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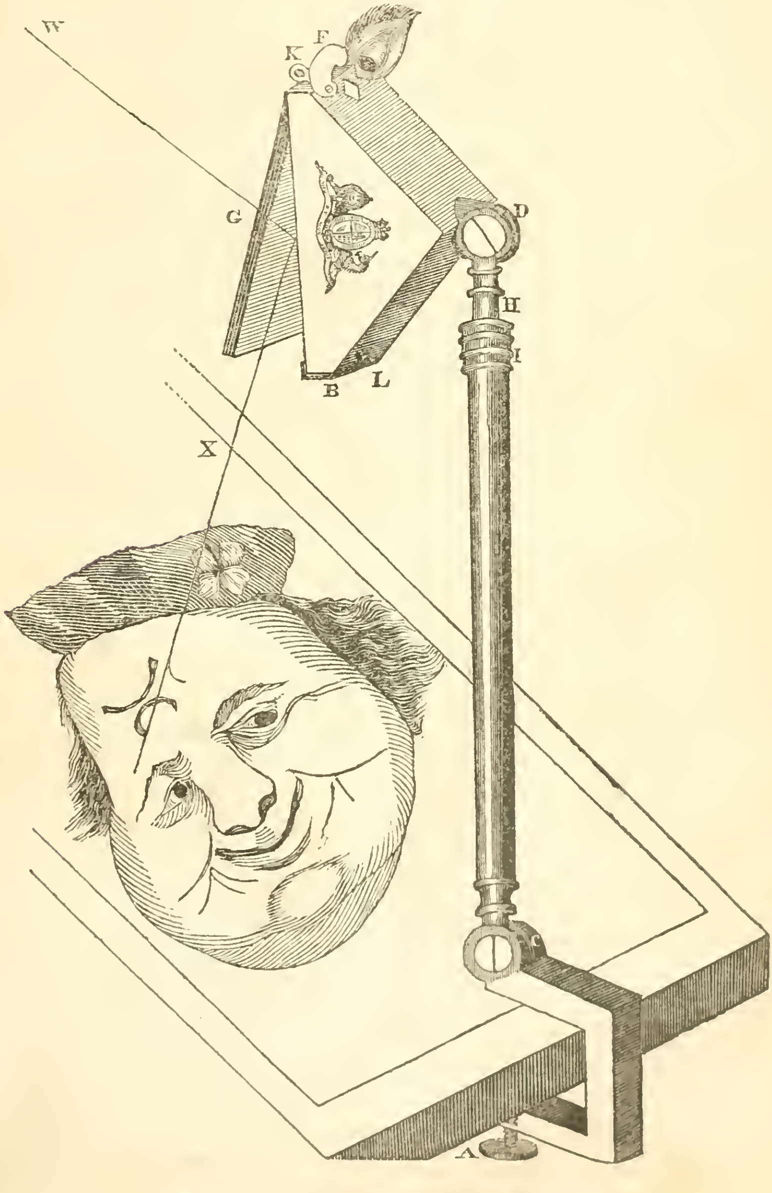
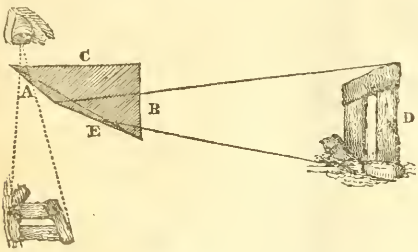


ALEXANDER'S GRAPHIC MIRROR.

WOLLASTON'S CAMERA LUCIDA, AMICI'S DITTO, AND ALEXANDER'S GRAPHIC MIRROR.

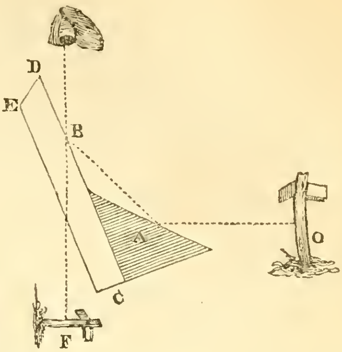
Among the most useful of optical instruments are those which enable persons unacquainted with perspective to take correct views of extended scenes, or of isolated objects, such as the Camera Obscura, (see Nos. 1 and 2 of the "Magazine of Science,") the Camera Lucida, &c. The latter instrument in its different modifications it is our present object to explain.

The Camera Lucida is an invention of Dr. Wollaston, (in 1807.) It is more compact than the Camera Obscura, and adapted to delineate objects in a superior manner, though it must be admitted that the difficulty of using it is extremely great. This arises chiefly from the impossibility of the person using it seeing the point of his pencil and the reflected object at the same time, besides which the stress upon the eye is very injurious, if even moderately long continued. The construction will be seen by the following cut. The general form of it is similar to that of the Graphic Mirror, represented on the foregoing page, to which we shall afterwards refer.



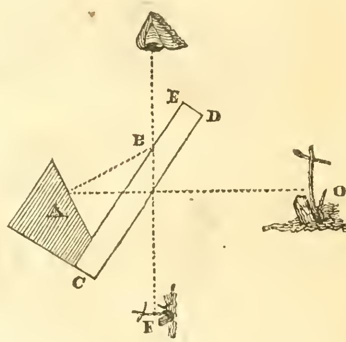
Let the trapezium A B C E represent the end of a prism of glass, having its perpendicular side B presented to some object as D. The rays of light from this object pass through the prism until they are intercepted by the side E, which makes with B an angle of $67\frac{1}{2}^{\circ}$—here being thrown off at a similar angle, they strike the side A, which side makes with E an angle of double this, or 135°. At this place they are again reflected towards the eye, looking at the prism from above. They will therefore be seen at the horizontal surfae C; but this being transparent they will seem seated below it upon the table, or any thing else which may be underneath, their vividness depending, (other things being the same,) upon their nearness or distance from C. The nearer to C of course the more brilliant they will appear. If the eye be thus placed, and so as to look wholly through the prism, it would see the reflected object only, and if a pencil be held ready to trace it, the pencil would be invisible, because the rays of light from the pencil strike the side of the prism at A, and are reflected from it at an angle equal to that of their impingement, therefore never reach the eye at all. In the next case, suppose the eye looked downwards, but without looking through the prism, it would see the pencil, but not the object. The difficulty then lies here, that the eye at the same time must look at two objects, and must be directed so as to look over the edge of the prism, and half through the air alongside of it.

Amici contrived a Camera Lucida, which is a very great improvement upon that of Wollaston: its sectional structure is as follows:—



Suppose A to be a triangular prism of glass, or else a metallic speculum, having its upper side reflective, and connected by one of its other sides to a piece of plate glass D E C. The angle which the reflecting surface makes with the side of the plate glass being 135°. The rays from the object O impinge upon A, are reflected to B, and again to the eye, which looking downwards sees the object at F, through the piece of plate glass D E C. The pencil is also seen through the plate glass, at or near the same point; and as both are seen through the same medium, much less fatigue to the eye, and facility of management is acquired, than by Dr. Wollaston's instrument, where the sight is to be carried through media of such different density as glass and the air.

Another construction, which is also due to Amici, is as follows:—



Let A represent the mirror upon which the light from the object O is reflected. (It is to be observed, that in this instrument, as well as some of the others, the light traverses through the piece of plate glass, yet as the sides of it are exactly parallel, it is not diverted from its course;) and D E C the glass as before. The light passes to the inner side of A, thence to B, and from B to the eye above, which beholds the object at F, seen through the glass as before.

The *Graphic Mirror.*—This instrument is the invention of Mr. Alexander, of Exeter, and appears to be superior to either of the former instruments. The construction of it will be easily understood from the preceding remarks, (see Figure on page 1.)

The upper part of the instrument consists of a triangular box, having a fixed reflecting mirror or looking glass within it, and a transparent plate of glass in the front, and which is capable of adjustment. The rays from the object pass through the glass to the reflector, and upwards to the eye, which sees them by looking through the small square hole at the top, when they appear at X.

The form or general frame-work of all these instruments is similar, and easily understood from the cut. The management of the instrument is best given in the Inventor's own words, especially as they are applicable to all similar contrivances.

"The instrument being fixed by the clamp and screw A to the table and paper on which the drawing is to be made; look through the eye-hole F, having the front of the case B, which contain the glasses opposite the object to be copied, adjusting it by means of the joints C and D, getting the first line perpendicular, the whole of the tracing will prove to be in true perspective.

"If objects can be seen distinctly on the upper part of the paper and not on the lower, incline the case B downwards by the joints C and D, until the reflected image is on the part of the paper required.

"Many persons upon first attempting to use the instrument occasionally lose sight of their object or pencil by an unintentional motion of the eye; to avoid which, contract the eye-hole F, by means of the eye-piece which covers it.

"The greater the distance from the object, and the higher the case containing the glasses is from the drawing paper, the larger the image will be represented, which is obtained by the sliding tube H, and fixed to any point by the tightening screw I: on the contrary, the nearer the object and shorter the instrument, the smaller the drawing. The sliding tube H is divided for the purpose of ascertaining the height of the instrument, should the drawing not be finished at one time.

"Some little attention is necessary to the position for taking profiles, sketching flowers, &c. Darken one half the window to shade the instrument, and place the object on the opposite part of the table in the light, having the table close to the window; the latter always to the right hand, as in the manner usually adopted by artists when taking likenesses.

"The eye-hole F should be kept closed when the instrument is not in use. Shonld the mirror become dull from the damp or dust, remove the bottom B by means of the screw L. Slide the front glass gently downwards for the purpose of cleaning the mirror. Care being taken the instrument will be as perfect as ever."

Should any of our readers not fully understand the above they may see it at Messrs. Ackerman's, in the Strand.

ANIMALCULES, OR MICROSCOPIC AND INFUSORIAL ANIMALS.

Of the multiplicity of objects, which the almost incredible powers of the microscope have brought under our observation and scrutiny, perhaps that class of animated beings denominated animalcules may be considered the most remarkable. The bare knowledge that there are myriads of atoms (and in the scale of living creatures we can call them nothing else) existing in a single drop of water, recreating and executing all their various functions and evolutions with as much rapidity and apparent facility as if the range afforded them were as boundless as the ocean, must carry with it an intensity of interest to the mind of every human being; of every one, at least, who is at all accustomed to meditate on the perfections of nature, and to recognise and adore the hand that guides her through all the vast variety of her stupendous operations.

The term animalcule, which implies nothing more than the *diminutive* of animal, has been commonly used to denote those living creatures inhabiting fluids, which are too minute to be scanned, or even seen by the naked eye: such, for instance, as those produced in inconceivable numbers from infusions of animal and vegetable matter: it comprehends as well such as are found in, and are peculiar to, the bodies of larger animals.

In the variety of systems that have been put forth respecting these extraordinary creatures, the main characteristic of each have referred either is a difference in their size, or to the general appearance of their external forms. Until the introduction of vegetable coloring into the fluid, which supplies them with food,—an experiment that has been attended with very successful results,—these creatures were commonly supposed to be entirely devoid of internal organization, and to be nourished by the simple process of cuticular absorption. By the application of colored substances, which, moreover, have been found to invigorate rather than to depress the animalcule, and to maintain it in the full exercise of all its functions, this erroneous notion is set at rest, and an internal structure is discerned in some, equal, if not surpassing that of many of the larger invertebrated animals, and comprising a muscular, nervous, and, in all probability, vascular system; all wonderfully contrived for the performance of their respective offices.

The most obvious portion of their internal structure is undoubtedly that connected with the digestive functions; and hence it is that Ehrenberg has selected this as the leading feature of his arrangement, denominating his two grand divisions of the Phytozoa, Polygastrica and Rotatoria; the former of which includes such as are possessed of several distinct stomachs or digestive sacs; and the latter such as have true alimentary canals and rotatory organs provided with a number of cilia aptly disposed for promoting the objects of life: these two grand divisions of the Phytozoa are afterwards subdivided into families and other minor branches. The cilia, in their different combinations, supply the means of locomotion, propelling the creature in many cases with great rapidity through the water: they are apparently stiff, like eye-lashes; and from Dr. E.'s description of some of the larger ones, they issue from bulbous substances at their bases, and being acted upon by muscular fibres are capable of being moved to and fro in particular directions, so as to occasion a current of the fluid to flow towards the mouth of the animalcule, by which it is furnished with fresh water, or food. They are sometimes disposed, as before stated, round certain organs of a circular form, which, on account of their peculiar vibrations giving the appearance of a rotatory action, are termed rotatory organs. A second curious feature in the construction of some of these minute creatures are the *setæ*, or bristles, attached to the surface of their bodies: these