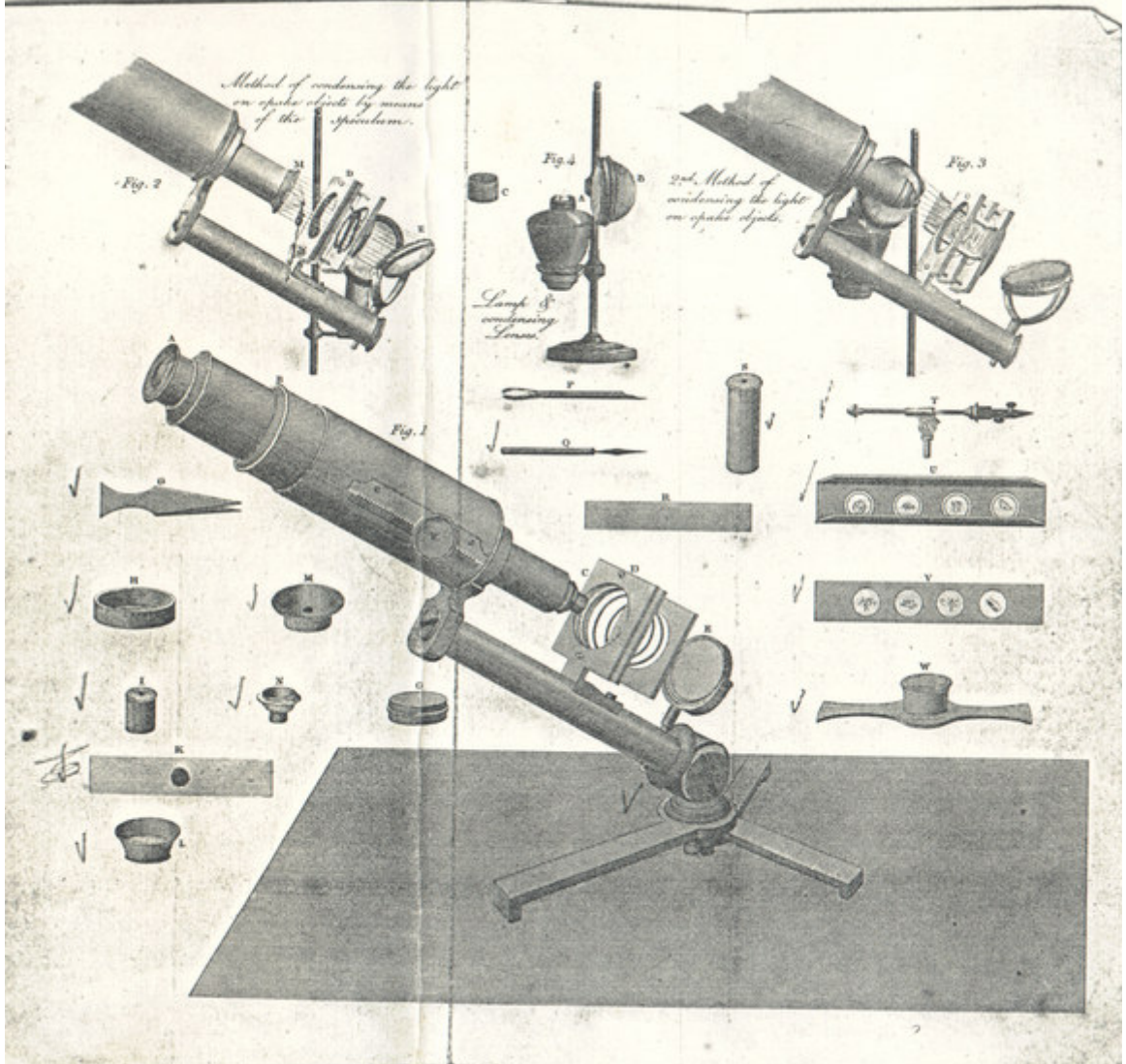
Method of condensing the light on opake objects by means of the Speculum.
Fig. 2
Fig. 4
Lamp & condensing Lenses
2nd. Method of condensing the light on opake objects.
Fig. 3
Fig. 1

A DESCRIPTION OF

# THE NEW IMPROVED

## COMPOUND MICROSCOPE,

FOR

## OPAKE AND TRANSPARENT OBJECTS.

This Microscope is very simple in its construction, and will be found much easier to manage than any other compound Microscope in use. Opake and transparent objects, of any size from $\frac{1}{8}$ of an inch diameter to the most minute animalcule, are seen either by day or night, very brilliant and distinct, in a field of view, nine inches in diameter,* and magnified according to the magnifier used, from 700 to 90,000 times. The apparatus for confining and enlightening the object is very effective, and contrived so as to give as little trouble as possible. The observer can also be seated in the most convenient position, as the Microscope can be inclined to any angle.

* The field of view could have been increased to 12 or 15 inches, but the Microscope would not then have answered so well for Opake objects, which is one of the principal things I had in view, in its construction.

ANIMALCULES are very conveniently examined by putting a drop of the water containing them on the lower glass, and pushing the upper one down gently till the drop is flattened. If it is designed to keep the animalcules some time, put a fragment of bee's wax on the small hole, and the water will not evaporate for several days.

Many transparent objects appear better by candle light than by day light; for most purposes a common candle will be sufficient, but for many, and particularly when the higher powers are used, the illuminating apparatus Fig. 4 should be used.

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## TO EXAMINE OPAKE OBJECTS

### BY DAY LIGHT.

Transparent objects are seen by the light which passes through them, but *Opake Objects* must have the light thrown on the surface; and the more they are enlightened the better they appear. The objects in the wood sliders can be viewed by placing the Microscope so that as much light as possible may fall on them, and using the magnifier numbered 5 or 6. But to view opake objects with higher powers, and indeed to see them to the greatest advantage with No. 5 or 6, an additional quantity of light must be thrown upon them. The only way of effecting this with day light is, to reflect the light from the mirror E to the silver speculum M, which returns it on the object. Fig. 2 represents the Microscope arranged

for this purpose by candle light; but supposing the illuminating apparatus to be removed, the arrangement is the same for day light. It is made as follows:—Having screwed on the magnifier you intend to use, suppose No. 4, draw down the tube over the magnifier till it coincides with the circle on the inner tube, numbered 4; then slip the speculum M into it, and replace the body; when you have brought the magnifier nearly to the focus, turn the mirror E so as to reflect the light on the speculum, which will return it on the object, you can then see to adjust the magnifier nicely, and the object being also in the focus of the speculum, it will be strongly enlightened. It will be easy to ascertain if the illumination is at its maximum, by moving the speculum gently, a little nearer to, or farther from, the object, looking at the same time through the Microscope.

The object may either be held in the plyers, as represented in the plate, or it may be stuck on the black disk of the glass K. This is much easier to manage than the plyers, and answers exceedingly well for any object of which you only want to see one side, such as butterflies, scales, sands, seeds, skins, &c.; simply breathing on the glass will serve for some objects; for others it may be wet with the tongue; a wafer, gum water, or turpentine, may be used for others. If you wish to view the object in the wood sliders with the speculum, they must be taken out and held in the plyers.

## TO EXAMINE OPAKE OBJECTS

### BY CANDLE LIGHT

Opake objects are exhibited in a very distinct and brilliant manner, either by day or night, by means of the illuminating apparatus, Fig. 4. If used by day, the Microscope should be set in the darkest part of the room, and the objects will appear more brilliant if the shutters are closed. The apparatus is made in bronze, and consists of a thick double convex lens, A, and a plane convex one, or bull's eye, B; this latter can be removed by unscrewing it; the lamp can also be taken out of the socket, and a candle substituted in its place. This apparatus is contained in the box with the Microscope, except the lamp, which has a separate case, and when not in use the cover C should be screwed over the wick. The lamp when properly trimmed with good oil gives a better light, and is less trouble than a candle; because when once set at a proper height it continues the same, but the candle requires to be raised as it burns away. When either is used it must be placed so that the centre of the flame stands a little lower than the centre of the lenses, and straight before them.

There are two methods of illuminating opake objects by this apparatus. The first is represented at Fig. 2. The bull's eye must be unscrewed, as the double convex lens condenses the light sufficiently when used with the mirror. The lamp must be placed on the left of the observer, and as near the mirror as possible. The method of adjusting the speculum

and reflecting the light on the object has been already described.

If the speculum is removed, the Microscope is properly arranged for *transparent* objects, which will appear much better than when illuminated with a candle only. It may not be unnecessary to caution the observer against using the condensing apparatus without first removing the bull's eye, when the light is to be thrown on the mirror, otherwise the light on the object will be much less powerful.

The other method of illuminating opake objects is represented in Fig. 3, it is much easier in practice, and for all large objects will be generally preferred. In this method the two condensing lenses are combined, and the lamp is placed in front of the stage, on the left of the observer, and as near the object as possible. The lamp and condenser must be raised, or lowered, till that position is obtained, in which the object is most strongly enlightened. The opake objects in the sliders may be examined in this way, and the lamp being once fixed, all the sliders may be viewed without further adjustment. Opake living objects may be inclosed in the aquatic box W, and illuminated in this way, but it will be necessary first to fix a black wafer on the lower glass. Living objects may likewise be held in the plyers, and then they may be turned about and seen in any position. Other objects may be stuck on the disk of black glass K, as before directed, or gumed to pieces of card, and held in the plyers. In examining any objects, but particularly opake ones, it

is desirable to shade the eyes from the light; this is readily accomplished by hanging the oblong piece of pasteboard on the end of the Microscope. Another advantage of this shade is, that there is no occasion to shut one eye when looking through the Microscope. This shade when not in use lies under the cushion in the top of the box.

The remainder of the apparatus unexplained is as follows:—

G a pair of tongs to take up any small object.

H a plane glass with a brass rim; it is used for examing duck-weed and other water plants, to ascertain if there are any animalcules attached to them; also for polypes, aquatic larvæ, &c.

Q is a needle with a wood handle; by wetting it with the mouth and touching any very minute living or inanimate object it will adhere to it, the needle is then to be held in the plyers and, by means of the handle turned about in every direction under the Microscope. For larger objects gum-water or turpentine may be used.

I a brass box to hold turpentine or gum-water, for the above purpose.

L is a magnifier to be held in the hand to magnify any large object.

P is a hair pencil for brushing the dust off the object, or from the magnifiers.

R is a slip of glass for the crystallization of salts, animalcules, &c.; when either this or the glass H is used the Microscope must be set in a perpendicular position.

S is a brass box to hold spare talc and rings for the sliders.

O is a dead glass for moderating the light; when the lower powers are used with the lamp and condenser, the effect is particularly beautiful; it is to be sliped on the under side of the stage D.

U represents a wood slider with opake objects stuck on circular pieces of pasteboard, they are fixed in the slides with wire rings at the back; when the objects are stuck on the slides as usual, they cannot be examined under the silver speculum, but by this little contrivance they may readily be taken out and held in the plyers.

V represents an ivory slider with transparent objects, confined between two circular pieces of talc; by removing the wire ring which confines them, the objects may be taken out and changed if desired.

Six of the opake sliders, and six of the ivory ones accompany the Microscope, besides two large slides in which transparent objects are confined between two plane glasses, ground very thin for this purpose.