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W. C. HUGHES.

Lamp for Burning Paraffine or Mineral Oils.

No. 212,003. **Patented Feb. 4, 1879.**

Fig. 1

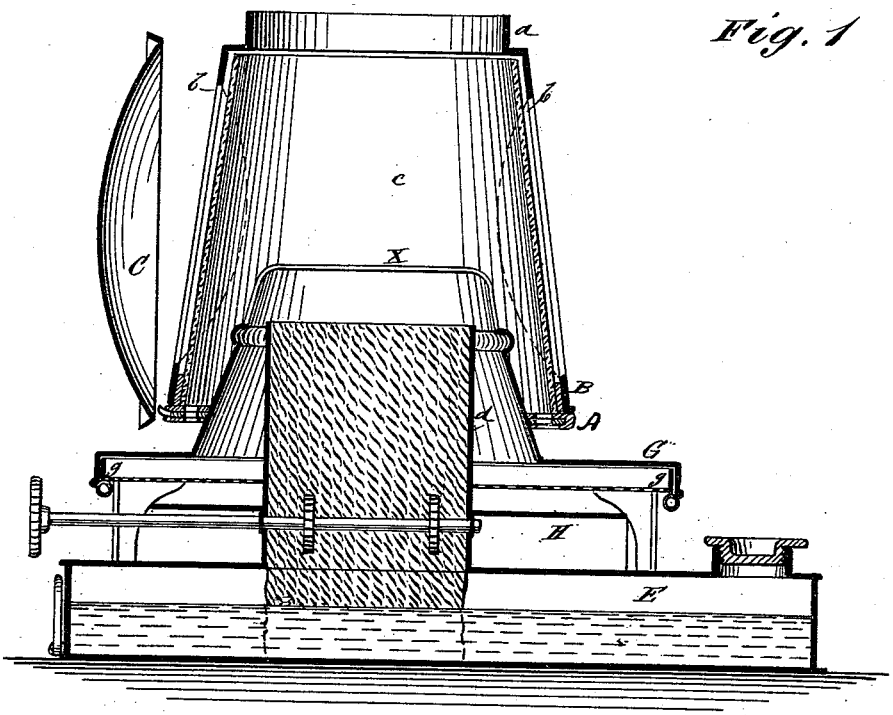
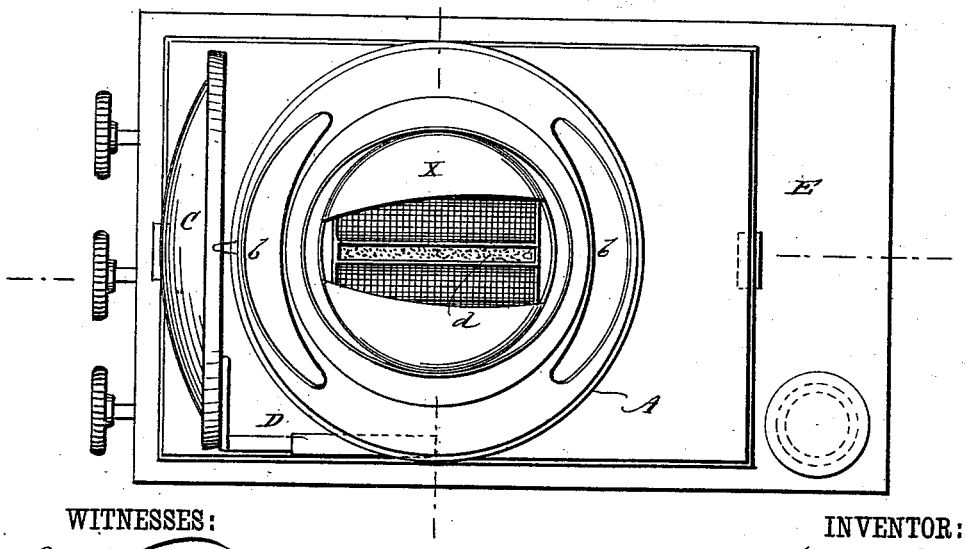


Fig. 2



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2 Sheets—Sheet 2.

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Fig. 3

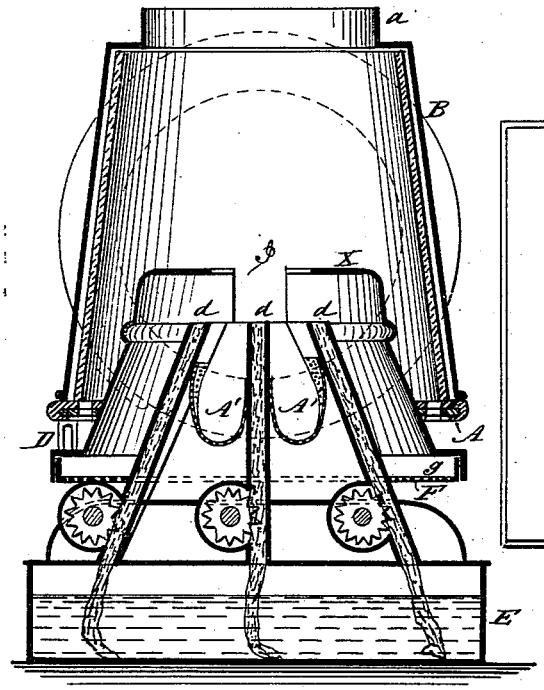


Fig. 4

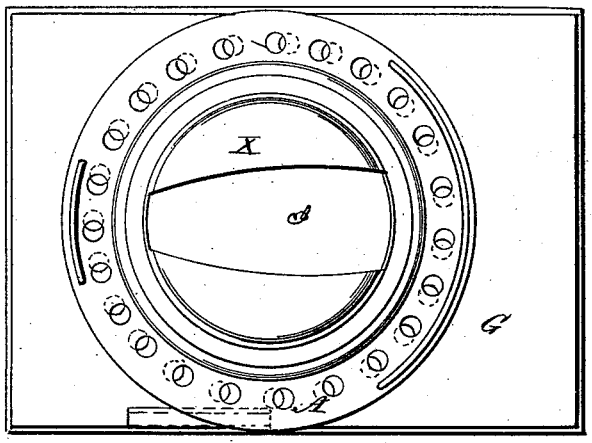
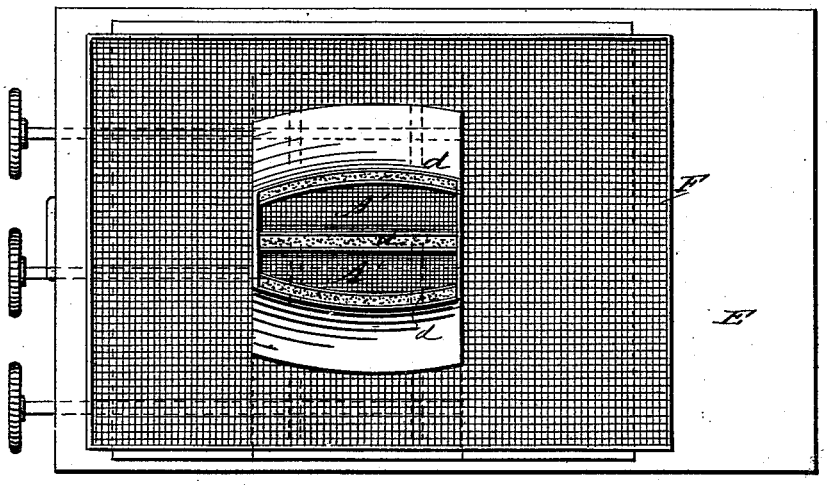


Fig. 5



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WILLIAM C. HUGHES, OF LONDON, ENGLAND.

IMPROVEMENT IN LAMPS FOR BURNING PARAFFINE OR MINERAL OILS.

Specification forming part of Letters Patent No. **212,003**, dated February 4, 1879; application filed October 11, 1878; patented in England, September 5, 1877.

To all whom it may concern:

Be it known that I, WILLIAM CHARLES HUGHES, of London, England, have invented an Improvement in a New Form of Lamp for Burning Paraffine or Mineral Oils, of which the following is a specification:

My invention consists in a new and improved form of lamp having three distinct wicks and separate racks and pinions arranged in such a manner and having such dimensions in construction and shape as to cause proper and perfect combustion for magic lanterns, the public streets, rooms, halls, ships, light-houses, &c.

It has long since become apparent that to get the proper combustion of three separate wicks, so as to make them burn with anything like certainty and effect, would require a vast amount of ingenuity and skill. This, however, is done by regulating to a nicety the proper admission of the proper amount of air in such quantities as to support combustion without losing any of the whiteness of the light or flame.

I am enabled, however, by my arrangements to produce great intensity of light for the purposes above mentioned.

In the first place it is very essential that the wicks for magic lanterns and the orifice of the wick-tubes should be shaped and arranged in certain positions, so as to be compatible with the absorbing power of a lantern-condenser, so that few rays of light may be lost by it.

It has been the aim of magic-lantern manufacturers generally for years past to obtain a properly-illuminated and bright disk on the screen.

One of the essential features for the accomplishment of this object is the size of the flames themselves, and the position and shape the wicks should necessarily occupy. For example, there may be placed at the back or front of a lantern-condenser ever so concentrated a light, at either the top, bottom, or sides, and still scarcely any result will be perceptible; but adjust the same light at a proper focal distance and in the center, then nearly all the rays are absorbed, provided the flame or flames are placed in straight lines or partially curved from the lens. What is meant is this: Suppose a flat flame is placed strictly parallel with the condenser, only that portion of the flame that comes immediately within the absorbing radius of the same will produce any advantageous result, because it is only the center part of the lens that collects really the rays of light; but reverse the lamp by presenting the edges of the flames to the condenser and you get quite a different effect. Thus the condenser absorbs more light longitudinally than in a parallel direction. Therefore, in a lamp of this kind it is very essential to study these points. This ultimatum has been obtained by the introduction of wicks placed in straight lines to the condenser, as in the sciopticon and lamps of similar construction.

In the application of three wicks for the same purpose, the like principle is to be adopted; but to obtain in this case the concentrated light the width of the wicks, as well as their various shapes, together with their proper combustion, must be of vital importance.

If three wicks are placed very close together, no matter in what position, a very poor light would be obtained, on account of sufficient air not being allowed to pass between the wicks, because of their closeness to each other, and, on the other hand, if placed too wide apart, they would certainly lose their power for transmitting light to the screen, a large quantity of the outside rays being lost.

Suppose a large Argand burner (say, two inches in diameter) is placed in a magic lantern, a great deal of heat would be generated, adding but very little more light to the screen, on account of the light from the front and the back being caught by the lens, while the greater part of it on the sides would be lost, and on the whole give but little more brilliancy to the screen than a one-inch Argand burner. Hence, it is that the oxyhydrogen lime light is so valuable, because of the concentration of the light at a given point in magic-lantern use.

Next comes the relation of these three wicks to each other and to the condenser itself.

The object I have in view is to get the greatest amount of light possible. This can alone be obtained from the width of the burning-edges of the wicks being placed in suitable positions, and having such internal and exter-

nal arrangements as to carry off the hot air as much as possible. Therefore the width of the wicks for magic lanterns of three and a half or four inch condensers should not be less than one inch and five-eighths, but more if necessary, up to eight or ten inches.

In a magic lantern with three and one-half or four inch condensers my standard size of the wicks is not less than two inches wide, although I claim to use them as low as one inch and five-eighths in condensers three and one-half to four inches in diameter, and wider, if necessary.

It is evident that a condenser absorbs more rays of light when placed in such a position as to catch them edgewise. Therefore the wider the wicks (consistent with the other arrangements) the greater must be the intensity of the light, and a more brilliantly lit-up disk will be the consequence.

The condenser at the focal distance will absorb or take in any amount of concentrated light. If three wicks are arranged (say, three-quarters of an inch wide) for use in a magic lantern, what would be the result? No more effect than an ordinary light would give; but make them two inches and you get a wonderfully-increased light, and so on, if larger, *cæteris paribus*.

In this part of my invention I adhere strictly to this point, viz: that no three-wick magic lantern lamp should have wicks less than one inch and five-eighths wide, and increased, if necessary, to eight or ten inches, according (as before mentioned) to the size of the magic lantern condenser; but in streets, rooms, halls, shops, light-houses, &c., they, when curved or bent, (one or more of them,) may be used in sizes varying from half an inch to eight or ten inches wide.

The wicks should be placed in the following positions in relation to the condenser, so that it absorbs as much of the light as possible, as well as to produce a properly-illuminated disk without aberration or shadow: In the first place, to produce these results the wicks should be situated thus—viz., the center wick straight, while the two side ones curve, as shown in Fig. 5 of the accompanying drawings. In the second place, the center wick is straight and the two side ones each at an angle. In the third place, the center wick is straight, the side ones forming part of a circle or egg shape, also arranged in divisions. Either of the three tripple-shaped wicks will produce the same effect on the screen. Now, although the wick-tubes take the above shape at their orifice for magic-lantern purposes, as before mentioned, they are equally as powerful for rooms, streets, light-houses, &c. The whiteness and intensity of the flame are also determined by the proper and well-regulated amount of air being admitted by the proper arrangements underneath, between, and above the perforated plates and that which surrounds the flames. This is very important, as brilliancy of light is produced by the arrangement of parts as to size and dimensions of the various fittings and parts forming the lamp, as shown by the drawings.

As it is absolutely necessary to have properly-arranged air-drafts underneath the flames, it is also imperative to have the required quantity of air admitted around, about, and above them. This is done externally by the size of the combustion-chambers, which are shaped by my invention in more forms than one, suitable to the various sizes of the flames. For instance, if a set of wicks two inches wide will take a chamber four inches in diameter, a wick three inches wide will take one six inches in diameter, the same standard being observed with regard to the size of the fittings, and so forth, provided they have the arrangements I have made for their proper combustion. The flames, too, must rise steadily to a proper height, and burn with great whiteness, which can only be guaranteed by my calculated constructions, as before described. In the combustion-chambers, covering the flames of the ordinary two-wick lamps on the sciopticon principle, they have at either end two glass plates. These chambers are made of metal, and form part of the chimney by which the hot air escapes.

In my invention, for covering the three wicks, I place at each end, instead of glass, very finely cut plates of mica or talc, or the condenser itself at one end, if necessary. My reason for so doing is that the ordinary window-glass will not stand the heat, which has always been a serious defect even in the two-wick lamps, and would be much more so in lamps of three wicks; but I do not confine myself to the use of this form of chamber when the lamps are used in magic lanterns only, but to the other parts of my invention, which apply to its use in streets, shops, halls, rooms, light-houses, &c. The combustion-chamber consists of an annealed glass, square, circular, conical, polygonal, or other convenient shape suitable for the purpose for which it is required; but I prefer for present use the conical annealed-glass chamber, four inches in diameter at the bottom, three inches and one-eighth at the top, and three inches and three-quarters deep, and hollow right through like a cylinder, the bottom of which rests on the ground-plate A, Fig. 4, and is covered over by a metal conical-shaped frame or cap B, Figs. 1 and 3, the glass cylinder fitting loosely inside the same, and with the long metal chimney, which fits around the collar *a* of the metal cap B, and forms an entire and complete chamber, two openings, *b*, back and front, allowing the light to pass out at either side. A silver reflector, C, with movable piece, D, is attached to the cover or top plate of lamp, and reflects the light to the condenser. This cap or metal frame rests entirely on the plate, and can be removed as a separate piece.

The glass chamber *c* should be made of annealed blown glass, of any of the shapes and sizes before mentioned. The outer frame or cap fitting to correspond with it may have as

many openings as required to admit of light passing out in any direction; or, in place thereof, a metal cap resting on the top of the glass chamber may be applied, so proportioned and arranged as to leave a large area of light to pass out without any interruption, so as to support the chimney, hereinbefore described.

The plate A, which is circular, and on which rest the metal frame and glass chamber, has an arrangement for letting in minimum quantities of air, if necessary, to feed the flames.

As before mentioned, common window-glass will crack under ordinary circumstances, because it cannot be got very readily and properly annealed; and when placed, as it has to be, in direct communication with the heat coming from the three flames, two inches wide, scarcely a minute will pass without its being shattered; hence it is the blown annealed-glass chambers that will survive any amount of heat that may be brought upon them during the combustion of the same. Moreover, in this form of chamber and connected chimney the hot air escapes without any obstruction, which is of great moment when the lamp is placed in a confined space, while in the metal combustion-chamber it collects and remains intensified, much to the detriment of surroundings.

Figure 1 is a sectional elevation of my improved lamp. Fig. 2 is a plan view of the lamp, showing exactly the form it assumes. Fig. 3 is a vertical section. Fig. 4 is a plan view, showing the ground plate. Fig. 5 is a plan view of the lamp with the cover removed.

The lamp proper consists of an ordinary cistern or reservoir, which can be made of any size to contain sufficient oil for the time the lamp is wanted to burn. On the top of this are wick-tubes *d*, three in number, through which the wicks pass, and are raised and depressed by three separate racks and pinions with milled heads.

The center wick-holder is quite perpendicular, while the two side ones lean toward the center one at the top, so that the three wicks may be enabled to assume the several shapes previously mentioned, the two outside wicks in either case being more widely separated at some points than at others from the center wick, while at one point they are brought closer together, and are not wider apart in any position than half an inch and one-sixteenth, and not nearer together than a bare quarter of an inch in the narrowest part of the various curves. There must be, also, between each two wick-holders (soldered near the bottom) perforated plates, as shown at A′. This is to prevent the air from rushing through too violently, and to allow only the proper quantity of air to pass between the flames for the proper combustion.

The wick-holder is generally two inches and three-quarters in height. On account of the capillary attraction, they should not be less, as sufficient amount of space must be allowed for the air to pass through in order to feed the flames.

Above the reservoir E, and resting on four separate feet, barely one inch in height, is the plate F, which is perforated with a number of small holes. This plate is about six and a quarter inches long by four and a quarter inches wide, having entirely around it a ledge, *z*, three-eighths of an inch in depth. When the cover-plate G is placed thereon, the air penetrates through the cone and thence to the flames.

Between the perforated plate or platform and on the top of cistern of the lamp is placed a metal shield, H, to prevent the heat from being thrown down direct upon the cistern containing oil. This is situated at both ends of the lamp, and is arched like a bridge. On the cover-plate is fixed a bell-shaped cone standing two inches in height, and in diameter at the bottom three and three-quarters, the extreme edge of same being turned back to allow of firmly soldering it to the plate of the cover underneath, the top part of the cone covering the wicks being two inches and three-quarters in diameter, down the center of which a slot, I, is cut of the size and shape to lie right above the curves of the two side wicks in either of the three positions before mentioned, and is raised above the two side wicks half an inch. The slot is carried in depth on the cone at either end half an inch.

Between the cone and the wicks there is sufficient space to allow the air to efficiently do its work on any portion of the flames. It is therefore these dimensions and sizes of the various parts and fittings, together with the combustion-chambers, that regulate this sized lamp suitable for magic lanterns with three and a half or four inch condensers.

This lamp can be used for burning paraffine oils; but should it be required to burn colza oil in it, I can adapt an ordinary fountain-cistern; but a little variation in sizes, either larger or smaller, will not prevent the desired and proper combustion of the flames; but to whiten the flames a proportionate quantity of fine wire-gauze or muslin can be placed between the perforated plate and the top plate.

The combustion-chamber, as before mentioned, can be made of various shapes, but not larger in proportion than adopted by me for present use for magic lanterns with three and a half or four inch condensers.

c is the glass chamber or cylinder, (which must be made of crown annealed glass,) about four inches in diameter at the bottom, three inches and one-eighth at the top, and three inches and three-quarters deep, the metal frame or cap being just the size to cover the glass cylinder or chamber loosely, having openings back and front to let the light out. This, when the metal chimney is attached, forms a complete combustion-chamber.

A is the plate, which is circular and raised about midway up the belt-shaped cone X, cover-

ing the flames, and securely fastened to the same, in order to hold the combustion-chamber firmly. This plate is made in two separate pieces, but forming, when together, one platform. The top plate has its inner and outer edges turned over on the underneath portion to form a frame, in which is placed the bottom plate, fitted moderately loose to allow it to revolve round either one way or the other. Both of these plates have a number of holes—say, twenty-seven, for instance—at certain distances apart and about one-eighth of an inch in diameter, same being punched through the plates for the purpose of forming a vent for letting in the outside air to the combustion-chamber should the glass chamber fit too tightly in the metal frames. By this arrangement the bottom piece is turned, and so covers and uncovers the holes situated in the top plate.

Attached to the perforated ground-plate are two ledges, placed in such a position as to be back and in front of the lamp. These ledges are placed for the purpose of retaining the combustion-chamber firmly and securely in its place. A connective metal chimney forms part of the combustion-chamber.

C is the reflector, which moves to and fro in a slide, D, and is placed on the right side of the plate covering the wicks. This is to enable the operator to adjust it in a proper position.

The triplexicon lamp, in its completeness, can be made larger, the dimensions being, of course, in proportion with the size of the wicks, any part accordingly being made on a proportionate scale, which will insure proper combustion.

Having now particularly described and ascertained the nature and object of the said invention, and in what manner the same is to be performed or carried out in practice, I hereby declare that I claim—

1. The reservoir E, the arched shield H, the perforated plate F, the wick-tubes *d*, the perforated plates A′, the cone X, attached to the cover-plate and provided with the slot I, and the circular perforated plate or support A, in combination with the chimney *c*, with or without the metal cap B, and with the reflector C, substantially as and for the purpose described.

2. The metal cap B, provided with rear and front openings, *b*, and collar *a*, in combination with the chimney *c* and with the adjustable reflector C, substantially as and for the purpose described.

The above specification signed by me this 12th day of April, 1878.

W. C. HUGHES. [L. S.]

Witnesses:
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Both of 21 *Cockspur Street, Charing Cross, S. W.*