Some Illuminants

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THE lamps originally employed in the magic lantern were so premature as to raise a feeling of surprise how any of the wonder-working projections of which we read could have been made by such a smoky, dingy, yellow light. It was not till in 1789, when Ami Argand made his great discovery and invention, that a light at all worthy of the name was made known to the world. It consisted, in brief, in supplying air in large quantities to the interior as well as the exterior of the ring of flame, and creating a fierce draught by means of a chimney, which caused the combustion of the carbon, which otherwise would have escaped unconsumed into the atmosphere. The best lanterns soon had this principle of lighting applied to them, and except in the matter of the form of the wick, remain so up to the present time—that is when they are lighted by oil of any nature.

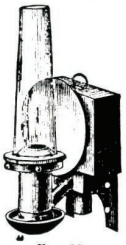

Fig. 10.

In all oil lamps the oil is drawn from the reservoir below up to the burning point by means of the capillary attraction residing in a cotton wick not too tightly woven.

Argand Burner.

The solar fountain lamp, constructed on the Argand principle, is useful for viscid oils—the colza, for example. This, although not possessing anything like the intensity of modern three or four wick lights has the advantage of being easily worked, and of giving a uniformly lighted disc. Paraffin oil or petroleum is now found to prove a better oil than those of the colza type, and in consequence it is most generally used.

Circular burners having two or more concentric wicks have been tried for the lantern, but unless made large, as in some lighthouse lamps, they have not been found to possess any particular advantage for the lantern; the trouble of keeping the wicks properly trimmed has also proved very great. But, for the production of a photographic enlargement, a small Argand paraffin lamp, or one in which the flame is contracted to a small diameter, either by an indentation around the glass chimney just above the wick, or by a cup-shaped diaphragm of brass (Fig. 10), will be found superior to most other forms, on account of the small size of the flame. This, if stopped off above and below by an opaque piece of metal with a hole in it, will be no larger than a lime-light, the greatest sharpness being thus attainable. Of course such a light will prove insufficient for illuminating a large screen for the spectacular projection of a picture, but for enlarging purposes it only entails the giving of a longer exposure. The resulting picture will prove to be much sharper than if it were made by a large flame, no matter how intense it might be.

Camphorated Oil.

The quality of the flame is greatly improved, whatever oil is used, by saturating such oil with camphor. This should be shredded into small fragments and added to the oil, which should be carefully warmed in order to dissolve it. Let those who are doubtful as to the illuminating powers of camphor take a bit the size of a pea, and holding it stuck on to the point of a pin, inflame it by a match, and they will see how beautiful and pure is the light it gives.

Sciopticon Lantern.

It is to Mr. L. C. Marcy, of Philadelphia, that we are indebted for the greatest improvement that has ever been effected on the construction of lamps on Argand's idea. In his sciopticon he converted quantity into intensity of light, by the flattening out of the circular wick, and placing two or more of these side by side with the requisite air supply spaces between, with their edges in the axis of the optical system. The flames are thin, very intense, and are close together. This is the class of lamp which is fitted to all the best oil lanterns of the present day. Modifications of the original Marcy lamp have been made by various makers, but none of these are of such a nature as to even becloud the merit which must ever attach to Mr. Marcy's ingenuity.

It is of great importance that the wicks of the Marcy lamp are properly trimmed, the slightest inequality in one of them affecting the excellence of the lighting; even a minute tag at one end will operate most prejudicially. A little instrument like a pair of pincers (Fig. 11), with a flat sliding blade, having a guillotine action, has been invented in America, which effectually supersedes the use of the sharpest pair of scissors, or even a razor, for this purpose. It costs only a small sum, and no one who wishes to experience comfort in using the oil lamp should be without one.

Fig. 11.

The Limelight.

Soon after Newman of London invented the oxy-hydrogen blow-pipe, it was found by Sir Humphrey Davy, that while many hitherto infusible substances were melted by its great heat, lime emitted a light of intense brilliance; and later, Lieutenant Drummond, R.E., recommended in 1826 an application of it in distant signalling, whence a name formerly applied to it—*the Drummond Light.* Its application to the magic lantern soon followed, and it is the most beautiful and powerful system of lighting we now possess.

Oxy-calcium.

Relative to the forms of burner for utilizing oxygen as applied to the incandescence of lime, the simplest and—for those who reside at a distance from a supply of house gas—the most convenient burner is the oxy-calcium, shown below in Figure 12. In this there is a reservoir (A B) of spirits of wine, constructed on the principle of the fountain lamp, which keeps a steady supply to the wick at a uniform level; a blowpipe (C), connected with a bag or other reservoir of oxygen, sends a fine jet of this gas through the spirit flame, causing it to impinge on the lime cylinder (D, supported on E), which thus becomes luminous. This light is quite safe, and with methylated spirits, very economical, while if properly managed it illuminates a disc with sufficient power to serve in a small hall or schoolroom.

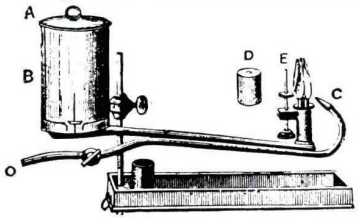

Fig 2.

Blow-through Jet.

The blow-through or safety jet, much employed at present where house gas is laid on, is similar to the above, only instead of a spirit lamp, the common gas takes its place. This form is shown in Figure 13. As the taps for both oxygen and hydrogen are placed adjacent to each other, it is usual to have a distinguishing mark so that no mistake may occur as to which gas is being regulated, in some cases the handles are made of different sizes, and in others of different shapes.

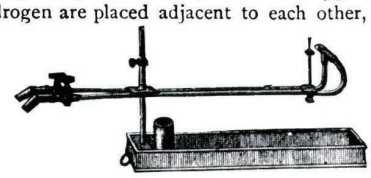

Fig. 13.

Oxy-hydrogen.

In the case of the oxy-hydrogen burner, the gases are allowed to mix before being emitted from the jet Fig 14. This admixture of gases, in conjunction with the lime, gives an exceedingly intense light.

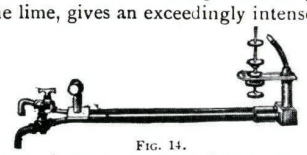

Fig. 14.

A convenient means by which the lime can be turned consists in a pair of cog-wheels and an extended handle, as will be seen by Fig. 15.

In the mixed gas-jet it is necessary that the pressure from both gases be uniform.

To provide a bye-pass for the hydrogen, and thus to prevent the light from going altogether out, Messrs. Newton constructed for Mr. Pringle the form shown in the cut Fig. 16. The latter writing concerning it, says:

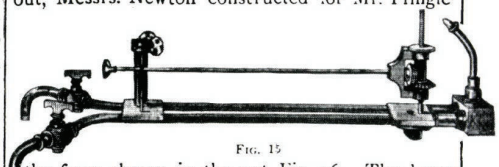

Fig. 15

"In lectures there is often a long interval when the light is not wanted at all and the gases are merely being wasted, unless the light is turned right down as before. I accordingly devised the addition to the jet figured here. The tubes of an ordinary jet are cut, and two extra taps fitted anywhere in front of the usual taps, but preferably pretty near the middle, between the upright pin and the lime pin. The hydrogen tap has a small bye-pass; the oxygen is a complete cut-off. The two taps are turned equally and simultaneously by two toothed wheels working into each other and of equal diameter, so that the gases, when the wheels are turned, are lowered proportionally and the light is only lowered without losing quality.

"The manner of using the jet is simple. The extra taps are turned full on, and the usual taps worked so as to get the best possible light. When desired, the extra taps can be turned lower at will by the milled head, and again turned full on by the same means, without any interference with the 'normal' taps. When the light is not wanted at all on the screen the oxygen is cut right off, while the bye-pass allows a sufficient quantity of hydrogen to pass, not only to keep the lime hot, but to allow of a full relighting at a moment's notice."

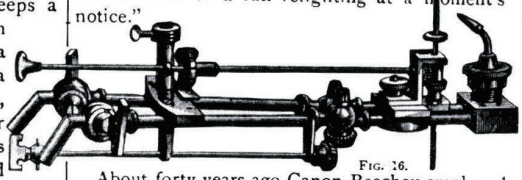

Fig. 16.

About forty years ago Canon Beechey employed for his trinoptric lantern a light which, although not so powerful as the limelight of the present day, yet served very well for illuminating a twelve foot disc. It consisted of a circular wick fed by oil. A lime ball was suspended in the flame by a platinum wire, and a stream of oxygen was made to play up the centre of the circular flame, which was rather of small diameter. This imparted so great a degree of heat to the oil flame as to illuminate the ball equally on all sides.

For any kind of lantern in which the light has to be directed in more ways than one, such as in that for which it was originally adapted, a system of this sort would necessarily be more useful than where one of the more modern forms of burner is employed, because in the latter the rays of light are emitted from the front of the lime only, whereas in Mr. Beechey's lamp the lime-ball is luminous in every direction. Instead of an oil lamp it is evident that a spirit lamp with a circular wick, a Bunsen burner, or even an ordinary gas Argand burner can be made to serve the purpose equally well.