

**A description of the safety lamp invented by George Stephenson, and now in use at Killingworth colliery. To which is added, an account of the lamp constructed by Sir Humphrey Davy. With engravings / [George Stephenson].**

### **Contributors**

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Davy, Humphry, Sir, 1778-1829.  
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STEPHENSON, GEORGE.

A DESCRIPTION of the SAFETY LAMP in-  
-vented by GEORGE STEPHENSON; and  
AN ACCOUNT of the LAMP constructed by  
Sir HUMPHRY DAVY.-

1817.



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A  
DESCRIPTION  
OF THE  
SAFETY LAMP,  
INVENTED BY  
GEORGE STEPHENSON,  
AND  
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TO WHICH IS ADDED, AN  
ACCOUNT OF THE LAMP  
CONSTRUCTED BY  
SIR HUMPHREY DAVY.  
WITH ENGRAVINGS.

LONDON:

PRINTED FOR BALDWIN, CRADOCK AND JOY; ARCHIBALD CONSTABLE  
AND CO. EDINBURGH; AND E. CHARNLEY, NEWCASTLE.

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1817.





A  
DESCRIPTION  
OF THE  
SAFETY LAMP, &c.

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SEVERAL of my friends having expressed a wish that I would lay an engraved plan of my Safety Lamp before the public, with as correct an account of the dates of the invention as I am able, I have resolved to do so. I was, at the same time, advised to publish the steps by which I was led to this discovery, and the theory I had formed in my own mind upon the subject, which, with the facts from which I drew my conclusions, were freely communicated to several persons during the time I was engaged in the pursuit. With this I cannot persuade myself to comply; my habits, as a practical mechanic, make me afraid of publishing theories, and I am by no means satisfied that my own reasons, or any of those I have seen published,



why hydrogen gas will not explode through small apertures, are the true ones. It is sufficient for our present purpose that that fact has been discovered, and that it has been successfully applied in the construction of a Lamp that may be carried with perfect safety into the most explosive atmosphere.

During the four years that I have been employed to superintend the engines at Killingworth Colliery, one of the most extensive mines in Northumberland, where there is a considerable quantity of machinery under ground, I have had frequent opportunities of employing my leisure hours in making experiments upon hydrogen gas: the result of these experiments has been the discovery of the fact above stated, and the consequent formation of a Safety Lamp, which has been, and is still, used in that concern, and which my friends consider, (with what justice the public must decide,) as precisely the same in principle with that subsequently presented to their notice by Sir Humphrey Davy. A plan of that gentleman's Lamp I shall take the liberty of adding, with the time of its arrival in this part of the country, and some dates I have extracted from a letter published by the Rev. John Hodgson, and from the Newcastle



Chronicle. The use of the wire gauze is certainly a happy application of a beautiful manufacture to a very useful purpose, but I confess I cannot consider it in any other light than as a variation in construction. If any other substance was to be used instead of the glass cylinder, for instance, the tin guard in plate 3, fig. 2, it surely must have been immediately obvious that no apertures could be allowed in it greater than those through which I had ascertained explosion would not pass. As a discovery, the person who first constructed the perforated Tin Lanthorn in common use, may, with great justice, claim the merit of having surrounded flame with a substance less liable to injury than glass, which, at the same time that it admits the air, transmits the light. It might be considered a want of candour were I not to take notice of the Lamp constructed by Dr. Clanny, but my reason for not inserting it is, that I considered it as constructed upon a principle entirely different from mine, that of separating the external and internal hydrogen by means of *water*. If I am deceived, there can be no question upon the merit of the discovery, as there is no doubt but that gentleman had directed his talents to the subject, and had



constructed his original Lamp long before I had reduced my ideas into practice.

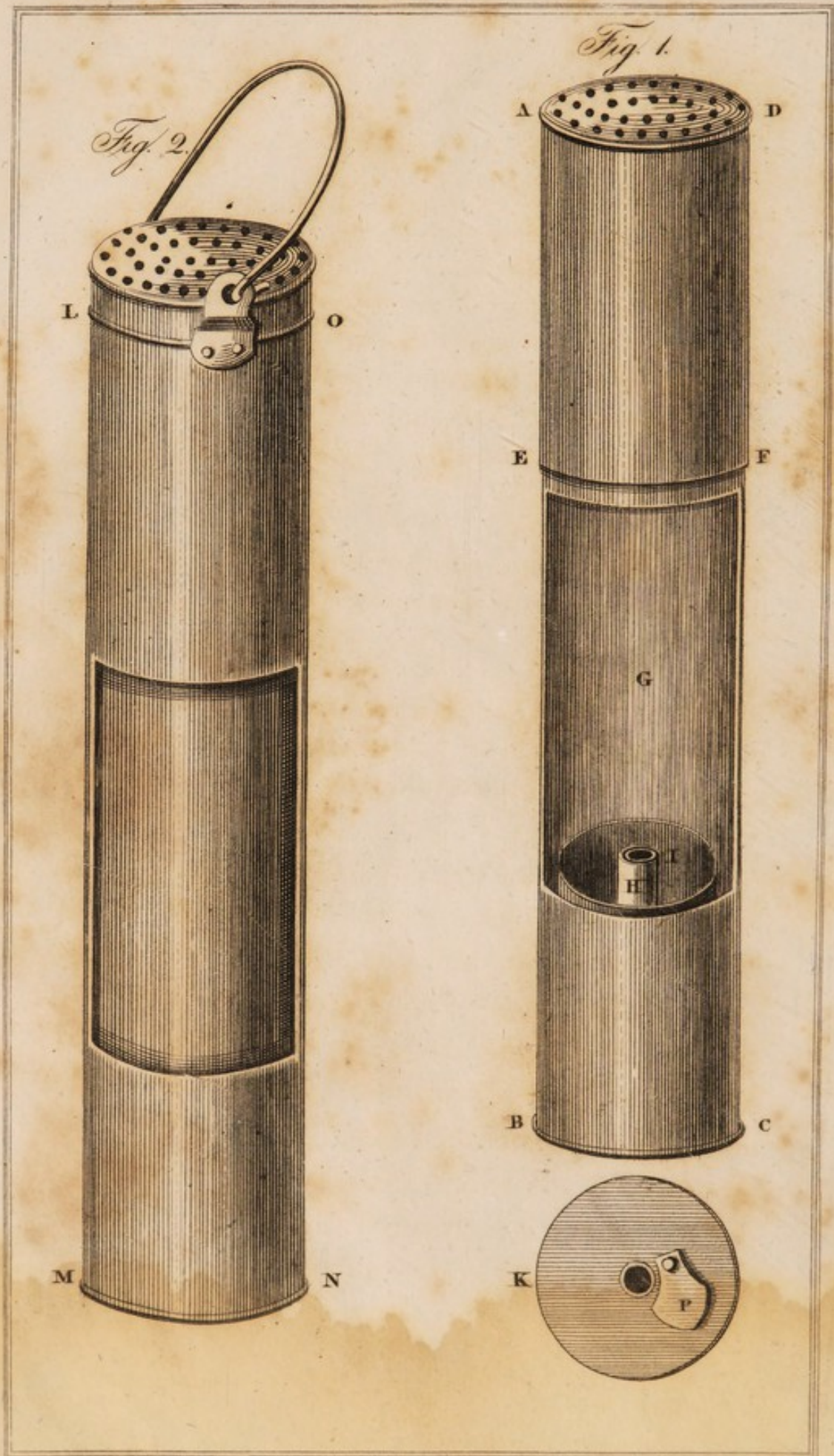
With respect to Mr. R. W. Brandling and Mr. Murray's Lamps, I conceive them to have been constructed on the principle of not allowing the hydrogen gas, in any case, to come in contact with the flame, which they proposed to accomplish by means of flexible tubes. At least, this I know was the intention of the former gentleman,—whose more complex machine, to which the Lamp was in some cases to be attached, was intended to meet the danger arising both from carbonic acid gas, and hydrogen gas, the date of which invention may be easily ascertained, by its having been published soon after a very melancholy accident that occurred in one of the mines in this country.

I shall now proceed to describe the Lamps I constructed.











*Plate 1.—Fig. 1.*

A. B. C. D. the lamp made of tin.

G. the glass cylinder.

A. E. F. D. the top which takes off to admit the glass cylinder, and keeps it tight to the bottom B. C.

H. two tin tubes, the cavity between them for the wick ; the interior one to admit the air.

I. the chamber for the oil.

*Fig. 3.*

K. The bottom of the lamp with the slide P. to regulate the quantity of air to be admitted.

*Fig. 2.*

L. M. N. O. the case in which the lamp is carried, with the tin back (which in fig. 1. is seen through the glass at G.) turned towards the opening where the light is not required.

This Lamp was tried in Killingworth colliery, on the 21st of October, 1815. The idea I had long entertained, and the drawing was shewn to several persons employed in that concern, two months before the day above mentioned, when, I carried it with safety into a part of the mine where a strong blower of hydrogen was coming off. An experiment which was immediately repeated in the presence of two persons employed in that concern.



*Plate 2.—Fig. 1.*

- A. B. C. D. the lamp.  
 E. Three small tubes passing through the oil vessel, and out at bottom B. C. to admit the air to the flame.  
 F. the tube for the wick.  
 G. a small wire to raise and trim the wick.

*Fig. 2.*

- H. I. K. L. the cover to protect the glass cylinder.

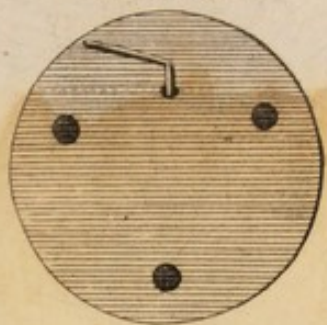
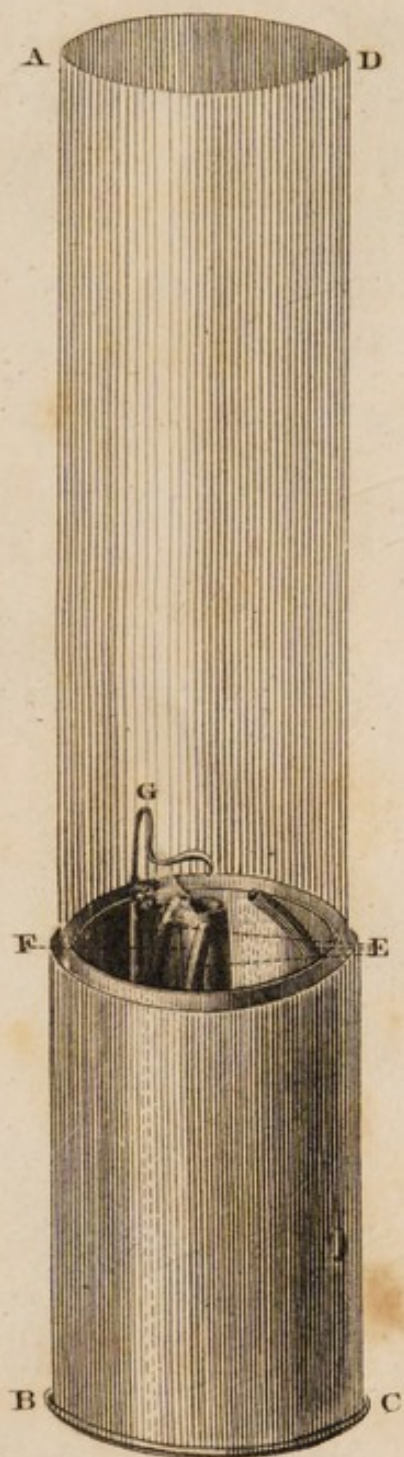
*Fig. 3.*

- M. the bottom of the lamp shewing the three apertures, and the wire to trim the wick.

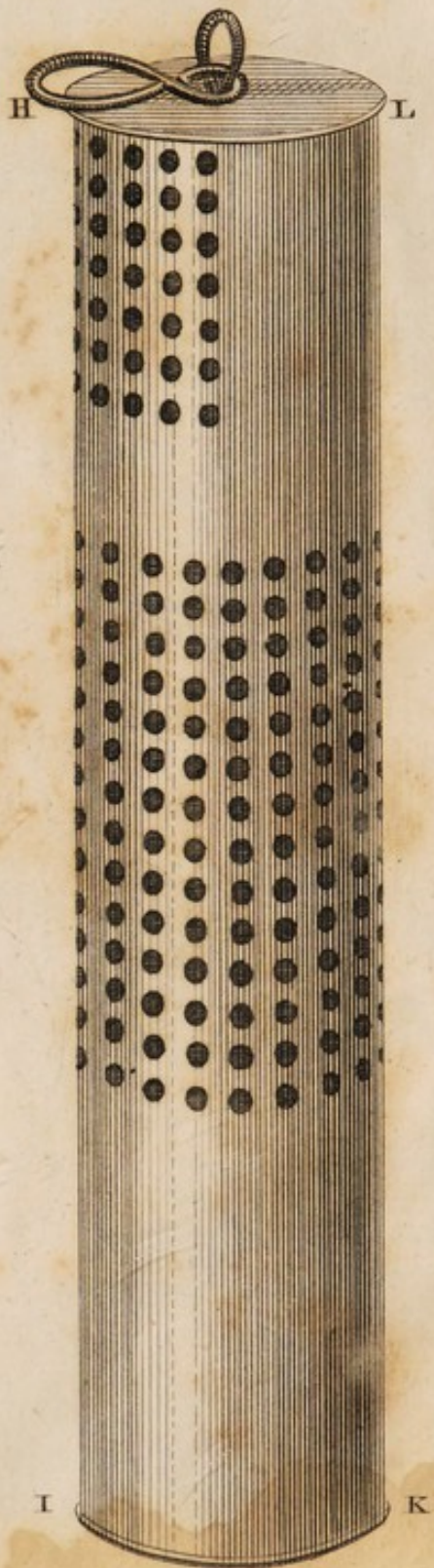
This was ordered immediately after the former one had been tried; and, on the 4th of November, was exposed to a blower in the same mine.—It was found to burn considerably better, and to be perfectly safe; but as it did not entirely answer my expectations, I determined to surround the oil vessel with a number of capillary tubes, as shewn by the section, fig. 3, plate 3, in which case the apertures would present the same appearance as the perforations in fig. 1, in the same plate; but I thought that the air would have an easier access, and that the effect might be the same if I cut away the middle of the tubes; and that the flame, if t



*Fig. 1.*



*Fig. 2.*









passed through the apertures at the top would not communicate the explosion to the hydrogen beyond the plate below. I constructed a Lamp upon this principle, and found that the holes having been punched very small, the flame never passed even through the first plate.



*Plate 3.—Fig. 1.*

- A. B. C. D. the lamp.
- A. E. F. D. the cover for the top.
- G. the tube for supplying the oil.
- H. the wire to trim the wick.
- I. the perforated plate covering the air chamber which surrounds the oil vessel.
- K. L. apertures through which the air passes into the air chamber.
- M. tube for the wick.

*Fig. 2.*

- N. O. P. Q. the cover to protect the glass cylinder.

*Fig. 3. Plate 3.*

- A. B. C. D. a section of the lamp. a. b. c. d. the capillary tubes. E. F. the apertures answering to the round holes in plate 3. fig. 1.

The second plate, which is not shewn in fig. 1, corresponds with the apertures at c. d. fig. 3.

This plate represents the Lamp at present in Killingworth Colliery. One, similar in principle and in construction (except that the top of the glass was contracted into a conical form), was in the hands of the manufacturer at the time I exhibited my former one to Mr. R. W. Brandling and Mr. Murray of Henderland, on the 24th of November, and was tried in the mine on the 30th, and on the 5th December was exhibited before the Literary and Philosophical Society of Newcastle.



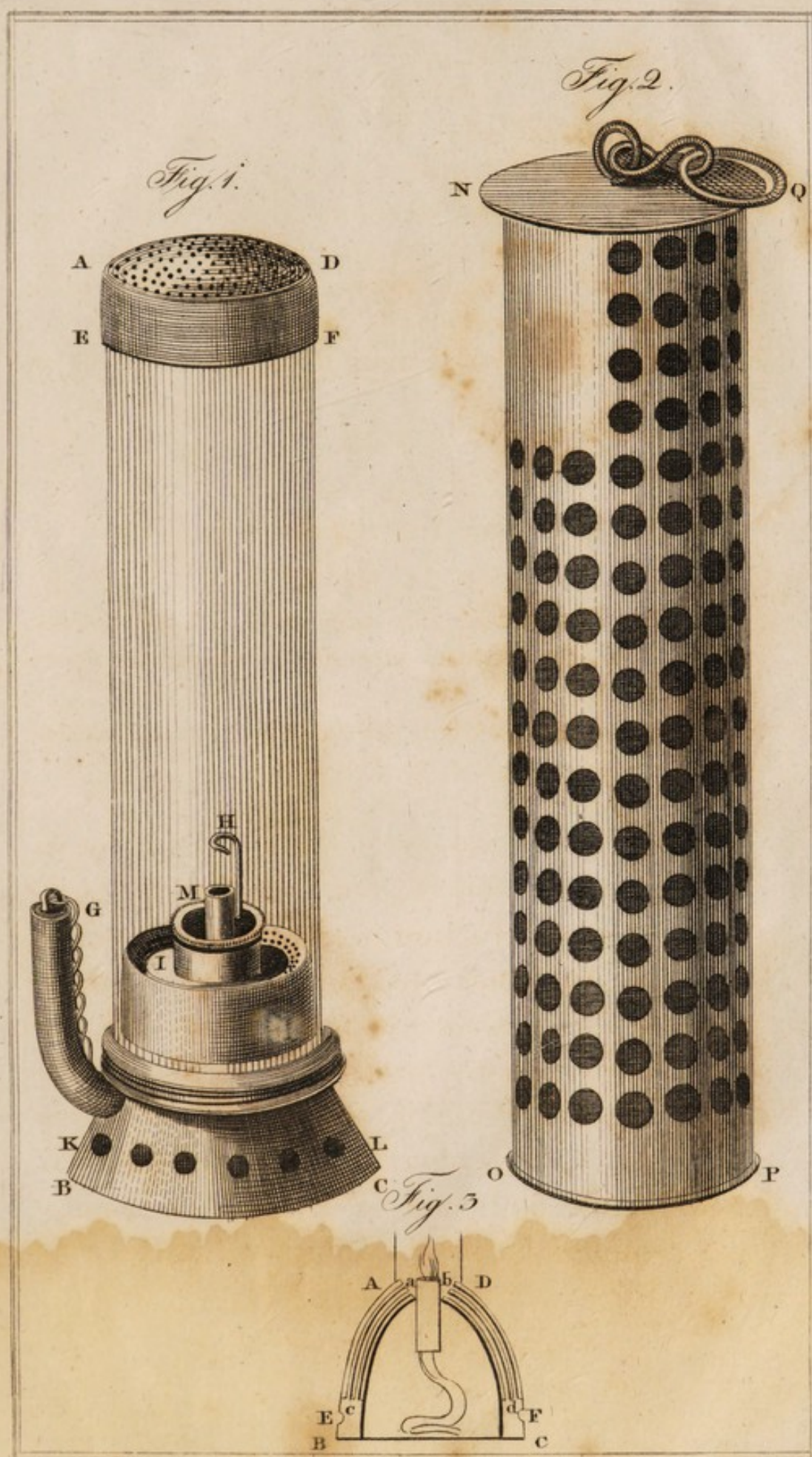




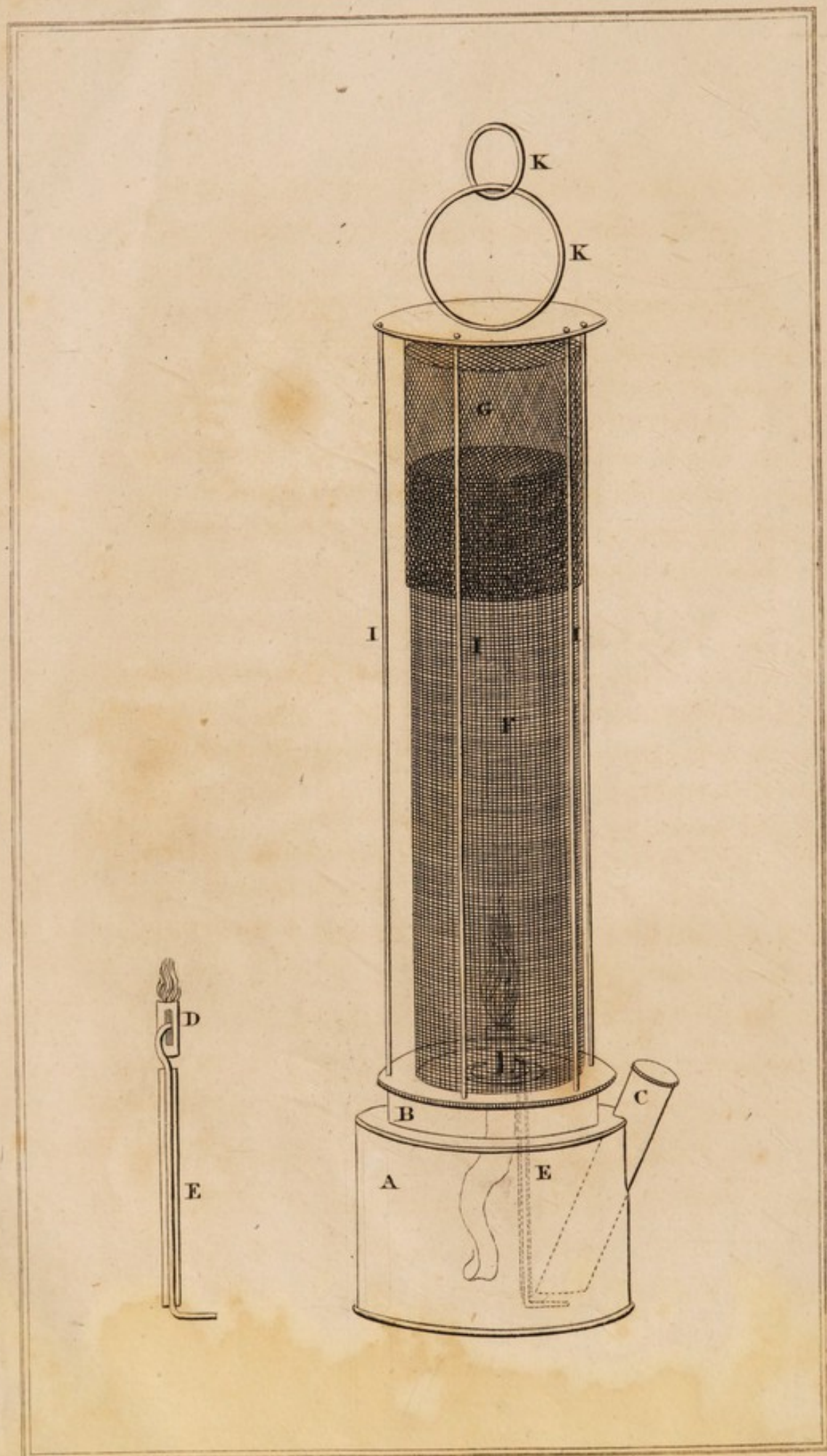








PLATE 4.





*Plate 4, represents Sir Humphrey Davy's Lamp.*

Fig. 1. represents a wire gauze safe-lamp of exactly half the length and breadth of a working lamp.

A. the cistern which contains the oil.

B. the rim in which the wire gauze cover is fixed, and which is fastened to the cistern by a moveable screw.

C. an aperture for supplying oil, fitted with a screw or a cork, and which communicates with the bottom of the cistern by a tube.

D. the receptacle for the wick.

E. a wire for raising, lowering, or trimming it, and which passes through a safe tube.

F. the wire gauze cylinder, which should not have less than 625 apertures to the square inch.

G. the second top  $\frac{3}{4}$  of an inch above the first.

H. a copper plate, which may be in contact with the second top.

I. I. I. I. thick wires surrounding the cage to preserve it from being bent.

K. K. are rings to hold or hang it by.



The following dates I have extracted from Mr. Hodgson's letter, and the Newcastle Chronicle :—

On the 15th of October, Sir H. Davy acknowledges the receipt of the fire-damp.

On the 19th, he informs Mr. Hodgson that he had discovered that explosion will not pass through small *tubes*.

On the 25th, he announces the same fact to the Chemical Club of London.

On the 30th, he describes a Lamp on the principle of *tubes* above and below.

On the 9th of November, Sir H. Davy announces his Tube Lamp to the Royal Society ; v. Newcastle Chronicle, Dec. 23d.

The Morning Chronicle of December 18th, announced the application of the wire gauze by Sir H. Davy ; v. Newcastle Chronicle, Dec. 23d.

In a subsequent communication by Sir H. Davy, and dated Newcastle, Sept. 9th, 1816, are the following observations ;—“ whenever  
“ workmen, &c. are exposed to such highly  
“ explosive mixtures, double gauze lamps  
“ should be used, or a Lamp in which the *cir-*  
“ *culatation of air is diminished*, by a tin plate



“ reflector placed in the inside, or a cylinder  
 “ of glass reaching as high as the double wire,  
 “ with an aperture in the inside. Such Lamps,  
 “ likewise, may be more easily cleaned than  
 “ the simple wire gauze Lamp, for the smoke  
 “ may be wiped off in an instant from the tin  
 “ plate or glass.”

To the above facts and dates, I have now only to request the attention of the public, begging them particularly to observe, that without adverting to the time when I first embraced the idea, the principle upon which the Tube Lamp is constructed was published, and a plan of it shewn early in September, and that it was actually burning in the mine on the 21st of October. That Sir Humphrey Davy does not announce his discovery of the fact, that explosion will not pass down *tubes*, till the 19th of October, in a *private* letter to Mr. Hodgson, that my double perforated plate Lamp was certainly ordered some time before the 24th of November, tried in the mine on the 30th of the same month; and that the earliest notice I had of Sir H. Davy having applied wire gauze for the same purpose, was, from the Newcastle Chronicle of the 23d of December.

Upon the important variation recommended



in some cases by Sir H. Davy, in his communication of the 9th of September, 1816, which renders his Lamp the same as mine, both in construction and principle, it is unnecessary for me to dwell. In the judgment that will be pronounced upon this statement, I feel the greatest confidence. This at least, I trust, I shall have credit for, that in this publication I have been actuated solely by a justifiable attention to my own reputation, and a sincere desire to have the truth investigated, and not by any disgraceful feeling of envy at the rewards and honours which have been bestowed upon a gentleman who has directed his talents to the same object, and whose reputation is too well established to be injured by me, even if I had the baseness to attempt it.

I may be permitted to add, that many gentlemen have already publicly declared their opinion in my favour, and I have the authority of one of them, to whom I submitted the above statement, to add, that at the first meeting of the Coal Trade where the subject was mentioned, and some testimony of gratitude proposed to Sir H. Davy, he called upon the friends of that eminent chemist to state in what his Lamp differed from mine in point of principle, which



was not *even* attempted to be done. I understand, at the same meeting, a gentleman, eminent for his success in mechanical pursuits, declared his conviction that a Lamp similar to Sir Humphrey Davy's must have followed mine, had he never directed his attention to the subject. On this strong assertion no comment was made, and the result was, a vote to me of 100 guineas.

The refusal of two subsequent meetings summoned for the purpose of bestowing some mark of approbation on Sir H. Davy, to enter upon an investigation of dates and facts, was justified by many gentlemen on the ground that they did not meet for that purpose, but merely to testify their approbation of a gentleman whose exertions in this interesting pursuit had been attended with considerable success: of such a determination, what right had I to complain? But when at the second meeting, the expression of "*the* invention of *his* Safety Lamp" was altered to "*his* invention of *the* Safety Lamp," I felt myself called upon to assert my claims; and, I trust I have now done it in a way not to offend any man of liberal feelings, particularly those to whom I already feel myself so much indebted, and who, declining the



unpleasant task of weighing the comparative merit of competitors in the field of science, generously resolved to reward each individual who had exerted his talents in their service.

Mr. Humphry Davy's name had followed mine, and he never directed his attention to the subject. On the strong opinion no comment was made, and the result was a vote to the £100 guinea. The result of two subsequent meetings announced for the purpose of bestowing some mark of approbation on Sir H. Davy, to enter upon an investigation of gases and acids, was justified by many gentlemen on the ground that they did not meet for that purpose, but merely to testify their appreciation of a gentleman whose exertions in the scientific pursuit had been attended with considerable success; of such a determination, what right had I to complain? But when at the second meeting, the expression of "the invention of the Safety Lamp" was altered to "the invention of the Safety Lamp," I felt myself called upon to assert my claims; and I trust I have now done it in a way not to offend any man of liberal feelings, particularly those to whom I already feel myself so much indebted, and who, declining the







