

II. *An account of an invention for giving light in explosive mixtures of fire-damp in coal mines, by consuming the fire-damp.*
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I HAVE already had the honor of communicating to the Royal Society an account of a safe light, which becomes extinguished when introduced into very explosive mixtures of fire-damp; in this communication I shall describe a light which will burn in any explosive mixture of fire-damp, and the light of which arises from the combustion of the fire-damp itself.

The invention consists in covering or surrounding the flame of a lamp or candle by a wire sieve; the coarsest that I have tried with perfect safety contained 625 apertures in a square inch, and the wire was $\frac{1}{70}$ of an inch in thickness, the finest 6400 apertures in a square inch, and the wire was $\frac{1}{250}$ of an inch in diameter.

When a lighted lamp or candle screwed into a ring soldered to a cylinder of wire gauze, having no apertures, except those of the gauze or safe apertures, is introduced into the most explosive mixture of carburetted hydrogen and air, the cylinder becomes filled with a bright flame, and this flame continues to burn as long as the mixture is explosive. When the carburetted hydrogen is to the air as 1 to 12, the flame of the wick appears within the flame of the fire-damp; when the proportion is as high as 1 to 7, the flame of the wick disappears.

When the thickest wires are used in the gauze, it becomes strongly red hot, particularly at the top, but yet no explosion takes place. The flame is brighter the larger the apertures of the gauze : and the cylinder of 625 apertures to the square inch, gives a most brilliant light in a mixture of one part of gas from the distillation of coal, and 7 parts of air ; the lower part of the flame is green, the middle purple, and the upper part blue.

I have tried cylinders of 6400 apertures to the square inch, in mixtures of oxygene and carburetted hydrogene, and even in mixtures of oxygene and hydrogene ; and though the wire became intensely red hot, yet explosions never took place : the combustion was entirely limited to the interior of the lamp.

In all these experiments there was a noise like that produced by the burning of hydrogene gas in open tubes.

These extraordinary and unexpected results lead to many enquiries respecting the nature and communication of flame ; but my object, at present, is only to point out their application to the use of the collier.

All that he requires to ensure security, are small wire cages* to surround his candle or his lamp, which may be made for a few pence, and of which various modifications may be adopted ; and the application of this discovery will not only preserve him from the fire-damp, but enable him to apply it to use, and to destroy it at the same time that it gives him an useful light.

* Fig. II. Pl. 1. represents this contrivance.