



XXV. On the instantaneous production of fire, by the mere compression of atmospheric air

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To cite this article: Frederick Accum M.R.I.A. (1808) XXV. On the instantaneous production of fire, by the mere compression of atmospheric air , Philosophical Magazine Series 1, 31:122, 130-133, DOI: [10.1080/14786440808563868](https://doi.org/10.1080/14786440808563868)

To link to this article: <http://dx.doi.org/10.1080/14786440808563868>



Published online: 18 May 2009.



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will appear as distinct when seen together, through this small aperture, as when they are viewed separately by the naked eye.

Experiment II.—A piece of wire being placed in a line between a remote object and my eye, at the distance of two feet from it, these two objects appeared *more distinct* when seen together through an aperture of $\frac{1}{37}$ of an inch in diameter, than when they were viewed separately by the naked eye.

It is evident that no change took place in the humours of the eye, in these experiments, neither in the convexity of the crystalline lens, nor in its distance from the retina; consequently that hypothesis which is built upon a supposition that the crystalline approaches to, or recedes from, the retina, by the contraction and dilatation of the ciliary processes, must be erroneous. For it is absurd to suppose that the crystalline lens can be at different distances from the retina at the same time; and it is equally as absurd to assert, that the crystalline lens can, at the same time, have different degrees of convexity.

I am, sir, your obedient servant,

Lynn,
June 17, 1808.

EZ. WALKER.

XXV. *On the instantaneous Production of Fire, by the mere Compression of Atmospheric Air.* By FREDERICK ACCUM, M.R.I.A., Operative Chemist, Lecturer on Practical Chemistry and on Mineralogy and Pharmacy, &c.

IN the ninth volume of the Philosophical Magazine, p. 363, professor Pictet communicates the accension of combustible substances by the rapid compression of atmospheric air. The discovery of this curious fact is due to Mollet, as appears from the *Journal de Physique* for Messidor, An. XII. It is there stated, that if the air be very suddenly compressed in the ball of an air-gun, the quantity of caloric liberated by the first stroke of the piston is sufficient to set fire to a piece

piece of *amadou** placed within the canal of the pump. And if the instrument be furnished by a lens firmly secured, a vivid flash of light is said to be perceived at the instant of this condensation. The evolution of light seems to have been first noticed by a workman employed in the manufacture of arms at St. Etienne, who discharged an air gun highly loaded, observed a vivid flash at the orifice of the barrel.

These curious discoveries of the foreign philosopher have lately been applied to practical utility in this country. Ingenious workmen have shown, that for the accension of combustible bodies by compressed air, the air gun is by no means necessary, but that the experiment may be performed, and even with more ease, by means of a common condensing syringe of good workmanship. The number of instruments of that kind which have been called for at my laboratory, and with which the scientific public has been supplied, gives me reason to think, that men of science deem this simple apparatus worthy of notice. The instrument I have furnished consists of a common syringe, as usually sold, about ten inches long, and not more than $\frac{3}{8}$ of internal bore. At the lower extremity it is furnished with a cap, which serves as a chamber to receive the substance intended to be fired, and which cap is attached to the instrument by a male and female screw, or instead of this cap a common stopcock may be used; the former contrivance, however, is more elegant, more durable, and less expensive.

To use this instrument the cap is unscrewed, or the stopcock turned, a small piece of *amadou* or common tinder is placed in the chamber, and the cap screwed on again. If the piston of the instrument be now depressed with as quick a motion as possible, the condensation of the air is so active as to set the *amadou* on fire.

From the result of a few experiments which I have made

* The name *amadou* is given to a kind of tinder which is imported from Germany. It is made of a large fungus, which grows on old trees, especially on the oak, ash, and fir. This substance, being first boiled in common water, and afterwards dried and well beaten with a mallet, is then soaked in a solution of saltpetre, and again put to dry in an oven.

with this instrument, I am induced to believe, that the accension of the combustible bodies which is effected in the manner stated, is not simply owing to the mere instantaneous condensation of the air which takes place in the syringe, and subsequent liberation of caloric, as stated by the continental philosophers; but that, on the contrary, it appears to be owing to the intense and rapid mechanical motion, vibration, or friction, produced in the particles of the body, placed in the chamber of the instrument against each other by the rapid current produced. For it was found that only such bodies as are exceedingly porous, or are made up of a multitude of minute fibres, could be set on fire by means of this instrument; and that the accension of compact combustible substances, or bodies of a different texture, when attempted, always failed: Hence phosphorus, phosphuret of sulphur, camphor, ether, naphtha, fulminating gold, fulminating mercury, and other inflammable substances, which so readily take fire, cannot be inflamed, nor can the thinnest piece of foil, made of the fusible alloy which liquefies in boiling water, be melted by the current of compressed air thus effected. The case is otherwise when a porous or fibrous inflammable body is suddenly struck upon: a piece of common tinder, a piece of amadou, very dry tow, rolled up in a coil, common touch-wood, and the scrapings of dry paper, or linen rag, are instantly inflamed by a stream of condensed air. Hence it appears, that the accension of these bodies is not solely owing to the mere disengagement of caloric, of which the air is deprived when its volume is suddenly contracted. Biot has, indeed, announced in the *Magas. Encyclop.* for April 1805, that the effect of a very instantaneous compression of oxygen and hydrogen gases might be substituted for the electric spark, in the performance of the famous experiment elucidating the production of water. He states, that having introduced into an air gun a mixture of the two gases, and having given a sudden stroke to the piston, a vivid light accompanied with a violent detonation took place, indicating the combination of the bases of the two gases. This important experiment, which no doubt will be repeated by others, stands, nevertheless, unconnected with what has been advanced.

advanced. And although the performance of the instrument I have described is absolutely harmless, when applied for the purpose it is intended, the experiment of Biot requires nevertheless precaution, to prevent dangers to which those who make it are exposed.

XXVI. *Some Hints respecting the proper Modè of inuring Tender Plants to our Climate. By the Right Hon. Sir JOSEPH BANKS, Bart. K.B.P.R.S. &c.**

RESPECTABLE and useful as every branch of the horticultural art certainly is, no one is more interesting to the public, or more likely to prove advantageous to those who may be so fortunate as to succeed in it, than that of inuring plants, natives of warmer climates, to bear, without covering, the ungenial springs, the chilly summers, and the rigorous winters, by which, especially for some years past, we have been perpetually visited.

Many attempts have been made in this line, and several valuable shrubs, that used to be kept in our stoves, are now to be seen in the open garden: there is, however, some reason to believe, that every one of these was originally the native of a cold climate, though introduced to us through the medium of a warm one; as the gold tree, *aucuba japonica*, the moutan, *pæonia frutescens*, and several others have been in our times.

In the case of annuals, however, it is probable that much has been done by our ancestors, and something by the present generation; but it must be remembered, that all that is required in the case of an annual, is to enable it to ripen its fruit in a comparatively cold summer, after which, we know that the hardest frost has no power to injure the seed, though exposed in the open air to its severest influence; but a perennial has to encounter frosts with its buds and annual shoots, that have sometimes been so severe with us as to rend asunder the trunks of our indigenous forest trees †.

* From Transactions of the Horticultural Society of London, vol. i. part i.

† See Miller's Dictionary, article *Frost*.