S.E.I. PHOTOMETER REPAIRS

1. Calibration must be checked even if the photometer has only had minor servicing, e.g. cleaning.

2. If more complex work be carried out, e.g. fitting new photocell, meter, wedges, or filters, then the Standard Brightness setting will definitely not coincide with that already marked on the dial of the microammeter.

3. Faults most likely to occur:-

(1)	Battery leakage(affecting battery tube, inner case, Rheostat Base and Scales).	10%
(2)	Photocell unserviceable	10%
(3)	Microammeter faulty	10%
(4)	Rheostat Base unserviceable	60%
(5)	Wedges and/or filters damaged due to age, corrosion, etc.,	30%
(6)	Scales and scale covers damaged	50%
(7)	Telescopic ring tube damaged	10%
(8)	Action of lower body siezed up	10%
(9)	Clean and recalibrate only	10%

This survey was conducted on 100 photometers serviced during the latter half of 1963. From this it will be seen that battery leakage and loss in photocell sensitivity caused most of the repairs to be necessary. Battery leakage is the main contributor to rheostat base failure, bloomed wedges and filters, and scale damage.

4. From this it will be seen that the spare parts which will be needed most are:-

(1) Photocells
(2) Scales
(3) Scale covers
(4) Battery tubes
(5) Wedges
(6) Filters
(7) All components of Rheostat Bases
(8) Complete Rheostat Bases

5. In addition to these important spares, it would be advisable to also stock:-

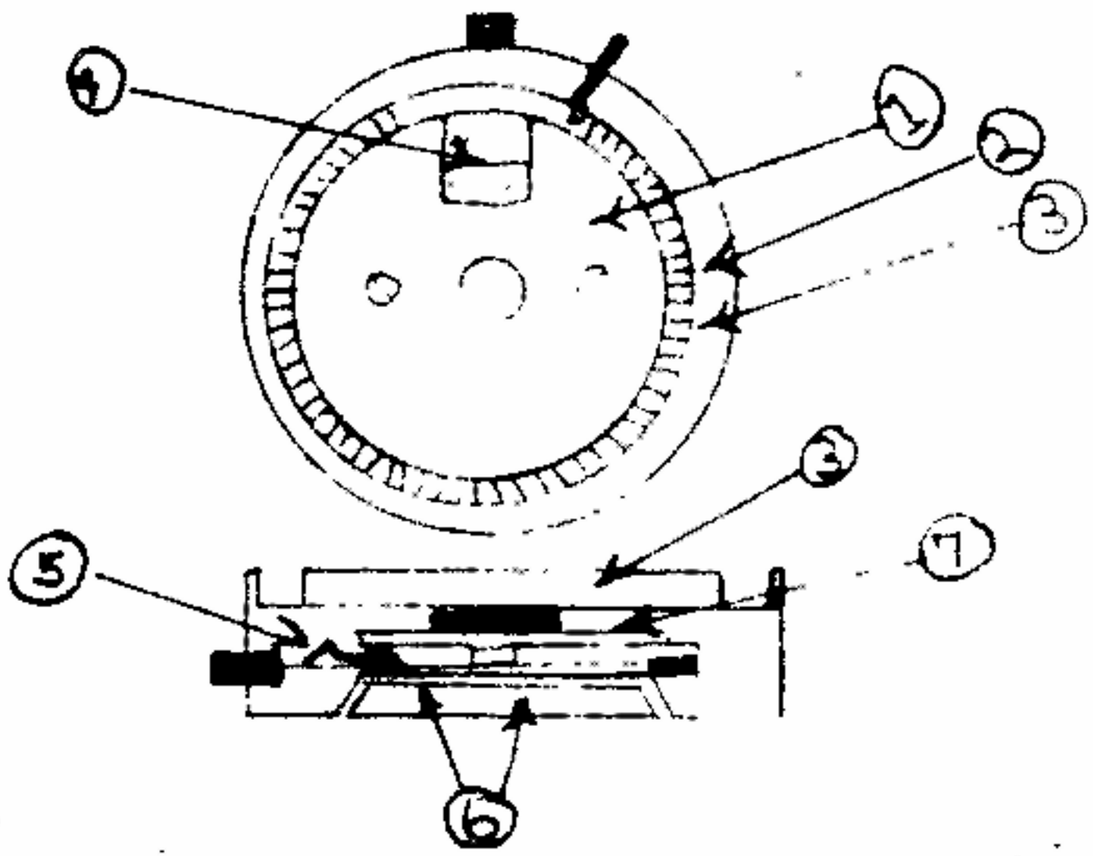
(1) Microammeters
(2) Tele-ring tubes
(3) Eyepiece mouldings
(4) Bulb assemblies
(5) Lenses
(6) Photocell assy.
(7) Photocell clamp
(8) Photocell contact plate
(9) Diffusing screen
(10) Filter discs
(11) Cursor ring
(12) Ratchet sleeve
(13) Lens aperture ring
(14) Speed degree ring
(15) Contact assy. 36392
(16) Battery insulator

6. In the absence of a service manual, here is a summary of the problems likely to be encountered when servicing the S.E.I. Photometer.

The instrument is stripped down and given a thorough examination for signs of damage and wear. From this a quotation is prepared for the customer. Very little experience is necessary for the actual estimation and, with practice, this becomes easy.

A few of the faults to look for are as follows:-

RHEOSTAT BASE ASSEMBLY

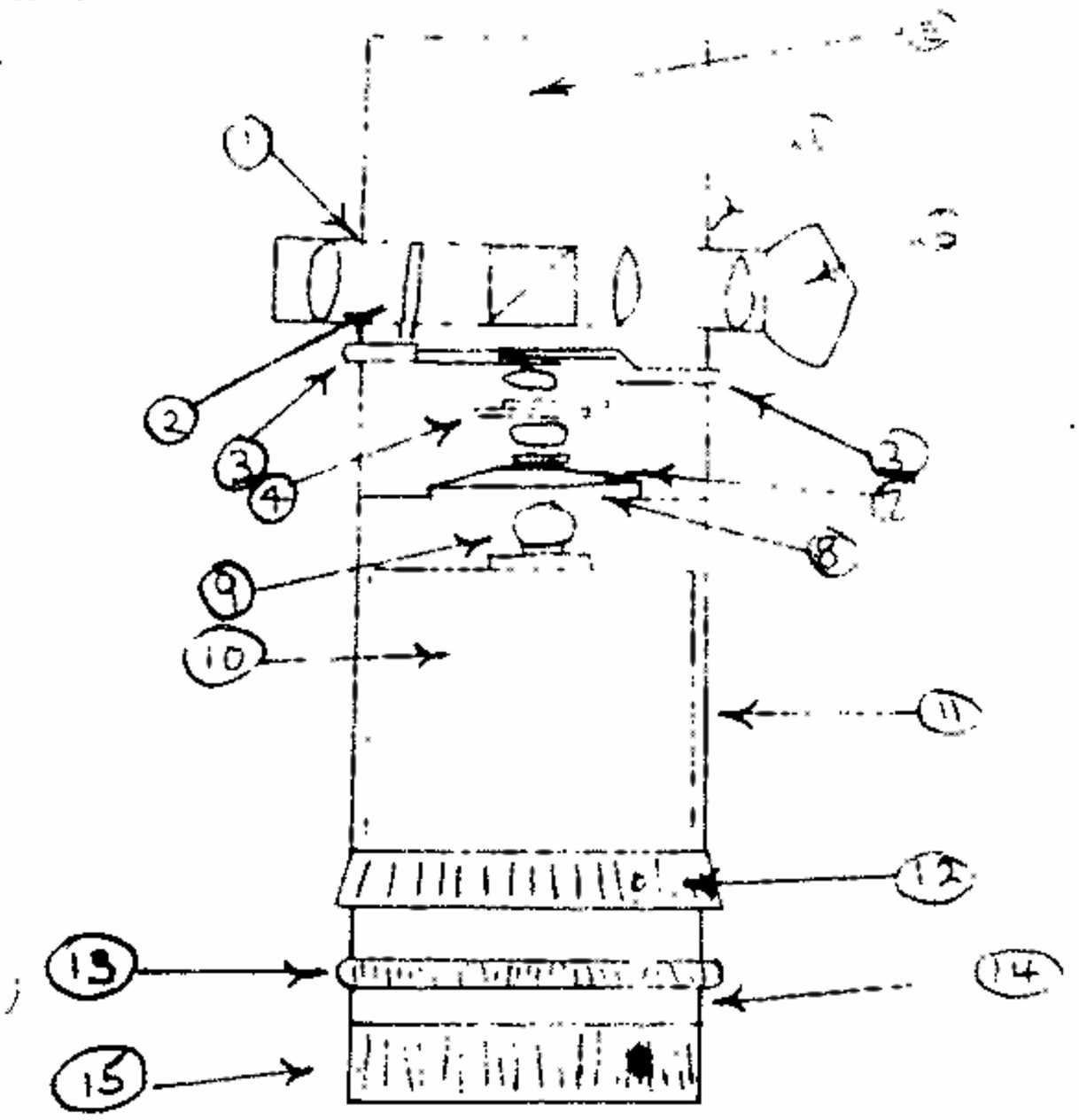


(1) Check for cracks and corrosion.
(2) Check resistance for corrosion and smoothness of track.
(3) Cup moulding should be unbroken
(4) Contact and contact carrier to be free from corrosion and be fully plated.

(5) Contact)
(6) Bottom face of contact) *
(7) Edge of wiper)

* These edges to be polished for good electrical contact.

A GUIDE TO PREPARING AN ESTIMATE



(1) Look for tubes coming loose in T.R. Tube.
(2) Check filters for scratches and blooming.
(3) Check for cracked discs.
(4) Check wedges for scratches, blooming and ageing (yellowness showing).
(5) Meter should be well balanced and be on zero. If not zeroed check springs are not hooked up.
(6) Check moulding for cracks and lenses for chipped edges.
(7) Polish contact plate.
(8) Check output of photocell.
(9) Does the bulb light?
(10) Check for corrosion and that insulation is O.K.
(11) Examine scale and cover for bad damage. Normal ageing does not require new scales.
(12) Check cursor ring for correct alignment (details later).
(13) Check for correct ratchet actions and alignment.
(14) Check for alignment.
(15) Strip rheostat base. This is almost a separate subject and will be dealt with on its own.

PREPARING AN ESTIMATE (Cont'd)

(16) Check prism for alignment on all planes, also for bubbles in cement between two halves of the cube and any fault on the silver spot.

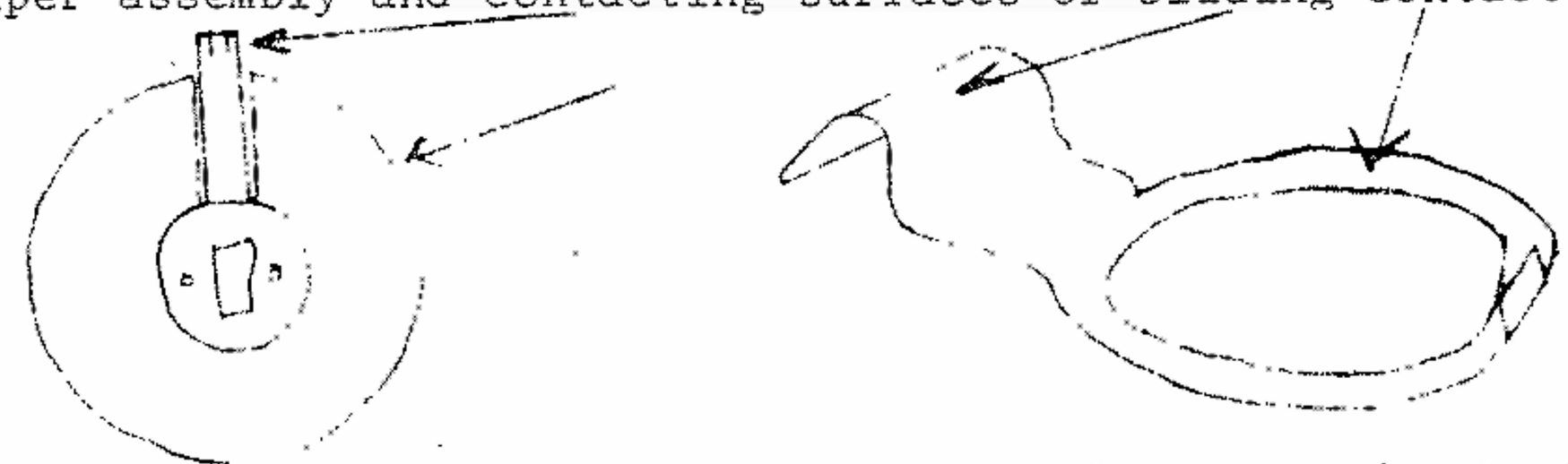
When the actual repair is being carried out, one of the major operations is the cleaning of various components. The whole of the instrument should be clean, but particular attention should be paid to parts marked thus

For the repair we will divide the Photometer into its different sections:-

(1) RHEOSTAT BASE
(2) BODY
(3) DISC HOUSING
(4) TELE-RING TUBE

(1) RHEOSTAT BASE

To get a smooth action on both the switch and the rheostat, all moving surfaces must be polished. These are the underside of the wiper assembly and contacting surfaces of sliding contact.



These are the points at which "flicker" is caused in the bulb, a fault which is most annoying in use, particularly during calibration.

Care must also be taken that contact is not made in any position of the wiper without the Switch Button being depressed. The most likely cause of this is one of the 10BA screws under the wiper having a burred slot or not being countersunk enough.

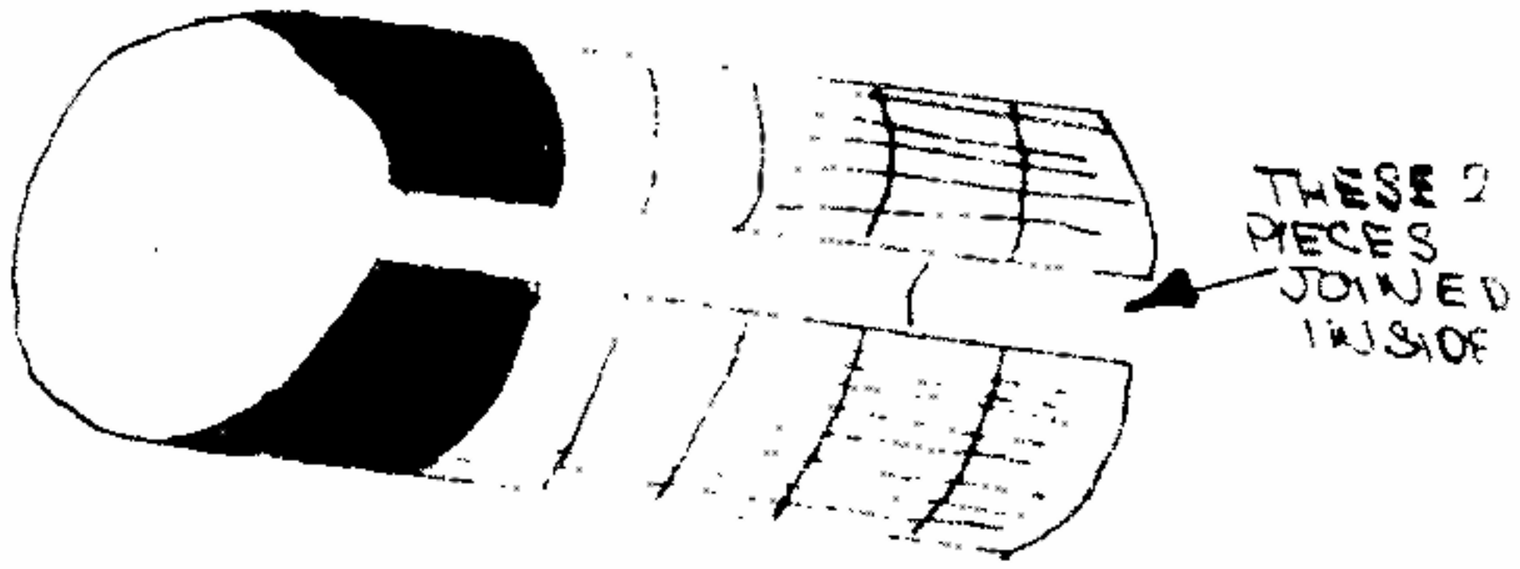
The insulated cover (in 2 parts) of the Sliding Switch Mechanism, if needing replacement will need to be filed to the shape of the one removed. This mainly consists of putting a chamfar on the edge under which the contact and its guide slide.

Should the Contact Carrier need replacing, then it will also need filing to fit.

The method of fixing these scales is as follows:-

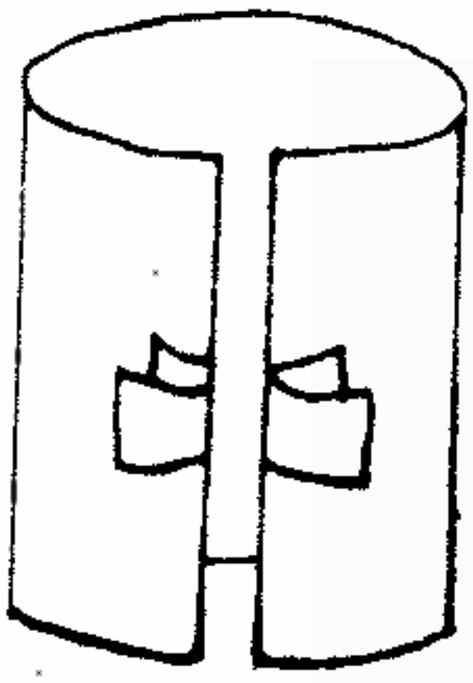
Main Scale

This is pre-shaped inside a parapex tube with adjustable internal diameter. The lines on each edge of the scale are matched up and a strip of gummed paper joins the two edges.



This tube is then slid carefully over the outer case which has been thinly coated with the Shellac solution and allowed to dry. The white line on the black edge of the scale card is positioned on the engraved line at the top of the outer case. Bake in an oven for about 10 minutes.

When the case has cooled down the cover may be put on. Wrap the acetate cover around the scale, positioning the overlap to coincide with EXPOSURE TIME - SECONDS on the join of the scale. Both the scale and the cover must of course, be very clean and free from fingerprints. With the scale cover in position a split brass tube is slid over it as shown. This is opened by pressure on the levers and so does not scratch the cover as it is slid on and off. It should be set so that the join in the acetate shows in the slot. Acetone is then applied in the tip of a screwdriver between the two surfaces of acetate. A drop of acetone is placed on the bottom layer at one end and then the top layer laid down on it and the two pressed together by running the finger nail along.



With practice this can be done so that only the one drop of acetone is necessary, this running all the way along and sealing. It is no detriment however, if it has to be sealed with several applications - moving further along the seam with each one. Care must be taken not to touch the scale cover with the acetone in any place other than between the join for the acetate will be dissolved and a new cover will be necessary.

Small Scales

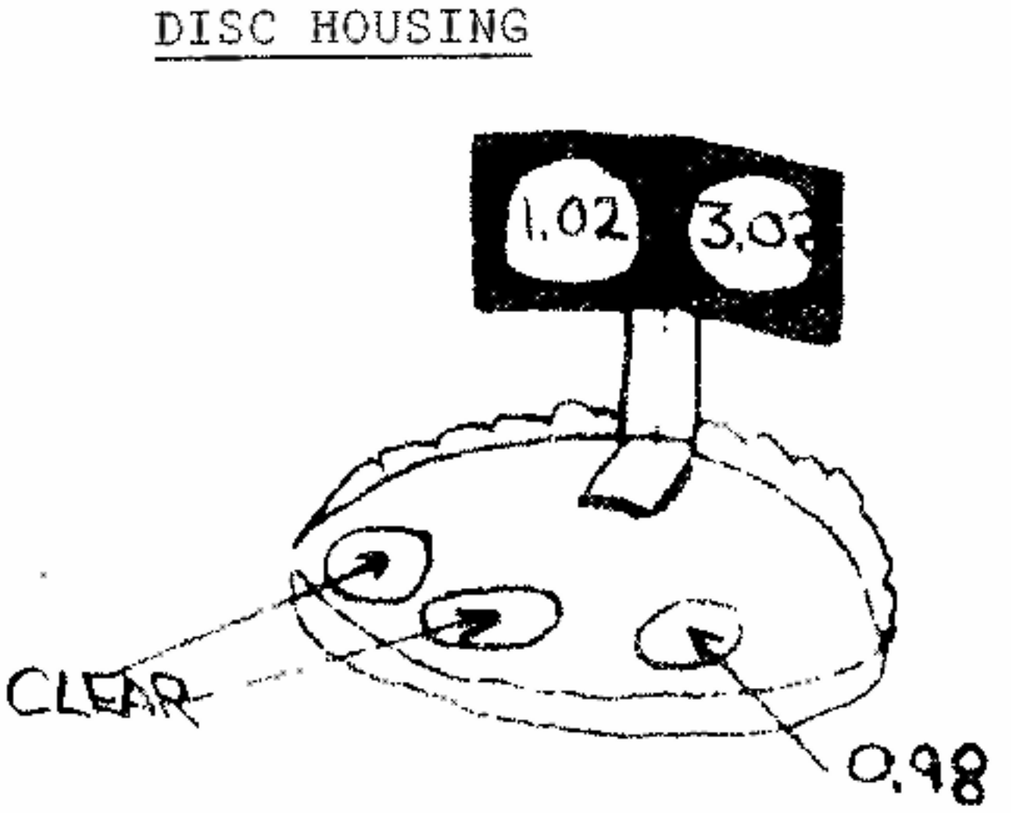
These are fitted in the same way as the main scale except that they are not made into a tube first.

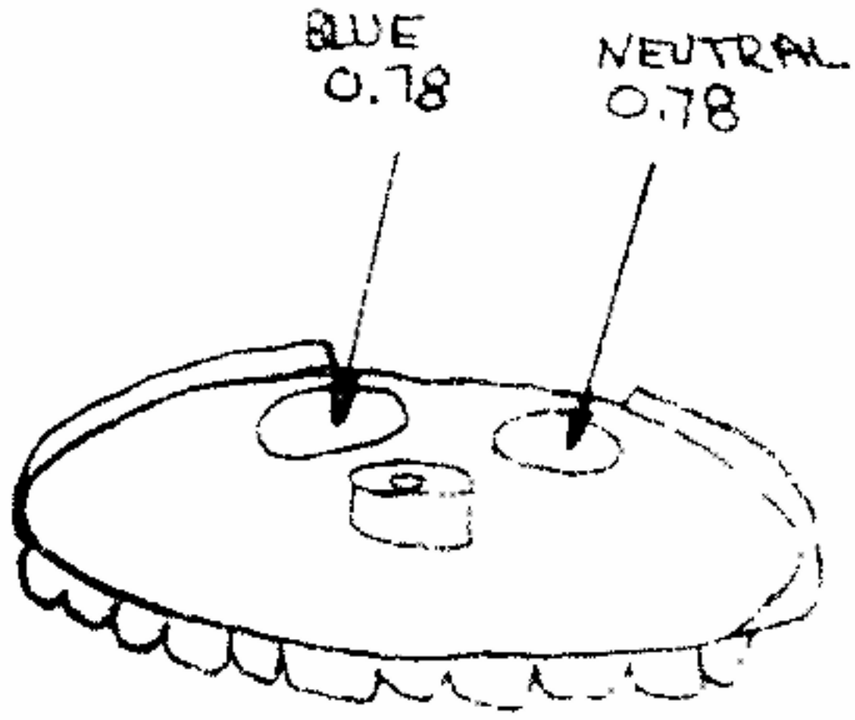
After coating the ring with Shellac and allowing to dry, the scale is wrapped around the ring, set in the correct position and the two ends held together with a gummed strip underneath. Care is necessary to ensure that there is no gap or overlap of the ends of the scale. After baking in the oven, trim the edge of the scale and clean off any excess Shellac. The cover is again secured with acetone, but this time is held in position by hand. On the Lens Aperture ring Shellac must be kept away from the spring otherwise the ratchet action may sieze up.

General

The Inner and Outer case rotation is helped by a thin application of an adhesive lubricant - ROGOL KILOPOISE 0136.

DISC HOUSING



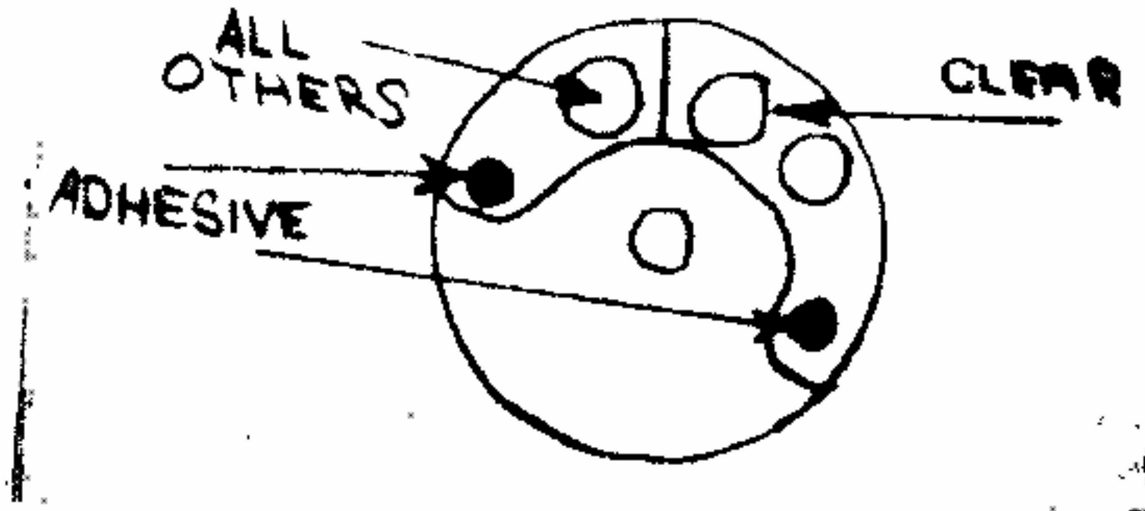


This shows the position of the range and colour matching filters in their respective discs.

The filter is held in position with a suitable adhesive (with the exception of the 1.02 and 3.02) and then the clamp is secured to the disc with a rivetted eyelet.

The 1.02 and 3.02 are simply squares of filter material clamped in the frame.

The filters that lie on the discs should be out so that the outer edge follows the shape of the disc and where the two different densities meet the cut should be radial. A A template should be made so that all filters can be cut the same. There must be no overlap and no gap between the filters.(Fig.8). The clear filter used is the same cellulose acetate as is used for scale covers. The reason for its being used is of course, that any ageing of filters that should occur will affect all these ranges equally and so conflicting readings will not be obtained when changine from one range to another - as would be the case were those two positions left empty.



The meter should be examined for free movement of the needle. Should there be anything more serious than the needle catching on the scale or foreign matter between the coil and magnet then a replacement meter should be fitted.

Care must be taken to ensure that contact betweeen photocell and meter is not lost due to a loose screw particularly the two 10BA countersunk type connecting the meter pillars to the meter.

CALIBRATION

The calibration equipment should be set to the 100 FT.LAMBERT level.

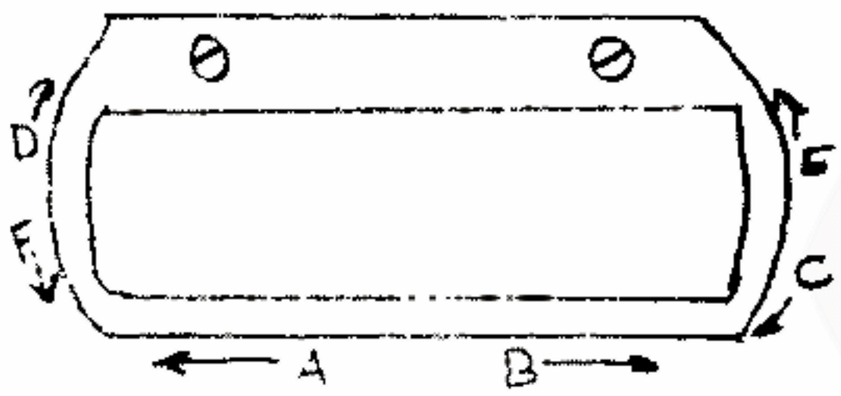
Set the Photometer Colour Matching Disc to the yellow spot and the range disc to the white spot. Turn the base of the photometer fully anti-clockwise so that the cursor screw is opposite 1/10000 on the blue scale.

Switch on and rotate the rheostat in the base of the Photometer until a match is obtained between the Calibrator and the Photometer spot. With the rheostat in the same position and the Log.2 filter in position over the front of the Calibrator a match should be obtained at the other end of the movement, i.e. with the cursor screw against 1/100 on the blue scale.

Remove the Log.2 filter from the Calibrator and set the Range disc to the Blue spot. The spot and calibrator should again match.

Return the base of the photometer to $\frac{1}{10000}$ Set the range disc to the red spot and a match should be obtained again with the Log.2 filter in position. The position of the needle is then marked with a red line.

Should a match not be obtained at any of these settings (except the first) then adjustment of the wedges is necessary. Movement in the direction of Arrow "A" will not affect the balance but will move the position of the red line up the scale. Similarly movement in the direction of Arrow "B" will bring the red line down the scale.



If a match cannot be obtained with the base clockwise on the white range, then the wedges must be moved accordingly.

(1) Should the spot be too dark then adjust as arrow "C". Adjustment in the direction of arrow "D" will not only correct the balance but will also move the red line higher. So, should this adjustment be made it may also be necessary to adjust as "B" also.

(2) Should the spot be too light than adjust as arrow "E" or "F" with the same provisions as above.

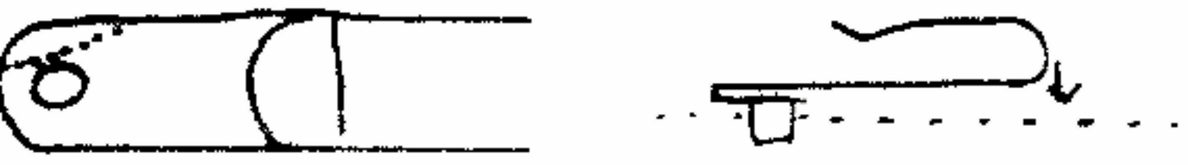
Wedges on repaired Photometers should need little or no adjustment unless replacements have been fitted.

Should it be necessary to change the disc itself - due to breakages - then certain work is necessary before the filters are fitted to it. The old disc should first be examined for any chamfers etc., that may have been filed on it. After copying these, the disc should be rubbed down on emery cloth until a click-stop motion is felt with the screw fully home. It must also be ensured that the two discs do not foul one another and should be tried in all positions. When the discs are both operating satisfactorily then the filters may be fitted.

THE FILTER MATERIAL MUST AT ALL TIMES BE HANDLED WITH TWEEZERS.

FINGERMARKS CANNOT BE REMOVED AND COMPLETELY RUIN THE MATERIAL.

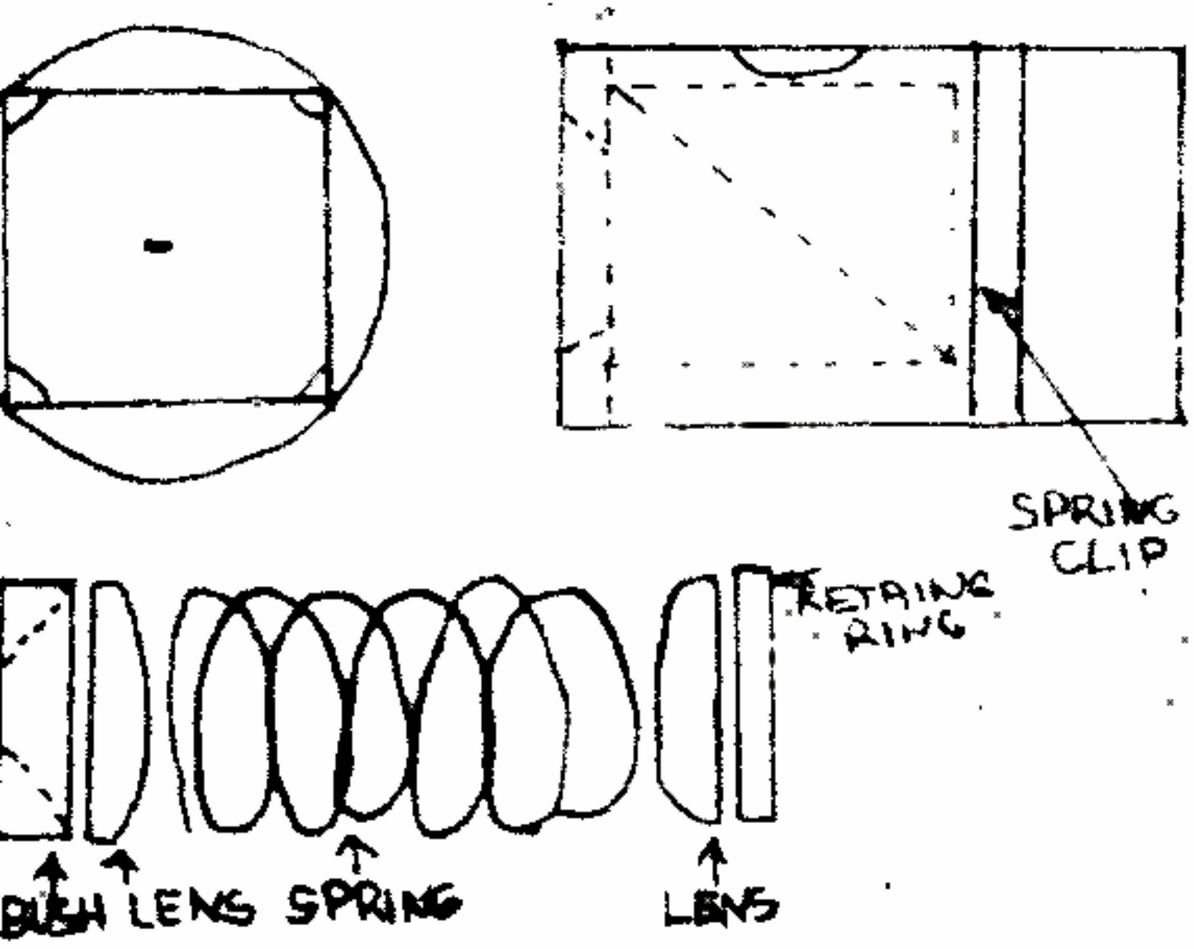
The contact on the underside of the disc housing should be shaped and filed to match the one already fitted. If it is not filed along the dotted line then a short circuit of the photocell is possible, from the contact to the outer case once the disc housing is put into position. It must also be ensured that no short is allowed in the direction of the arrow.



TELE-RING TUBE

This assemby carries two of the most important - and delicate - items in the instrument.

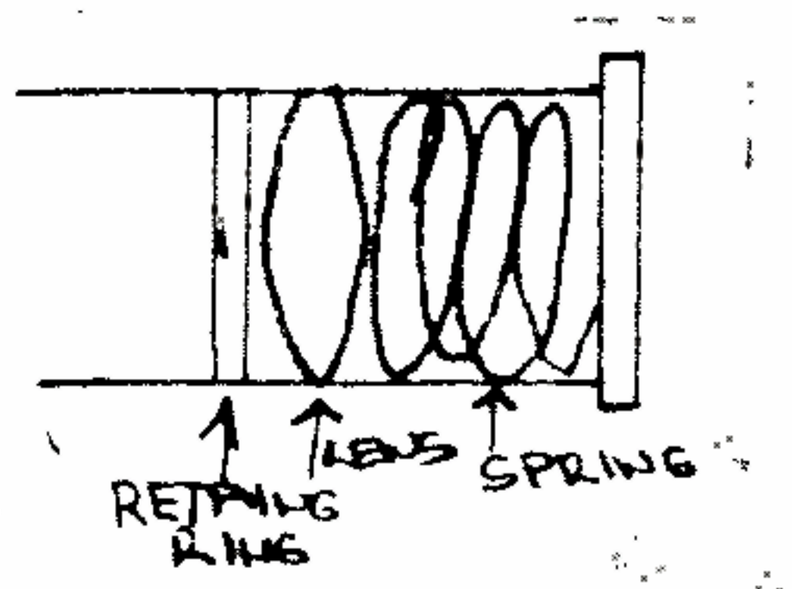
(1) Mioroammeter
(2) Prism



The prism is secured in the housing in the position shown, by a small amount of adhesive - Evostick or similar - on the four corners of the front face. The prism must be square in its housing. The three polished surfaces must be spotlessly clean.

The two eyepiece lenses (Fig.11) are mounted with their convex surfaces facing and these also must be spotlessly clean.

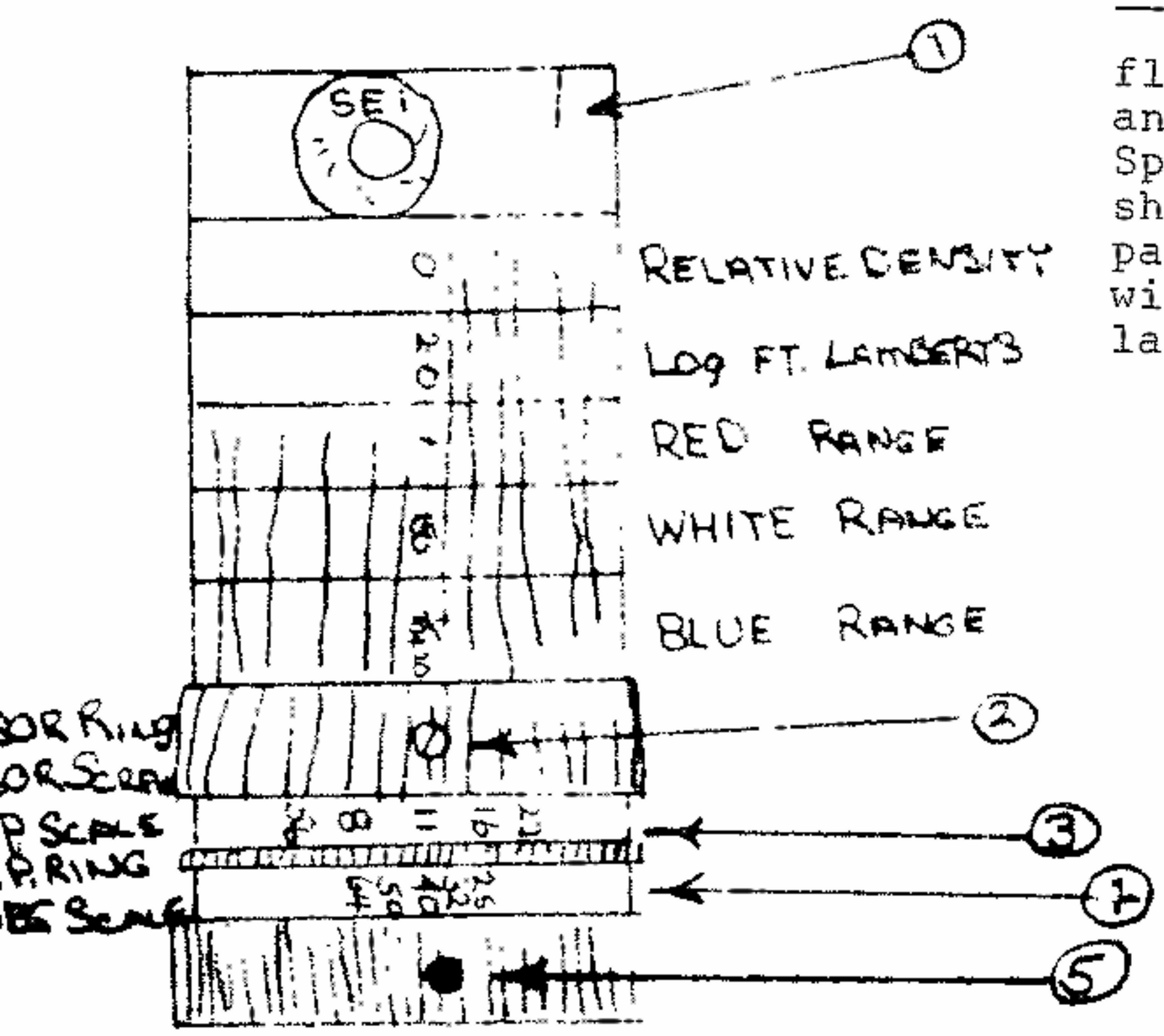
The object lens, after cleaning, should be screwed down approximately halfway, Then, with the prism and eyepiece also in position in the tele-ring tube both the silver spot and infinity should be in focus. The infinity focus can be altered by adjustment of the object lens.



The surest method of checking the completed base for correct operation is to view the mirror spot while operating the switch and rheostat, also examining the movement of the meter needle is a good test for "flicker" etc.

With the resistance "cut" - i.e. with the wiper at the lead end of the resistance - the two engraved red lines on the base and the controller should approximately coincide.

(2) MAIN BODY



SCALES

These are secured with Shellac flakes dissolved in approximately an equal quantity of Methylated Spirit (white). The consistency should be such that it can be painted on to the metal parts without being too liquid. (details later).

(1) White line on main scale to coincide exactly with engraved line on outer case.

(2) Cursor screw to line up with $\frac{1}{1000}$ on blue scale (Tolerance=+ of one line).

(3) F.11 to be set against black dot, F1.1 against white dot.

(4) Speed degree scale can be either BSI or ASA. When F.11 is not against the cursor screw the black dot should point to 40 ASA or 27 BSI.

(5) Switch button should be in line with cursor screw (in repaired instruments this will not always be so).

If a spare bulb is included in the repair, then it also will require calibration. Here the method is to calibrate to the new red line on the meter. Replace the fitted bulb with the spare and check on the white range with the base anti-clockwise. When a match is obtained the needle should coincide with the red line. It it does not then the bulb must be adjusted. If the needle does not reach the red line then the bulb should be lowered in its holder a fraction of a turn. If the needle passes the line then the bulb must be screwed up, first unscrewing the locking screw in the retaining ring.

Several adjustments will probably be necessary before the calibration is correct.