



XXXVI. Memoir on the supply and application of the blowpipe

Mr. Robert Hare jun.

To cite this article: Mr. Robert Hare jun. (1802) XXXVI. Memoir on the supply and application of the blowpipe , Philosophical Magazine Series 1, 14:55, 238-245, DOI: [10.1080/14786440208676189](https://doi.org/10.1080/14786440208676189)

To link to this article: <http://dx.doi.org/10.1080/14786440208676189>



Published online: 18 May 2009.



Submit your article to this journal [↗](#)



Article views: 4



View related articles [↗](#)

XXXVI. *Memoir on the Supply and Application of the Blow-pipe.* By Mr. ROBERT HARE jun. Member of the *Chemical Society of Philadelphia* *.

THE blow-pipe is, on many occasions, an useful instrument to the artist and philosopher. By the former it is used, for the purpose of enamelling, to soften or folder small pieces of metal, and for the fabrication of glass instruments: while the latter can, by means of it, in a few minutes, subject small portions of any substance to intense heat; and is thereby enabled to judge of the advantage to be gained, and the method to be pursued, in operations on a larger scale. The celebrated Bergman has amply displayed the utility of this instrument in docimastic operations; and with the perfection of the docimastic art the improvement of metallurgy is intimately connected. It is by means of the blow-pipe that glass tubes are most conveniently exposed to the heat necessary to mould them into the many forms occasionally required for philosophical purposes; and by the various application of tubes thus moulded, ingenuity is often enabled to surmount the want of apparatus, which is the greatest obstacle to the attainment of skill in experimental philosophy.

To all the purposes which I have mentioned the blow-pipe is fully adequate, when properly supplied with air, and applied to a proper flame: but it appears that the means which have hitherto been employed to accomplish those ends are all faulty.

The most general method is that of supplying this instrument with the breath. In addition to the well-known difficulty of keeping up a constant emission of air during respiration, and its injurious effect on the lungs †; it may be remarked, that as the breath is deprived of part of its pure air, is mixed with carbonic acid gas, and loaded with moisture, it is not the most fit for combustion; and the obvious impossibility of supporting a flame with oxygen gas, by this method, is also worthy of consideration.

Another way of supplying the blow-pipe with air, is that of affixing to it a small pair of double bellows. A contrivance of this kind possesses obvious advantages over the mouth blow-pipe; but, owing to the perversity nature of the materials of which bellows are constructed, and the difficulty of

* Published by order of the Society.

† In consequence of this, some artists have abandoned the use of the instrument.

making their valves air-tight, upwards of nine-tenths of the air drawn into them escapes at other places than the proper aperture. A pair of bellows of this kind, belonging to an artist of this city, which were considered as unusually air-tight, were found to discharge the complement of their upper compartment in six-fourths of a minute, when the orifice of the pipe was open; and in seven-fourths of a minute when it was closed. Hence it appears, that six-sevenths of the air injected into the upper compartment escaped at other places than the proper aperture; and if to this loss were added that sustained by the lower compartment, the waste would be found much greater. As in operating with these machines, it is necessary constantly to move the foot, the operator cannot leave his seat; and, in nice operations, the motion of his body is an inconvenience, if not a source of failure. Bellows of this kind cannot be used for supplying combustion with oxygen gas; because, as this air is only to be obtained by a chemical process, the smallest waste of it is of serious consequence; and as there is always a portion of air remaining in them, even when the boards are pressed as near to each other as the folding of the leather will permit, any small quantity of oxygen gas which might be drawn into them would be thereby contaminated.

It seems that the only instrument hitherto used for the supply of combustion with oxygen gas, is the gasometer of the celebrated Lavoisier: but this machine, although admirably calculated for the purposes of that great philosopher, is too unwieldy and expensive for ordinary uses.

Being sensible of the advantage which would result from the invention of a more perfect method of supplying the blow-pipe with pure or atmospheric air, I was induced to search for means of accomplishing this object. Having observed the cheapness, strength, and tightness, of coopers' vessels, I became desirous of forming an apparatus for my purpose, by means of hydrostatic pressure exerted within them. I soon found that this could not be effected conveniently without the use of leather. Obligated to resort for assistance to this material, I endeavoured to apply it in such manner, as to remedy the evils resulting from the use of it in the common kinds of bellows. The causes of these evils appeared to be, the opening of the pores and joints of these instruments by dryness, and the tension to which they are so frequently subjected. I therefore determined to subject the leather which I should use, to moisture and compression. In this I succeeded, and derived the expected advantage from success. The result of
my

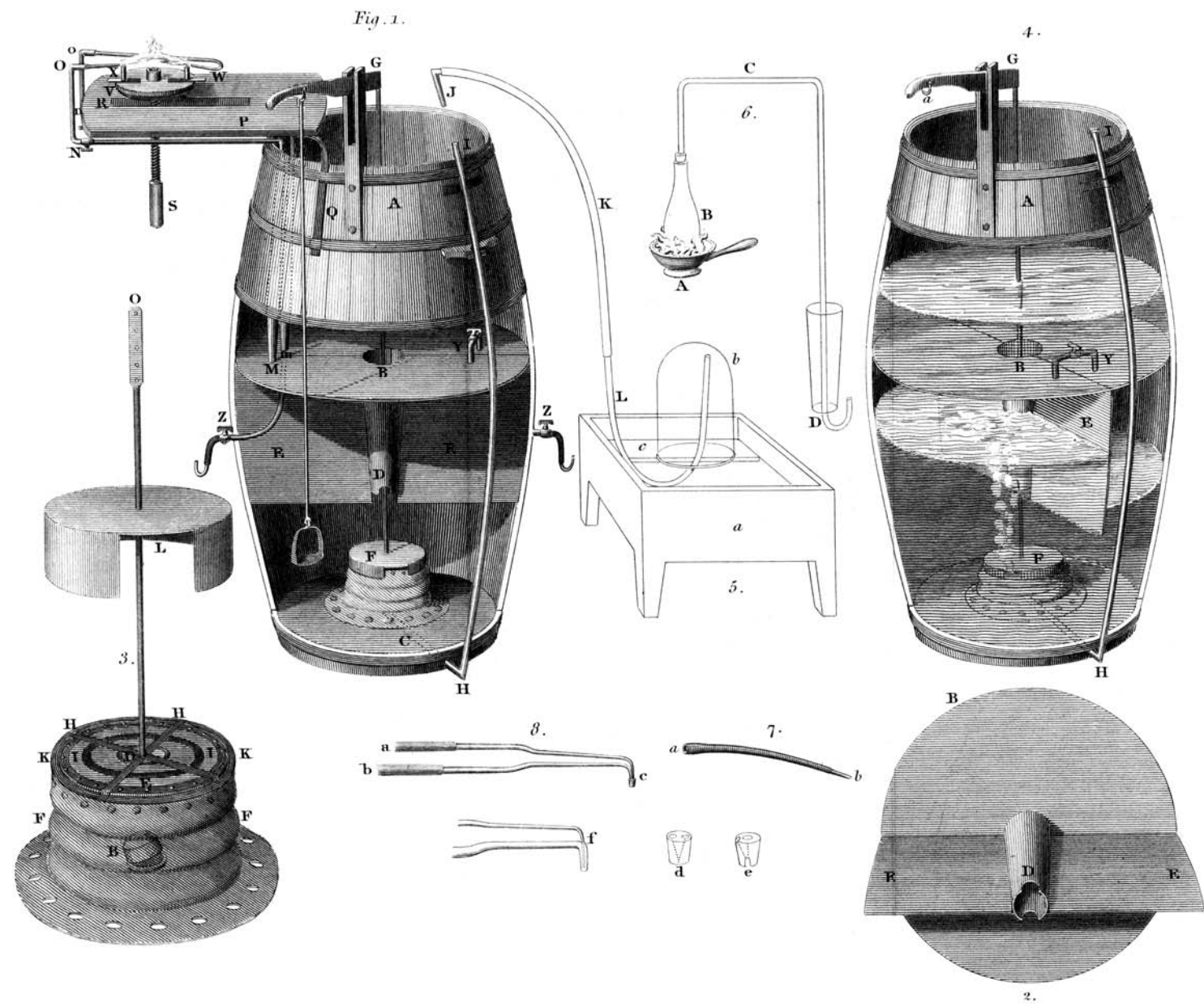
my attention to this subject is the production of a machine, of which there follows an engraving and description.

When it was first shown to the gentlemen of the Chemical Society, some of them bestowed on it the appellation of *gasometer*; but, as etymology does not authorize this name, it has been changed for that of *hydrostatic blow-pipe*.

Fig. 1. (see plate VI.) is a perspective engraving of the hydrostatic blow-pipe. Part of this figure is made transparent, that the internal construction of the machine may be understood with the greater facility.

It consists of a cask A, whose length is thirty-two, and whose least diameter is eighteen inches. It is divided, by the partition B, into two apartments. The upper and external apartment BA, is in depth fourteen inches. The lower and internal apartment BC, is in depth sixteen inches; and contains a sheet and pipe of copper EE, D, which descend into it nine inches, forming two equal compartments of that depth. The sheet and pipe of copper are folded together and inserted into the partition B, as may be observed at fig. 2; where B represents the partition, EE the sheet of copper, and D the pipe. The edges EE of the sheet were slid down into corresponding joints in the staves of the cask until the partition attained its proper situation. Coopers' flags were then passed into the joints; and the hoops were driven on the cask.

CF, fig. 1. is a pair of circular bellows. The bottom of the cask serves as a bottom for these bellows. In the centre of this bottom there is a hole, round which, at the distance of one inch from its centre, is a circular rim of wood. On this is nailed a valve opening upwards, which may be observed at B, fig. 3, where there is a transparent engraving of the bellows. Under the valve B may be observed the hole, and circular rim of wood, over which it is nailed. C the top of the bellows, is a circular piece of wood, seven inches in diameter and two in thickness. In its centre there is a hole one inch and a half in diameter. Around this hole there is a circular rabbet, in which is nailed a valve, opening upwards. This valve, and the rabbet in which it is fastened, may be seen under the letter D, at the end of the rod. There is also in this top, at the distance of one inch from its perimeter, a circular dove-tailed furrow filled with lead, E. The body of the bellows FF, is composed of strong horse-leather so as to be water-tight. Before it was fixed to the other parts of the bellows its form was that of a hollow frustum of a cone, of which the perpendicular and greatest diameter were each



each eight inches, and whose least diameter was six inches and a half. It was more easily fastened to its appendages when of this conical form than if it had been cylindrical. At the protuberances FF, it is distended by two iron rings, to which it is sewed fast.

FG, fig. 1, is an iron rod, by means of which the top of the bellows may be raised or depressed. It passes up through the pipe D to the handle G, which is worked by the hand or with the foot by means of the pendent stirrup. An enlarged view of this rod, and of the contrivance by which it is annexed to the top, may be seen at fig. 3; where GD represents the rod, and H, H, H, H, flat pieces of iron branching from it. These are fixed to the circular rim KK in such a manner as to include the rim II, of the same metal, which is screwed fast to the top of the bellows. Sufficient room is left to allow the pieces H, H, H, H, and the rim KK, to move round without rubbing against the included rim II, or the top of the bellows.

A copper hood, with an opening in one side, may be observed at L, fig. 3. The rod GD is passed through the centre of this hood, until the flat pieces of iron H, H, H, H, come in contact with the flat part of it. The hole in the centre is then luted. The hood may be seen in its proper situation, at F, fig. 1.

HI, fig. 1, is a suction-pipe half an inch in diameter. It passes under the cask in the direction of the dotted lines at C, and turns up into the hole in the bottom of the bellows. This hole, which is of such a size as to fit the tapering end of the pipe, is seen at fig. 3, and has already been mentioned, together with a circular rim of wood, which, being nailed round it, prevents the end of the pipe from touching the valve. The suction-pipe has a conical mouth at I, into which is inserted occasionally the pipe J, fastened to the hose and syphon K, L. The hose is made of leather, distended by hollow cylinders of tin half an inch in diameter and one inch in length. These were coated with tar, after which the leather was sewed over them *.

Fig. 1, MNO, m n o, are pipes of delivery, furnished with cocks at N, n, and conical mouths at O, o. Each of these pipes communicates with one of the compartments on each side of the sheet and pipe EE, D.

In the partition B, may be observed the pipe Y, furnished

* This hose may be made very perfect by tarring, and covering it with leather a second time; the seams of the first and second coverings being placed on opposite sides. Flexible pipes thus prepared will be found useful for many other purposes besides that here mentioned.

with a cock. Each end of this pipe communicates with one of the compartments above mentioned.

P is a table affixed to the cask by means of irons, which are at pleasure slid into or out of staples. One of these irons, and its staples, may be seen near the letter Q. They are fastened to pieces of wood which run lengthwise under the table, and which are so grooved as to support a block of wood which slides between them. Through this block passes the screw S, which slides backward and forward in the opening TRV. The stand TV, which may be observed under the lamp, is loosely put on this screw, as a wheel is placed on its axletree. It rises and falls with the screw; but is prevented from turning round with it, by the upright strip of wood T.

Having described the construction of the hydrostatic blow-pipe, I proceed to an explanation of the principle and manner of its action, and to a detail of the uses to which it may be applied.

Suppose that as much water were poured into the cask A, fig. 1, as would fill the lower apartment, and rise above the partition B, one or two inches. Let fig. 4 be a representation of the cask when supplied with this necessary quantity of water. When the machine is at rest, the top of the bellows, being loaded with lead, is depressed as low as the folding of the leather will permit, and the small space which remains in consequence of this folding, between the top of the bellows and the bottom of the cask, becomes filled with water, which leaks through the upper valve. Let the bellows be extended by depressing the handle at *a*. The upper valve will shut tight; and a quantity of water equal to the bulk, which the bellows will gain by extension, will rise through the pipe D, to the external apartment; and the weight of the atmosphere being removed from the top of the valve in the bottom of the cask, the air will pass through the suction-pipe I H, lift this valve, and occupy the vacant space within the bellows. If the hand be then removed from the handle, the lead in the top of the bellows will again depress it, and the air drawn into them, being thereby compressed, will force open the upper valve, and ascend. During its ascent it will receive a strong lateral tendency from the hood, which will make it pass out at the open side of the hood, into that compartment which is immediately over this opening; and as by turning the rod, this part of the hood may be brought under either compartment, so the air may be thrown into either of them; and one of them being filled with one species of gas, the other may be filled with another species: nor can there be any danger of mixture; because, as the pipe D is shorter
than

than the sheet E E, any superabundant quantity of air which may be thrown into either compartment will pass up the pipe and escape.

In fig. 4, the bellows are represented as nearly depressed, and the air issuing from the open side of the hood into the compartment immediately over it, which is about half filled with air. The other compartment is represented as being completely full of that fluid. The water is represented in commotion, that the action of the machine may be strongly marked; but the motion of this fluid is in reality so gentle, that the regularity of a blast is not thereby perceptibly affected.

If it be desired to fill both compartments with one kind of air, without the trouble of turning the hood, by opening the cock of communication in the pipe Y, any air which may be thrown into either compartment will divide itself equally between both of them.

It must be obvious that the air in the compartments on each side of the sheet and pipe of copper E E, D, fig. 4, is subject to hydrostatic pressure, and that of course it will pass out at the pipes of delivery, unless stopt by the cocks. These pipes are omitted in fig. 4, but have been already described, together with their cocks, at M N O, m n o, fig. 1.

The leather and joints of the bellows are evidently subjected to the weight of a considerable column of water; but this pressure, being external, tends to tighten them, and renders this part of the machine so perfect, that if the orifice of the suction-pipe be closed, it will be found impossible to raise the top of the bellows, without the immense force which would be necessary to produce a vacuum within them. This would not be the case if the smallest leakage took place.

It is now time to give an account of the purposes to which the hydrostatic blow-pipe may be applied, and the manner of applying it to them.

This instrument may be employed to supply with atmospheric air a small flame for the various purposes of the mouth blow-pipe. To effect this, it is only necessary to place a lamp or candle on the stand TV, which is upheld by the screw S, fig. 1. By raising or lowering this screw, or by sliding backward or forward the block through which it passes, the stand may be so adjusted, as that the straight mouth-piece X will just enter the flame. The handle must then be worked until the blast obtains the proper strength. This generally happens when the water has risen above the partition B three or four inches. If it should be raised higher,

244 *On the Supply and Application of the Blow-pipe.*

the blast may be regulated by turning the cock more or less at N.

When an operation is to be performed on a subject which cannot be held over the table; by fixing the small hose and blow-pipe a b, fig. 7, into one of the conical mouths O, o, of the pipes of delivery, and, by placing a lamp or candle on the edge of the table, an operator may, with the subject in his hand, expose the proper spot to the flame. In this way glass matraffes filled with liquors have been hermetically sealed.

Nothing can be more steady than the stream of air emitted by this instrument. The falling off in pressure, arising from the descent of the water, does not perceptibly affect the flame in a blast of six minutes duration; and, in the mean time, the hand e may be depressed so gently, that the most strict observation will not discover the least unsteadiness to be produced by it. Or, if the machine be filled with air, by opening the cock more or less, an equable blast may be supported for more than the space of an hour.

In order to supply the enamellers' lamp with air by means of the hydrostatic blow-pipe, it is only necessary to substitute this instrument for the bellows commonly used for this purpose. There will then be nothing novel in the manner of operating, excepting, 1st, That the relative situation of the flame and the pipe is to be regulated by turning the screw S, or by sliding backward or forward the block through which it passes; and, 2dly, That in lieu of the frequent movement of the foot, necessary with the common bellows, in the space of one minute, and with fifteen strokes of the handle, as much air may be drawn into the hydrostatic blow-pipe as will blow for one hour; and as the cask and pipes are completely air-tight, the blast may be stopped, or its strength increased or diminished at pleasure, by turning more or less the cock of the pipe delivering the air.

The flame of the enamellers' lamp is not used exclusively for the purposes of the artist from whom it takes its name. It is this modification of the principle of the blow-pipe which is applied to the moulding of glass instruments. But in heating glass with this flame, an inconvenience arises from the impossibility of exposing both sides of any subject to the same heat, unless it be constantly turned round; for, if only one side of a large glass tube be applied to the flame, the part exposed to its action will be fused before the other will be softened, and if it be turned round constantly a much longer time will be required to melt it. Indeed some large tubes of refractory

refractory glass, which are not to be melted while undergoing this rotatory motion, may be readily fused in any spot constantly exposed to the action of the flame.

In order to produce a flame which should be free from the inconveniences just described, I procured the oblong lamp with two wicks W, X, Fig. 1. It may be observed, that these wicks are fixed on two plates, which slide in a groove, in the direction of the length of the lamp. They may therefore be made to approach to, or recede from each other. This lamp being as represented in the engraving placed on the little stand T V, so as that one of the wicks was before the orifice of the straight mouth-piece, above X; the bent blow-pipe at W was so adjusted to the other wick, that when they were both lighted, and a blast passed over them, their flames met each other as represented in the plate. The result of this was, that a much larger tube could be fused by the united action of two flames, than could be melted with one of them; and the parts being more equally heated, a bend could be made more regularly, and with less danger of collapsing.

It may be proper to observe that the machine represented in the plate is much more complex and expensive, than is requisite for the purposes of the mouth blow-pipe, or enamellers' lamp, simply. But it is expected that artists, availing themselves of the principles of the machine, will reject those appurtenances which are unnecessary to their peculiar purposes*.

[To be continued.]

XXXVII. *Memoir on the Fabrication of Charcoal in the Forest de Benon, near Rochelle. Addressed to the French Council of Mines, Novre 30, Year 10. By C. FIEURIAU-BELLEVUE* †.

FUEL of every kind is so scarce in the neighbourhood of Rochelle, that there are few manufactories in that quarter, and none of those which consume a large quantity of that article can be established. Wood is sold exceedingly dear, and there is scarcely a quantity sufficient for distilling the wines of the country.

* The cost of the machine represented in the plate was about twenty dollars; but a machine fully equal to the purposes of the mouth blow-pipe, or enamellers' lamp, may be made for one fifth of that sum.

† From the *Journal des Mines*, No. 65.