



### BREWSTER'S SPECIFICATION

TO ALL WHOM THESE PRESENTS SHALL COME, I, David Brewster, of Edinburgh, Doctor of Laws, send greeting.

WHEREAS His present most Excellent Majesty King George the Third did by His Royal Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Tenth day of July, in the fifty-seventh year of His reign, give and grant unto me, the said David Brewster, my executors, administrators, and assigns, His especial full power, sole privilege and authority, that I, the said David Brewster, my executors, administrators, and assigns, during the term of years therein expressed, should and lawfully might make, use, exercise, and vend my NEW OPTICAL INSTRUMENT CALLED THE KALEIDOSCOPE FOR EXHIBITING AND TREATING BEAUTIFUL FORMS AND PATTERNS, OR GREAT USE IN ALL THE ORNAMENTAL ARTS within England, Wales, and the Town of Berwick-upon-Tweed, in such manner as to me, the said David Brewster, my executors, administrators, and assigns should in our discretion seem meet; in which said Letters Patent is certified a proviso that if I, the said David Brewster, should not particularly describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be enrolled in His Majesty's High Court of Chancery within two calendar months next and immediately after the date of the said Letters Patent, that then the said Letters Patent, and all liberties and advantages whatsoever thereby granted, should utterly cease, determine, and become void, as in and by the said recited Letters Patent, relation being there unto had, may more fully and at large appear.

The kaleidoscope (from *καλός*, beautiful; *εἶδος*, a form; and *σχοπεω*, to see) is an instrument for creating and exhibiting an infinite variety of beautiful forms, and is constructed in such a manner as either to please the eye by an ever-varying succession of splendid tints and symmetrical forms, or to enable the observer to render permanent such as may appear most appropriate for any of the numerous branches of the ornamental arts. This instrument in its most common form consists of two reflecting surfaces inclined to each other at any angle, but more properly at an angle which is an aliquot part of  $360^\circ$ . The reflecting surfaces may be two plates of glass plain or quicksilvered, or two metallic surfaces, or the two inner surfaces of a solid prism of glass or rock chrysal, from which the light suffers total reflection. The plates should vary in length according to the focal distance of the eye; 5, 6, 7, 8, 9, and 10 inches will in general be most convenient; or they may be made only 1, 2, 3, or 4 inches long, provided distinct vision is obtained at one end by placing at the other end an eye glass whose focal length is equal to the length of the reflecting planes. The inclination of the reflectors that is in general most pleasing is  $18^\circ$ ,  $20^\circ$ , or  $22\frac{1}{2}^\circ$ , or the 20th, 18th, and 16th part of a circle; but the planes may be set

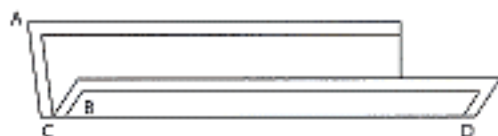


Figure 1

at any required angle either by a metallic, a paper, or cloth joint, or any other simple contrivance. When the two planes are put together with their straightest and smoothest edges in contact, they will have form shewn in Figure 1, where A, B, C, is the aperture or angle formed by the plates. In

this Figure the plates are rectangular, but it may often be more convenient to give them the triangular form shewn at M, Fig. 2, or N, Fig. 3.

When the instrument is thus constructed, it may be either covered up with paper or leather or placed in a cylindrical or any other tube, so that the aperture A, B, C may be left completely open, and also a small aperture at the angular point D. If the eye is now placed at D, and looks thro' the aperture A, B, C, it will perceive a brilliant circle of light, divided into as many sectors as the number of times that the angle of the reflector is contained in  $360^\circ$ . If this angle is  $18^\circ$  the number of sectors will be 20; and whatever be the form of the aperture A, B, C, the luminous space seen thro' the instrument will be a figure produced by the arrangement of 20 of these apertures round C as a centre, in consequence of the successive reflexions between the polished surfaces. Hence, it follows, that if any object, however ugly or irregular in itself, is placed before the aperture A, B, C, the part of it that can be seen through the aperture will be seen also in every sector, and every image of the object will be seen also in every sector, and every image of the object will coalesce into a form mathematically symmetrical and highly pleasing to the eye. If the object is put in motion, the combination of images will likewise be put in motion, and new forms, perfectly different but equally symmetrical, will successively present themselves, sometimes vanishing in the centre, sometimes emerging from it, and sometimes playing around in double and opposite oscillations. When the object is tinged with different colours, the most beautiful tints are developed in succession, and the whole figure delights the eye by the perfection of its forms and the brilliancy of its colouring. The motion of the object may be affected either by the hand or by a simple piece of mechanism, or the same effect may be produced by the motion of the instrument over the object or round its own axis. In the form of the kaleidoscope now described the object should be held close to the aperture A, B, C, and the eye should be placed as nearly as possible in the line C, D, for the figure loses its symmetry in proportion as the object recedes from A, B, C, and as the eye rises above D. The instrument is therefore limited in its present form to the use of objects which can be held close to the aperture. In order to remove the limitation, the tube which contains the reflectors should slide in another tube of nearly the same length, and having a convex lens at its further extremity; the focal length of the lens should be always less than its greatest distance from the aperture A, B, C. In general it should be about  $\frac{1}{3}$  or  $\frac{1}{4}$  of that distance, but it will be advisable to have two or even three lenses of different focal lengths to fit into the end of the outer tube, and to be used as circumstance may require, or a variation of focal length may be produced by the separation or approach of two lenses. When the instrument is thus fitted up it may be applied to objects at all distances, and these objects, whose images are formed in an inverted position at the aperture A, B, C, may be introduced into the symmetrical picture in the very same manner as if they were brought close to the instrument. Hence, we can introduce trees, flowers, statues, and living animals, and any object which is too large to be comprehended by the aperture A, B, C, may be removed to such a distance that its image is sufficiently reduced. The kaleidoscope is also constructed with three or more reflecting planes, which may be arranged in various ways. The tints placed before the aperture may be the complementary colors produced by transmitting polarised light thro' regularly crystallized bodies or pieces of glass that have received the polarising structure. The partial polarisation of the light by successive reflexions occasions a partial analysis of the transmitted light; but in order to develop the tints with brilliancy, the analysis of the light must precede its admission into the aperture. Instead of looking thro' the extremity D of the tube, the effects which have been described may be exhibited to many persons at once, upon the principle of the solar microscope or magic lantern, and in this way, or by the application of the camera lucida, the figures may be accurately delineated. It would be an endless task to point out the various purposes in the ornamental arts to which the kaleidoscope is applicable. It may be sufficient to state, that it will be of great use for

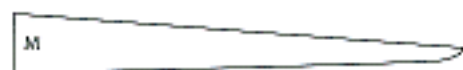


Figure 2

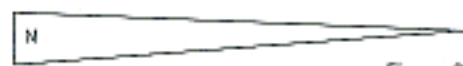


Figure 3

architects, ornamental painters, plasterers, jewelers, carvers and gliders, cabinet makers, wire workers, bookbinders, calico printers, carpet manufacturers, manufacturers of pottery, and every other profession in which ornamental patterns are required. The painter may introduce the very colours which he is to use; the jeweler, the jewels which he is to arrange; and in general, the artist may apply to the instrument the materials which he is to embody, and thus form the most correct opinion of their effect when combined into an ornamental pattern.

When the instrument is thus applied, an infinity of patterns are created, and the artist can select such as he considers most suitable to his work. When a knowledge of the nature and powers of the instrument has been acquired by a little practice, he will be able to give any character to the pattern that he chooses, and he may even create a series of different patterns, all rising out of one another and returning by similar gradations to the first pattern of the series. In all these cases the pattern is perfectly symmetrical round a centre, or all the images of the aperture A, B, C, are exactly alike; but this symmetry may be altered, for after the pattern is drawn it may be reduced into a square, a triangular, an elliptical, or any other form that we please. The instrument will give annular patterns by keeping the reflectors separate as at A, B, Fig. 4, and it will give rectilinear ones by placing the reflectors parallel to each other, as in Fig. 5. The kaleidoscope is also proposed as an instrument of amusement to please the eye by the creation and exhibition of beautiful forms in the same manner as the ear is delighted by the combination of musical sounds. When Custillon proposed the construction of an ocular harpsichord, he was mistaken in supposing that any combination of harmonic colours could afford the pleasure to the person who viewed them, for it is only when these colours are connected with regular and beautiful forms that the eye is gratified by the combination. The kaleidoscope, therefore, seems to realise the idea of an ocular harpsichord.

In witness whereof, I, the said David Brewster, have hereunto set my hand and seal, this Twenty-seventh day of August, in the year of our Lord One thousand eight hundred and seventeen.

DAVID (L.S.) BREWSTER

Signed and sealed by the within-named

David Brewster (being first duly stamped) in the presence of us,

ARCHD MONTGOMERY, Witness, residing at Wherin, Parish of Newlands, and County of Peebles.

ROBT MONTGOMERY, Of Lincoln's Inn, Barrister at Law.

Figure 4

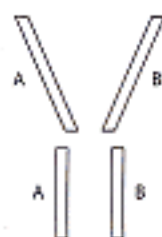


Figure 5