation may be accomplished. Very little experience will enable the operator to determine the point at which the top should be set in order to afford the best practicable results.

Beneath the adjustable top T we locate the air-deflecting ring *n*, which operates to deflect the ascending exterior currents slightly from the mouth of the draft-aperture, thus preventing their too sudden inflow, and otherwise operating to render the drafts more uniform.

When constructed and arranged substantially in accordance with the foregoing description, the lantern will be found capable of successfully withstanding the effects of sudden or prolonged gusts of wind, as well as the most violent handling, without danger of extinguishing the flame.

As previously intimated, we are fully aware of the numerous forms of tubular lanterns, and we are also aware that their several advantages have been secured by locating the tubes below the region of the flame, as in the before-mentioned patent to A. W. Paull. We do not desire, therefore, to be understood as making a broad claim herein to a tube beneath the globe, which shall conduct air from the flame-chamber to a point beneath the burner-cone, as that construction is covered by a previous application for patent; but,

Having now fully described our invention, what we do claim as new, and desire to secure by Letters Patent, is—

1. In combination with the air-conducting tubes receiving air at a point beneath the region of the flame, the vertical division-strips, located and arranged substantially as shown and described.

2. In a lantern having air-conducting tubes which receive air at or near the base of the globe, the combination, with the bottom plate, of an upright perforated ring adapted to admit air to the flame-chamber, substantially as shown and described.

3. The combination of the air-conducting tubes, the air-chamber, the division-strips, and the annular channel or gutter with the burner-cone, the several parts being located beneath the region of the flame, substantially as shown and described.

4. In a lantern, the combination, with the dome, of a vertically-adjustable top plate adapted to vary the size of the draft-opening between said plate and the dome, substantially as explained.

5. In a lantern, the combination, with the dome, of a vertically-adjustable top plate mounted upon a screw-threaded shaft, and adapted to be screwed up or down, substantially as shown and described.

6. In a lantern, the combination, with the vertically-adjustable top plate mounted upon the dome, of an air-deflecting guard, located beneath said adjustable plate, for the purposes and objects named.

7. In a lantern wherein the ascending and descending currents are counterbalanced, substantially as explained, the combination, with the globe, of a dome having a draft-aperture capable of regulation as to size, substantially as and for the purpose set forth.

In testimony that we claim the foregoing we have hereunto set our hands in the presence of two witnesses.

ARCHIBALD W. PAULL.
JOSEPH F. PAULL.

Witnesses:
GEO. F. GRAHAM,
WORTH OSGOOD.