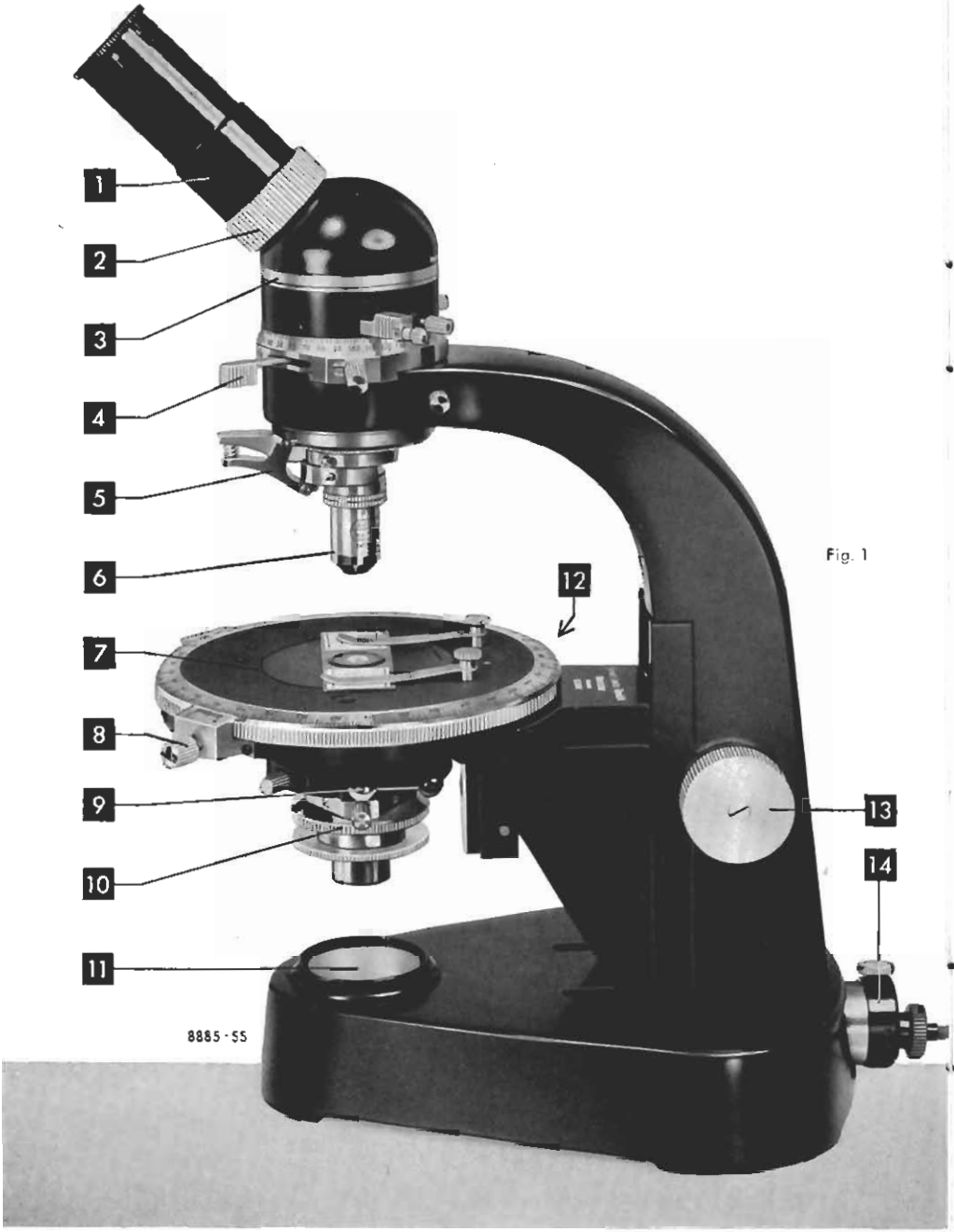


Fig. 1

1 *Monocular Pol tube P 10*

2 *Iris diaphragm for singling out small object detail during canoscopic observations*

3 *Tube changing head with bayonet fitting*

4 *Lever for operating analyser*

5 *Objective centring clutch*

5 *Objective*

7 *Circular, centred rotating object stage No. 37 on bal-bearings, with 360° graduation and 2 verniers*

8 *Arrest and friction clamp for the rotating object stage*

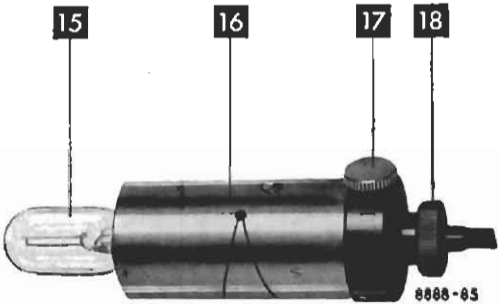
9 *Adjusting lever for 45° setting of the stage*

10 *Five-lens, two-diaphragm polarizing condenser No. 50f.*

11 *Glass disc as dust cover for the lamp unit*

12 *Rack and pinion vertical adjustment for the condenser (not visible in the illustration)*

13 *Single-knob control on either side for coarse and fine adjustment of the micrascopic image*



14 *Microscope lamp unit*

15 *Low-voltage filament lamp*

16 *Lamp holder*

17 *Locking screw*

18 *Centring screw*

Unpacking of the microscope

During consignment the tube and objectives are removed from the microscope stand. All parts are accommodated in the microscope cabinet.

The transformer or resistance is packed separately.

When unpacking, watch for small separate parts omongst the packing materiol and check the equipment immediately against the pocking slip or the catalogue specificotion.

The different parts should be laid out on o table so that they are handy when assembling the microscope. All optical and mechanical components are cleaned by us prior to dispatch, and so care should be taken to see that they do not become soiled or dusty and that no glass surfaces are touched, particularly the objectives and eyepieces. Any finger marks on glass surfaces must be removed at once with a soft leather or a well woshed fluffless linen cloth. Even slight traces of perspiration from the fingers can affect the surface of high quality optical glasses in a very short time.

Work room conditions

The work room should meet one or two special requirements. It should be as free as possible from dust, or oil vapours and chemical fumes which attack the optical and mechanical parts of the microscope. Marked fluctuations in temperature should be avoided.

In addition, an electric light socket should be near to the microscope for connection af the transformer or resistance used with the lamp unit. Normal 6 amp fuses are sufficient for the mains supply.

Make sure that the type and voltage stated on the data plate are carrect for the electricity supply available! (see page 7).

Assembling the microscope

1. First place the stand on the bench and remove the piece of wood from beneath the object stage, which is placed there to eliminate any strain upon the coarse and fine adjustment mechanism during consignment.

2. If the microscope is supplied with a revolving nosepiece the objectives will be packed in containers placed in the accessories case. The objectives should be screwed into the nosepiece in sequence according to their magnification, the lowest power objective into thread No. 1, the next one into thread No. 2 and so on. In this way correct matching is ensured. If, for any reason, the objectives are removed, care should be taken that they are always replaced in the nosepiece in the same sequence. Now lower the object stage (7) slightly by means of the focusing knob (13), push the nosepiece into the horizontal dovetail slide and secure it with the locking screw (19,

4 Analyser positioning lever
5 Objective centring clutch
19 Locking screw for the objective holder
20 Centring changing ring with objective in position
34 Bertrond lens centring screw

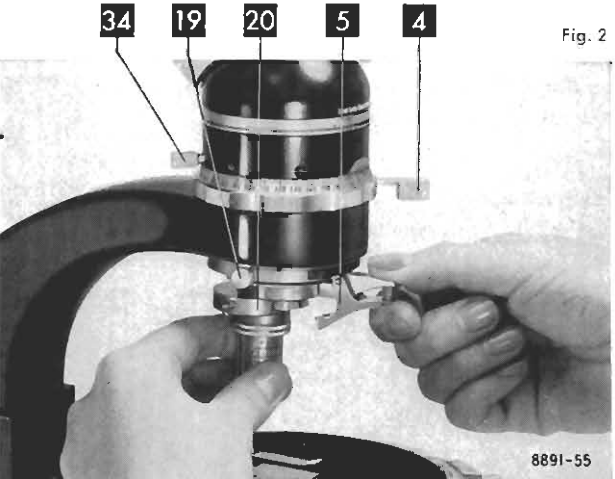


Fig. 2

Attaching the tube to the changing head of the stand

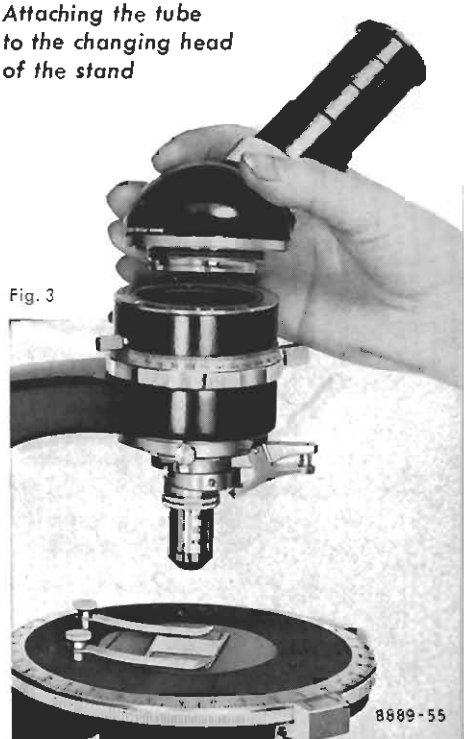


Fig. 3

fig. 2). If an objective centring clutch (5) is supplied instead of a revolving nosepiece, this is attached to the stand in the same manner. The objectives will be found in the accessories case at one side of the microscope cabinet and are screwed into centring objective changing rings (20, fig. 2). Figure 2 illustrates the method of inserting the objectives in the centring clutch.

3. The tube, of either monocular or binocular type, is engaged with the bayonet mount (3) of the stand and secured by a quarter turn anticlockwise (see fig. 3). The tube can also be attached so that the eyepiece points to the back of the stand, a suitable position for observations in incident light. When attaching the tube see that the red positioning dots are opposite each other.

4. The lamp unit (14) with its 6 volt, 15 watt lamp (15) is fitted into the foot of the stand from the rear. To change the lamp, the holder (16) can be easily removed after first loosening the locking screw (17). Insert the filament lamp (15) firmly in the socket and secure by turning clockwise as far as possible. The lamp holder (16) is then replaced in the foot of the microscope with the chromed locking screw (17) pointing upwards. Tighten up this screw again. The lamp should be checked for correct centring each time a change is made (see page 11). The 6 volt, 15 watt lamp can stand a maximum load of 2½ amps and gives an intense light of very suitable spectral composition. It should not be connected unless the transformer (for A.C. supplies) or resistance (for D.C. and A.C.) designed for this lighting unit is used. First compare the data on the mains meter and the rating plate of the transfarmer or resistance to make sure that the type and voltage of the electricity supply agree.

The transformers are only suitable for alternating current and can be set to 120 or 220 volts. If the mains voltage where the lamp unit is to be used is not known and not stated on the order, the transformer will be set to 220 volts at the factory.

The regulating knob on the transformer also switches the current on and off. For microscopical investigations the intensity of the lamp can be adjusted to suit the particular circumstances but it is seldom operated on full load except, for example, in photomicrography.

5. For observations in monochromatic light a sodium vapour lamp can be fitted to the stand foot instead of the normal lamp unit (fig. 4).

To do this, remove the lamp unit with the low-voltage filament lamp from the foot of the stand by drawing it to the rear. Then lay the stand on its back on a soft surface to render the base-plate accessible from underneath. Now remove the collector for the low-voltage lamp (see fig. 5) and place the stand upright again. The sodium vapour lamp can then be inserted in the foot of the stand.

Fig. 4

Sodium vapour lamp

Fig. 5

Removing the collector before inserting the sodium vapour lamp

Special light sources and monochromators can also be used in conjunction with a normal microscope concave and plane mirror fitted instead of the glass cover (11) of the lamp unit.

6. If the microscope is supplied with an attachment for synchranous rotation of the polarizer and analyser this should be fitted as follows (fig. 6).

a) First unscrew the lever (38, in fig. 8) used to rotate the analyser and replace it by the extension arm (21).

b) Then remove the polarizer from beneath the condenser and insert the polarizer part (23) of the synchronizing attachment in the polarizer collar of the condenser. Now screw the connecting limb (22) to the lower extension arm and pass its top end through the guide hole of the upper extension arm.

c) Loosen the locking screw (24) on the polarizer and turn until maximum darkness is obtained. With this attachment compensators can be inserted in a special slot above the polarizer to ensure satisfactory adjustment of the compensators during synchronous operation.

21 Extension arm
22 Connecting limb
23 Polarizer arm
24 Locking screw for polarizer ratation
25 Polarizer

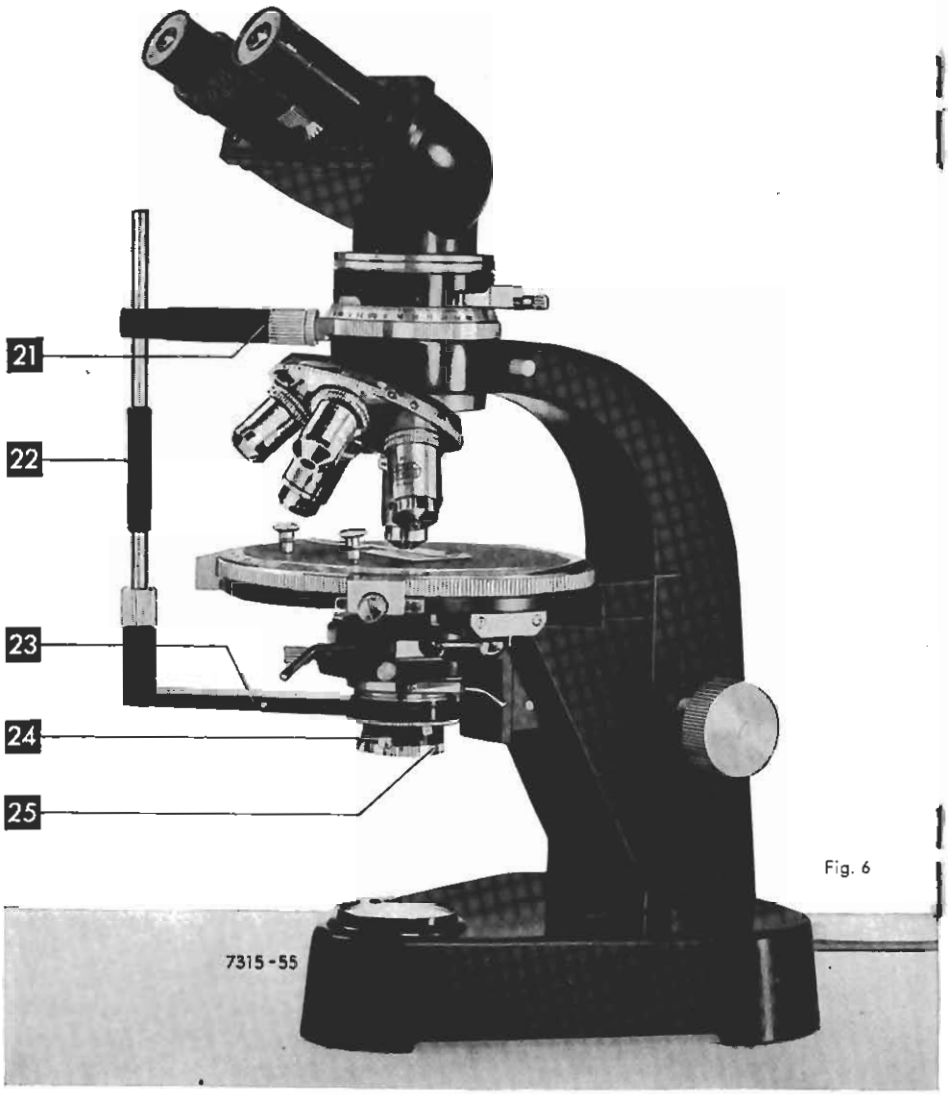


Fig. 6

A. Adjusting the illumination and the orthoscopic image

1. Focusing the image and centring the objectives

After placing a specimen on the object stage set or attach an objective of medium magnification (e. g. 10x) and fit an eyepiece with cross lines to the tube. Switch on the microscope lamp and focus the image of the specimen sharply. The objectives are centred at the revolving nosepiece or centring objective changing ring (40 in fig. 8) with the special keys supplied for this purpose in the following manner:

The object stage is rotated through a complete revolution, while at the same time an object point located at the intersection of the cross lines is observed. The objective is not correctly centred unless this specimen point remains in the centre throughout the entire revolution of the stage. If the object point in the centre of the cross lines describes a circular path, the objective should be aligned in order to bring the axis of rotation into the centre of the graticule. For this purpose this alignment is regarded as being separated into two components parallel to the spindles of the two centring screws. The objectives can usually be centred after performing this operation two or three times, and will remain centred provided the instrument is handled with care and the objectives are not unscrewed from their holders.

2. Adjusting and centring the condenser

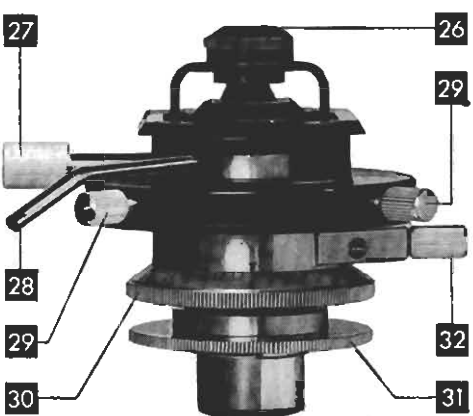
The condenser has two iris diaphragms of which the upper one, operated by the lever (28) controls the aperture with the top part of the condenser swung into place, whilst the lower one (rotating milled ring [31]) limits the illuminated field. With the upper part (26) swung in, the condenser has an aperture up to 0.85. When using an oil immersion objective the top lens of the condenser (26) is swung out and replaced by the condenser cap with an aperture of 1.40. With low-power objectives (having an aperture of less than 0.25) the upper part of the condenser is swung out by the knurled knob (27) at the side so that the lower iris diaphragm acts as the aperture stop and the upper one (28) remains at its full opening.

The condenser is adjusted to its highest positian by the rack and pinion control (12, fig. 1) and its upper part (26) swung in. Then the illuminated field diaphragm (31) is opened anly to such an extent that its edge just disappears from the field of view with this fully illuminoted and the specimen sharply facused. The illuminated field diaphrogm is focused in its sliding sleeve by vertical adjustment af the milled ring (31). Slight adjustments to the focus of the field diaphragm will probobly only be necessory where new specimens in slides of different thicknesses are placed on the stoge. With very thick slides it is not possible to focus the illuminated field diophragm shorply but this does not affect satisfactory operation. Here too, the condenser is set to its maximum height. If the illuminoted field diaphragm is not in the middle af the field of view the condenser should be centred by the two screws (29). Then the diaphragm is opened up until its edge just frees the field of view.

3. Centring the light source

To centre the light source, open up both condenser diaphragms (28 and 31), swing out the analyser (4), swing in the Bertrand lens (36) and centre with the screw (35). Now focus on the exit pupil of the objective with the knurled screw (36). Then loosen the black centring screw (18, fig. 1) of the lamp unit and turn it until illumination of the objective exit pupil is even and as bright as possible. Then tighten up the screw again. Improvements in illumination may also be made by horizontal adjustment of the lamp holder after first loosening the locking screw (17).

Fig. 7



26 Upper part of condenser with screw-out top lens

27 Knurled knob for swinging out upper part of condenser

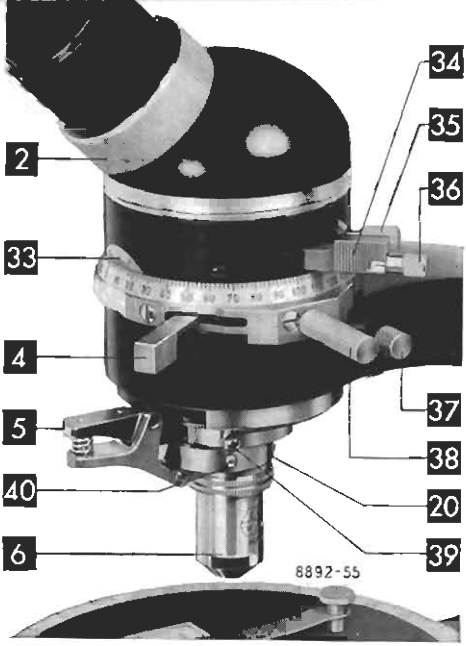
28 Setting lever of the aperture diaphragm

29 Centring screws for the condenser

30 Rotating polarizer ring with graduation

31 Setting ring for the illuminated field diaphragm

32 Clamping screw for polarizer rotation



2 *Iris diaphrogm for singling out object detoils with conoscopic obsservatians*

4 *Operating lever for analyser (the illustration shows the onolyser out of operation)*

5 *Objective centring clutch*

6 *Objective*

20 *Centring objective chonging ring*

33 *Vernier for analyser rototion*

34 *Operating lever far Bertrand lens (the illustration shows the Bertrand lens out of operotion)*

35 *Centring screw for Bertrand lens*

36 *Knurled focusing screw for Bertrond lens*

37 *Locking screw for analyser rototion*

38 *Anolyser rototing lever*

39 *Compensator slot*

40 *Objective centring screw*

B. Adjusting the interference image (conoscopic observation)

By the canoscapic methad af observation the interference figure at the rear focal plane of the objective and nat the true abject image is seen. This phenomenon can be observed in magnified form by using the Bertrand lens (34) which in conjunction with the eyepiece constitutes an auxiliary microscope.

The interference image is focused by the screw (36) without altering the length of tube. The Bertrand lens is centred with the knurled screws (35) on the upper part of the stand, care being taken to see that the diaphragm (28) is opened up. With the P 10 Pol tube small abject details can be singled out by means af the built-in iris diaphragm (2). All "Pol" tubes, including binocular types, are suitable for conascopic observation.

The two centring screws (51) are used to centre the image of the lamp filament. Full illumination of the exit pupil is then obtained by horizontal movement of the lamp housing in its socket.

For observations and particularly for exact measurements it is important to set the aperture diaphragm (46) in the manner illustrated in fig. 11. This is achieved by adjusting the height setting screw (48) of the aperture diaphragm. An example of aperture limitation likely to ensure a uniform linearly polarized field is shown in fig. 11.

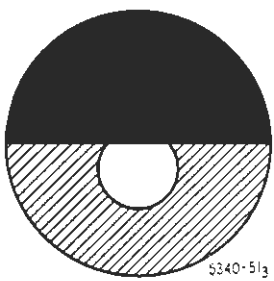
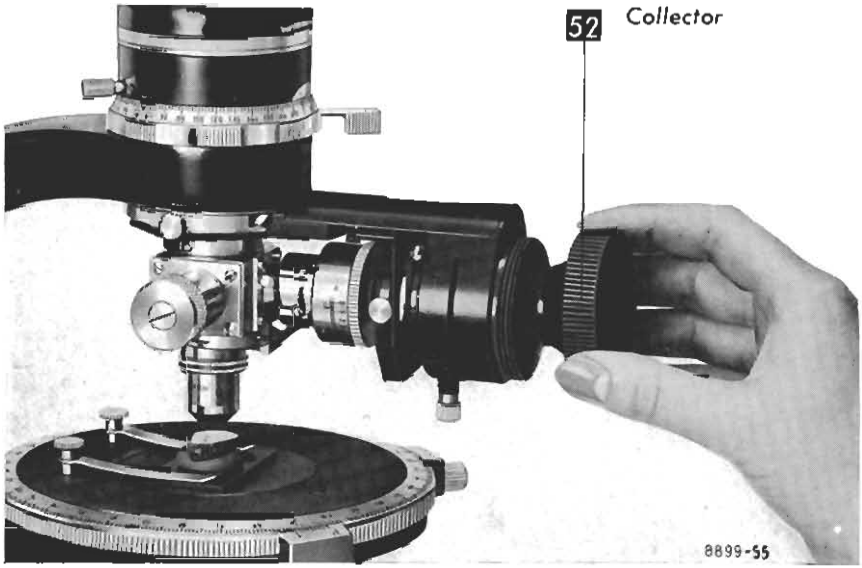


Fig. 11

Correct position of the aperture diaphragm and suitable aperture limitation (as seen with Bertrand lens in position or eyepiece removed)

To avoid disturbing reflections or glare, the half-stop (47, not visible in the illustration) or the slide (45) with central stops can be used (the central stop for each particular objective is suitably marked). The polarizer (44) and analyser are at their "crossed position" when both are set to "0". Any slight adjustment needed is made with the rotatable polarizer (possibly with the Bertrand lens in position).

If it is wished to use special light saurces separate from the microscope, such as spectral or arc lamps, the lamp housing should be unscrewed by turning the milled ring (50, fig. 9). The collector (52, fig. 12) is then substituted.



D. Photomicrography

The Pol FS 21 photo tube with inclined binocular observatian eyepieces or the Pol O 13 photo tube with iris diaphragm are used for phatomicragraphy. All our attachment cameras are suitable for this work and are supplied with full instructions for use.

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