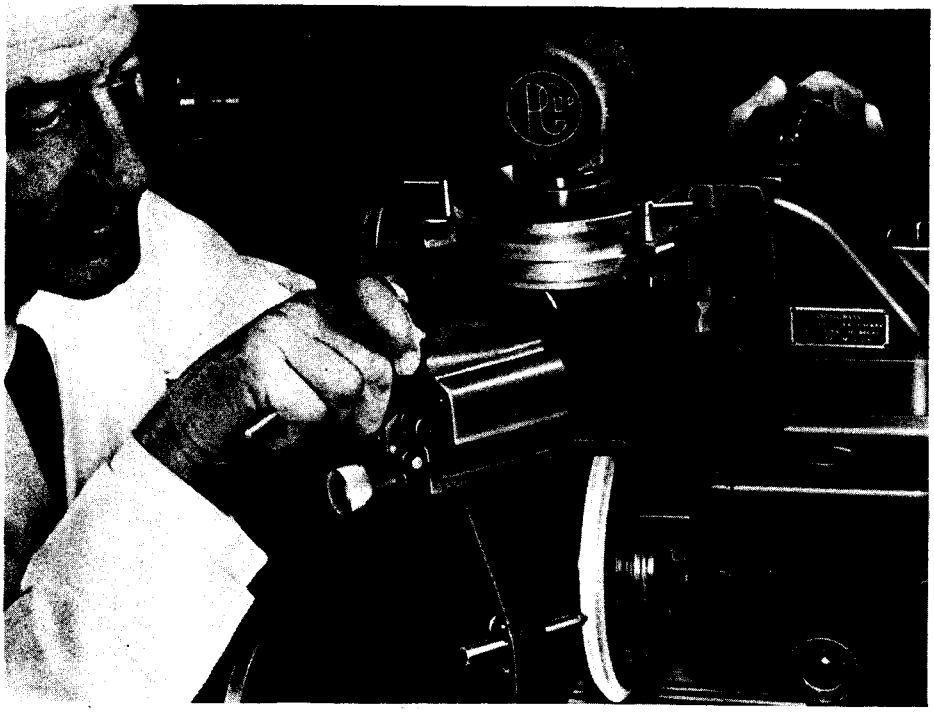
Optidress Operators Manual



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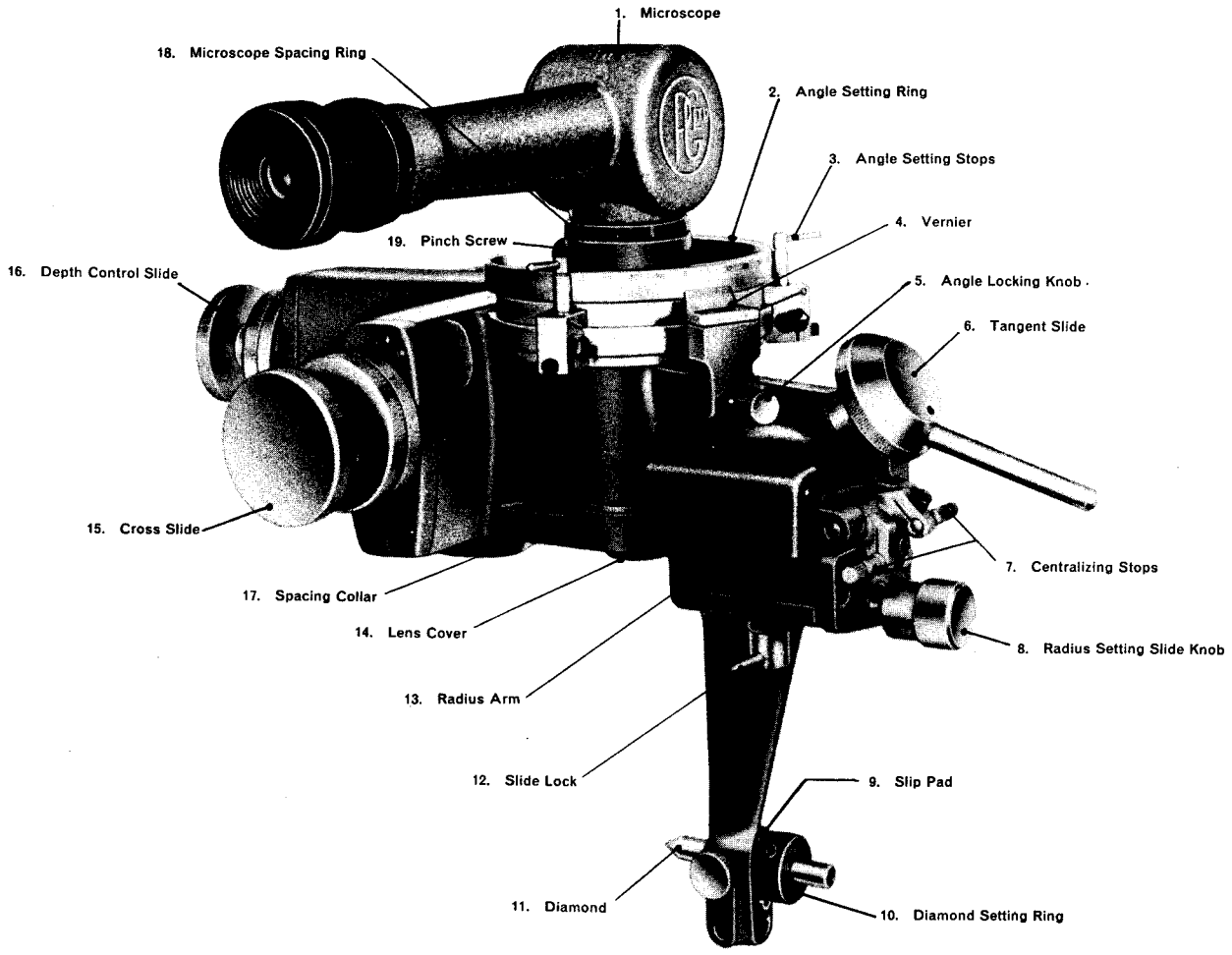
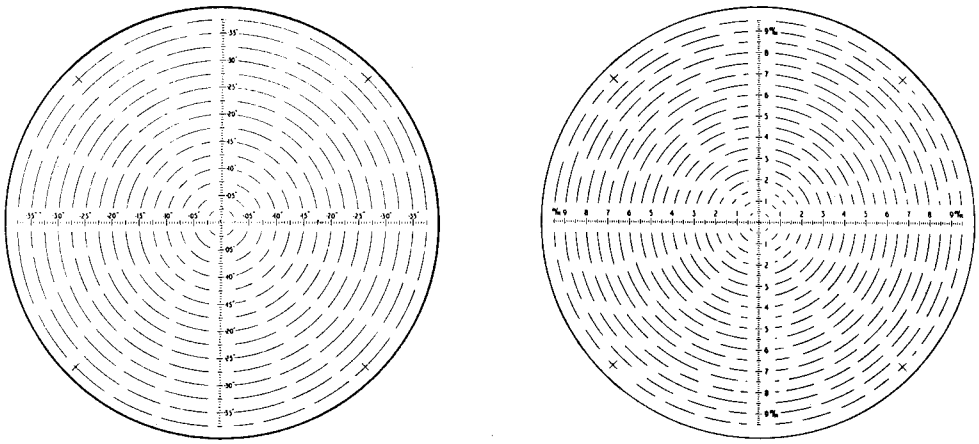


MAIN FEATURES OF THE OPTIDRESS (Fig. 2)

1. The MICROSCOPE. This has a 10 times magnification and is fitted with a graticule marked with concentric rings (Fig. 3). These rings are spaced 0.025 inches or 0,5 mm apart out to a radius of 0.375 inches or 9,5 mm. The vertical and horizontal co-ordinates are marked every 0.005 inches or 0,1 mm and figured every 0.05 inches or 1,0 mm. The down tube of the microscope forms the pivot for radius arm.

Fig. 3



English Metric

2. The ANGLE SETTING RING. This is used for setting the angular position of the setting stops (3) and the diamond arm when dressing tangents. The ring is graduated from 0 to 95° either side of the central position.

3. The ANGLE SETTING STOPS are used to limit the radial movement of the radius arm either side of the centre and provide the angle settings for dressing tangents. Auxiliary setting stops can be fitted for intermediate angle settings, these stops can be raised to allow the arm to pass.

4. A VERNIER fitted to the radius arm enables the setting stops to be positioned to 6 minutes of arc.

5. The ANGLE LOCKING KNOB is used for clamping the radius arm in position while angles are being dressed.

6. TANGENT SLIDE OPERATING HANDLE. With this the dovetail tangent slide and, in consequence, the radius arm and diamond are moved in a straight line when dressing a tangent. The operating handle is inclined to the slide and movement is transmitted through a rack and pinion.

7. The CENTRALIZING STOPS hold the tangent slide firmly in the central position to prevent movement of the slide while dressing a radius. When tangents are dressed the stops must be lifted to free the slide.

8. The RADIUS SETTING SLIDE KNOB is used in conjunction with the microscope graticule (Fig. 3) to set the point of the diamond at the required radius for radius dressing. A plain knob is fitted as standard but micrometer adjustment can be provided and this permits measured settings to .001 inches (0,025 mm), see Fig. 26.

9. SLIP PAD. The maximum convex or concave radii that can be set optically with OPTIDRESS is $\frac{3}{8}$ inch or 9,5 mm, but this dimension can be increased to $1\frac{1}{8}$ inch (28,6 mm) convex and 1 inch (25,4 mm) concaved, by inserting slip gauges of the required dimensions between the slip pad and the DIAMOND SETTING RING (10). It should be noted that this restricts the angular movement of the diamond arm on some makes of grinding machines.

10. The DIAMOND SETTING RING is used as described in (9) above. It can also be used to compensate for diamond wear.

11. DIAMONDS can be supplied with a .020 inch (0,50 mm) radius for roughing or .010 inch (0,25 mm) for finishing and with shanks of various lengths. A special diamond holder can be fitted which gives the diamond a 15° drag angle for longer tool life (Fig. 27). For dressing female radii the standard diamond is replaced by the 180° radius attachment, this is described in detail on page 24.

12. The SLIDE LOCK is used to prevent the radius setting slide moving while the wheel is being dressed.

13. The RADIUS ARM. This pivots about the hardened and ground microscope tube and carries the tangent slide and diamond arm complete with diamond. The standard diamond arm is an integral part of the radius arm but the Optidress can be fitted with a detachable diamond arm, this is described on page 26.

14. The LENS COVER protects the cover glass and objective lens against dust and damage.

15 & 16. The HORIZONTAL SLIDES, cross slide (15) and depth control slide (16), one parallel to and one at right angles to the axis of the grinding wheel, are used for initial positioning of the diamond prior to dressing. Both slides have micrometer adjustment and are spring loaded to reduce back lash. Each is fitted with zero setting micrometer dials graduated in inches or millimetres, one revolution equalling .050 inches or 1 mm and one division equalling .0005 inches or 0,01 mm.

17. SPACING COLLARS are individually fitted to each Optidress to eliminate vertical play in the radius arm.

18. The MICROSCOPE SPACING RING is fitted to ensure that the diamond is in focus in the microscope. This ring is anodized black and must not be interchanged with the spacing collar 17.

19. PINCH SCREW. This holds the microscope in position and should only be loosened when lining up the graticule with the diamond or when dismantling.

ILLUMINATOR (shown on page 20). The Illuminator for the Optidress is designed to stand on the work table of the machine and consists of a low power light source with diffusing screen. It is supplied complete with transformer.

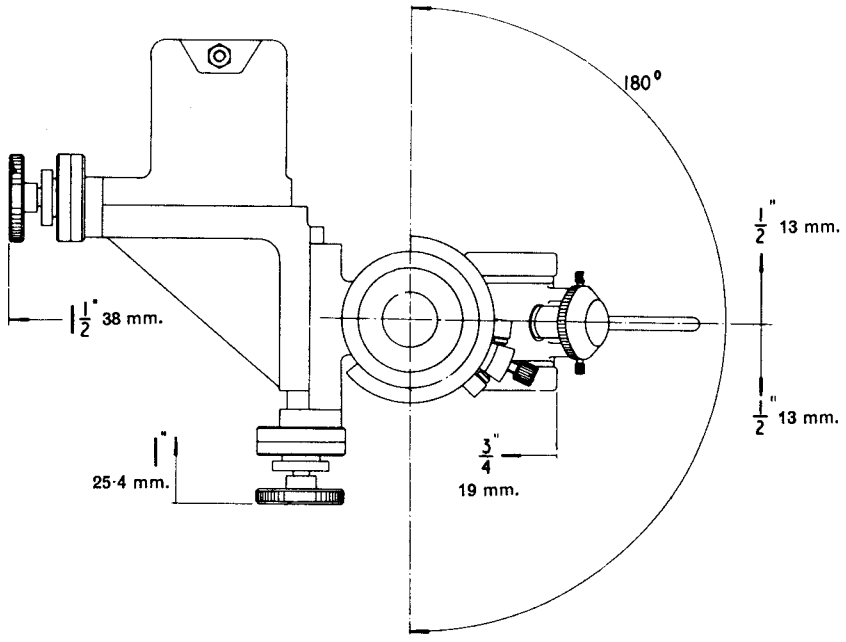


Fig. 4. Showing movements of the diamond arm and slides

SPACER PLATE (not illustrated). The Optidress is supplied with a spacer plate. This goes between the mounting surfaces of the Optidress and grinding machine and is machinable to enable accurate location of the Optidress in relation to the grinding wheel.

FITTING INSTRUCTIONS

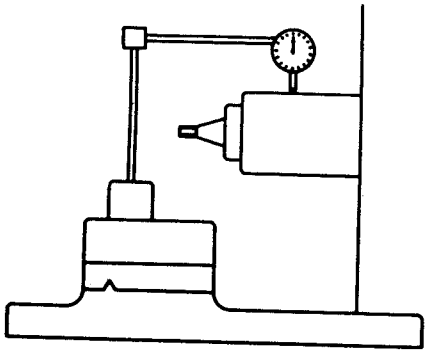
These instructions are of a general nature because the machines to which the OPTIDRESS is adapted vary in their construction.

Assembling the Optidress

The Optidress is normally supplied dismantled and must be assembled before being fitted to the grinder. Wipe clean the Microscope tube, the two bores and faces of the Cross-Slide and the bore and end faces of the Radius Arm. Lightly smear each bore and face with light spindle oil. Fit the Radius Arm into the Cross Slide and push the Microscope, complete with the Spacing Collar and Microscope Spacing Ring (17 & 18 Fig. 2), into the bores to form a pivot. Make sure that the Spacing Collar and Spacing Ring are in the correct position as shown in Fig. 2. Tighten the pinch screws (19 Fig. 2) on top of the Angle Setting Ring just sufficiently to hold the Microscope firmly in the position shown in Fig. 2, do not overtighten. Final alignment is done when the Optidress is assembled on the machine.

Checking the mounting pad

Fig. 5



For most adaptions, the Optidress with its spacer plate fits on the flat pad which forms the top of the wheel head. This pad must be checked to ensure that it is parallel with the machine work table. This can be checked using a dial indicator mounted on the work table as shown in Fig. 5. When the table is traversed in both directions the pad should be parallel to the table within .002 inch (0,05 mm) over its area.

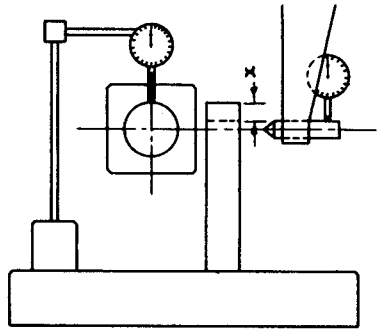
Aligning the Optidress

a) for height

Next check that the centre line of the diamond is within .005 inches (0,125 mm) of the centre line of the wheel spindle. To do this mount the Optidress temporarily but firmly in position, with the spacer plate placed between the mounting pad and Optidress.

With a dial indicator mounted on the work table (Fig. 6) clock a convenient diameter of the wheel spindle. Set the dial indicator to zero in this position and build up a pile of slips to the same height to give a zero reading. Measure the diameter of the wheel spindle and divide it by two. From this figure subtract 0.1875 inches (4,763 mm) (half the diameter of the diamond shank). This dimension (x figure 6) should now be subtracted from the slip pile and the dial indicator lowered and zero'd on the pile of slips. Now measure the diamond shank with the indicator, if the diamond is on the same centre line as the spindle it will read zero. Because the spacer plate has been made oversize to allow adjustment to be made, the reading will be high. Note this reading.

Fig. 6

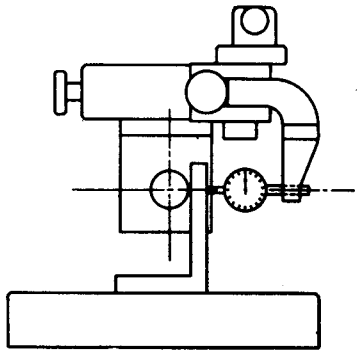


Dismantle the Optidress and remove the spacer plate. Reduce the thickness of the spacer plate by the amount noted. Re-mount the Optidress complete with spacer plate onto the pad and fasten down securely. Check to ensure that the dial indicator reads zero over the diamond shank.

b) for parallelism

Mount the dial indicator in the diamond holder (Fig. 7) and set the Radius Arm to zero position on the Angle Setting Ring. Use an eye-glass to ensure accurate zero setting. Hold the arm in position using the Angle Setting Stops. Mount an angle plate on the work table so that it is parallel to the cross traverse of the machine using the dial indicator together with the cross traverse of the machine. Then, with the indicator still in contact with the angle plate, traverse the tangent slide to check that the Optidress is square with the machine. The clock must read zero along the 1 inch travel of the tangent slide. To square the Optidress move it in its slots on the mounting head of the machine. Be sure that the Optidress is tightened down securely.

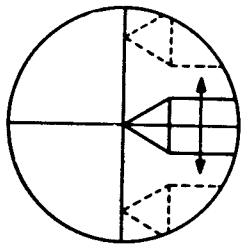
Fig. 7



Aligning the diamond with the graticule (Fig. 8)

Position the diamond in the diamond arm so that it is in line with the centre of the wheel spindle. Check that the Radius Arm is in the zero position on the Angle Setting Ring, use an eye-glass to ensure accurate setting. With the illuminator in position and switched on, watch the diamond through the microscope. By adjusting the radius setting slide move the diamond inwards until it is in line with one edge of the vertical graduations on the graticule. Release the Centralizing Stops (7 Fig. 2) and, still watching through the microscope, move the diamond along the graticule using the tangent slide. If the diamond does not stay with the line along its length loosen the microscope pinch screw (19 Fig. 2) and swing the microscope tube until it does. Then tighten the pinch screw, taking care not to overtighten. Make sure that the Spacing Ring (18 Fig. 2) is still tight against the top face of the Cross Slide. The Optidress is now in position ready for use.

Fig. 8



HOW TO DRESS A WHEEL FORM

Before dressing a form check that the diamond is pivoting about the centre of the graticule. If adjustment is necessary follow the procedure given under the heading Microscope on page 20.

Example 1

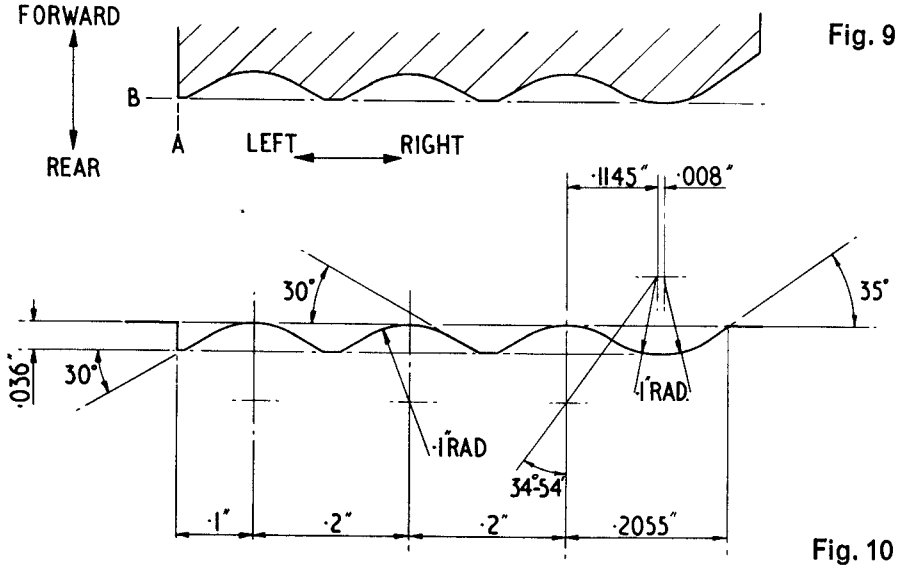


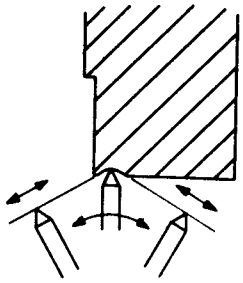
Fig. 9

Fig. 10

1. Set the diamond point to the centre-line of the graticule. Set the left hand angle setting stop to 90° and the right hand angle setting stop to 0°. With the radius arm against the 0° stop and locked in position with the angle locking knob move the cross-slide sufficiently to bring the left hand edge of the wheel approximately 0.250 inches to the left of the centre line of the graticule, so that the 1 inch movement of the tangent slide can be used to dress the full width of the wheel. Bring the diamond into contact with the wheel using the depth control slide, and dress the periphery (B Fig. 9) using the tangent slide. With the diamond in this position set the depth control slide to zero by loosening the locking ring and positioning the micrometer ring at zero and re-tightening. This establishes the depth datum line.

2. Move the cross-slide to bring the left hand side face of the wheel onto the centre line of the graticule and set the radius arm onto the 90° angle setting stop, locked in position using the angle locking knob. Bring the diamond into contact with the wheel and lightly dress the left hand side face (A Fig. 9) by raising the left hand centralizing stop and using the tangent slide. With the diamond in this position set the cross slide to zero by loosening the locknut, setting the micrometer slide to zero and re-tightening. The datums for A and B have now both been fixed.
Withdraw the diamond from the wheel and set the diamond to a 0.1 inch radius forward of the graticule centre line. Then, with the cross slide, move the diamond 0.1 inches to the right by turning the micrometer slide 2 revolutions (1 revolution of the micrometer equals 0.05 inches).

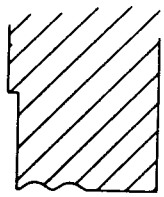
Fig. 11



3. Lock the tangent slide between the centralizing stops and set the angle setting stops to 30° left and right.

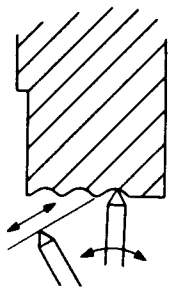
4. Gradually feed the diamond into the wheel using the depth control slide, at the same time rotate the diamond through the complete arc (Fig. 11). At each end of the arc movement raise the appropriate centralizing stop to form the 30° tangent. Raise only one stop at a time and lower the stop before the radius is dressed again. Continue this operation until the correct depth of 0.036 inches is reached. This dimension is read from the micrometer drum of the depth control slide.

Fig. 12



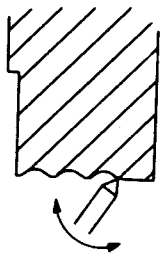
5. Withdraw the diamond from the wheel and move it to the right 0.2 inches using the cross slide. Repeat the previous operation (Fig. 12).

Fig. 13



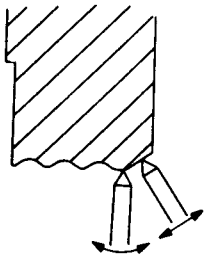
6. Withdraw the diamond from the wheel and move it to the right 0.2 inches using the cross slide. Set the left hand Angle Setting Stop to 34° 54′, this is the blend angle for the two 0.1 inch radii, and dress as before (Fig. 12). Gradually wind in the depth control and rotate the diamond onto the right hand 30° stop. Raise the centralizing stop and dress the 30° tangent (Fig. 13).

Fig. 14



7. Withdraw the diamond from the wheel and reset the diamond to a 0.1 inch radius to the rear of the graticule centre.

Fig. 15

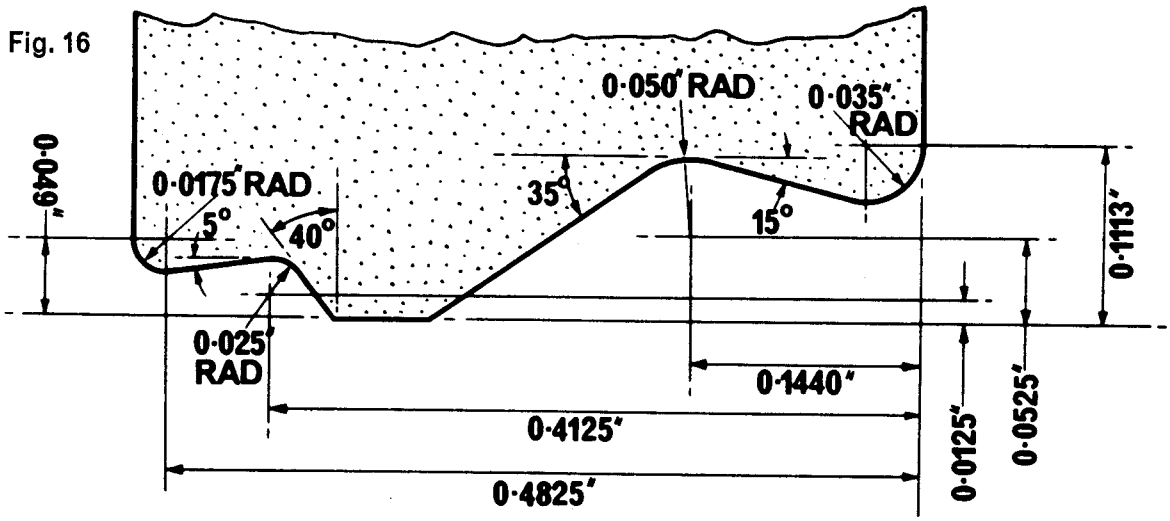


Set the right hand angle setting stop to 0° and the left hand angle setting stop to 34° 54'. Move the diamond to the right 0.1145 inches using the cross slide. Rotate the radius arm and at the same time feed the diamond in on the depth control slide until the 0.1 inch concave and convex radii and the face B blend. The micrometer depth control should read zero at this point. (4 turns further on than the concave radius settings).

8. Withdraw the diamond and move it to the right 0.008 inches using the cross-slide. Set the left hand angle setting stop to 0° and the right hand angle setting stop to 35°. Wind in the depth control slide and dress the radius and tangent until they blend with the previously dressed 0.1 inch radius, again the micrometer on the depth control should read zero. At the same time dress the right hand tangent by lifting the right hand centralizing stop and allowing the diamond to run off the edge of the wheel. This profile is now complete and ready for grinding the form.

Example 2

Fig. 16



1. Set the diamond point on the centre line of the graticule and position right hand angle setting stop to 90° and the left hand angle setting stop to 0°. With the radius arm against the 0° stop and locked in position with the locking knob move the cross-slide to bring the wheel central with the graticule so that the 1 inch movement of the tangent slide can be used to dress the width of the wheel. Bring the diamond into contact with the wheel using the depth control slide and dress the periphery using the tangent slide. With the diamond in this position set the depth control slide to zero by loosening the locking ring and positioning the micrometer ring at zero and re-tightening.

2. Move the cross-slide to bring the right hand side of the wheel on the centre line of the graticule. Position the radius arm against the 90° angle setting stop and lock in position using the locking knob. Bring the diamond into contact with the side face of the wheel and dress lightly by raising the right hand centralizing stop and using the tangent slide. With the diamond in this position set the cross-slide to zero by loosening the locking ring, position the micrometer ring at zero and re-tightening. Both datum faces are now fixed.

3. With the diamond still set to zero radius, position the diamond arm onto the 0° angle setting stop. Withdraw the diamond from the face of the wheel using the depth control slide and set the diamond to a 0.050 inch radius forward of the graticule centre line. Move the diamond 0.1440 inches to the left to the centre line of the 0.050 inch radius.

4. Lock the tangent slide between the centralizing stop. Set the right hand angle setting stops to 35° and the left hand angle setting stops to 15°. Gradually feed the diamond into the wheel using the depth control slide, at the same time rotating the diamond through the complete arc from stop to stop. At the end of each arc movement raise the appropriate centralizing stop to form the 35° and 15° tangents. Raise only one stop at a time and lower the stops before the radius is dressed. The diamond is fed forward a total distance of 0.1025 inches (0.050 inches + 0.0525 inches) from the zero setting. One complete turn of the micrometer drum equals 0.050 inches movement of the depth control slide.

5. Withdraw the diamond well clear of the wheel using the depth control slide and move it to the left 0.2685 inches, using the cross-slide, to the centre line of the 0.025 inch radius. Set the diamond point to a 0.025 inch radius forward of the graticule centre line. Set the left hand angle setting stop to 50° and the right hand angle setting stop to 5°. Dress the radius and two tangents by rotating the diamond arm through the complete arc and raising the appropriate centralizing stops to form the 5° and 40° tangents. Continue dressing the form until the depth control denotes correct depth of .0375 inches (.025 inches + .0125 inches).

Withdraw the diamond using the depth control slide and set the diamond point to 0.0175 inch radius forward of the graticule centre line. Move the diamond to the left 0.070 inches to the centre of the 0.0175 inch radius, using the cross slide. Set the left hand angle setting stop to 90°, the right hand angle setting stop stays at 5°. Dress side of wheel with stop set at 90°. Feed in the diamond on the depth control slide and dress the radius to blend with 5° tangent. Withdraw the diamond and set to a 0.035 inch radius to the rear of the graticule. Using the cross slide move the diamond to the right to a position 0.035 inches left of the right hand side and form 0.035 inch radius until it blends with 15° angle.

Example 3 (female radiusing)

To grind this form two wheels are needed. For dressing both forms standard diamonds are used for the reference faces and a 256D female radiusing attachment for the detailing (see page 24).

Wheel B

1. Set the diamond point to the centre line of the graticule. Set the left hand angle setting stop to 0° and the right hand angle setting stop to 90°. With the radius arm against the 0° stop and locked in position with the locking knob move the cross slide to bring the wheel central with the graticule so that the 1 inch movement of the tangent slide can

be used to dress the width of the wheel. Bring the diamond into contact with the wheel using the depth control slide and dress the periphery using the tangent slide. With the diamond in this position set the depth control slide to zero by loosening the locking ring and positioning the micrometer ring at zero and re-tightening.

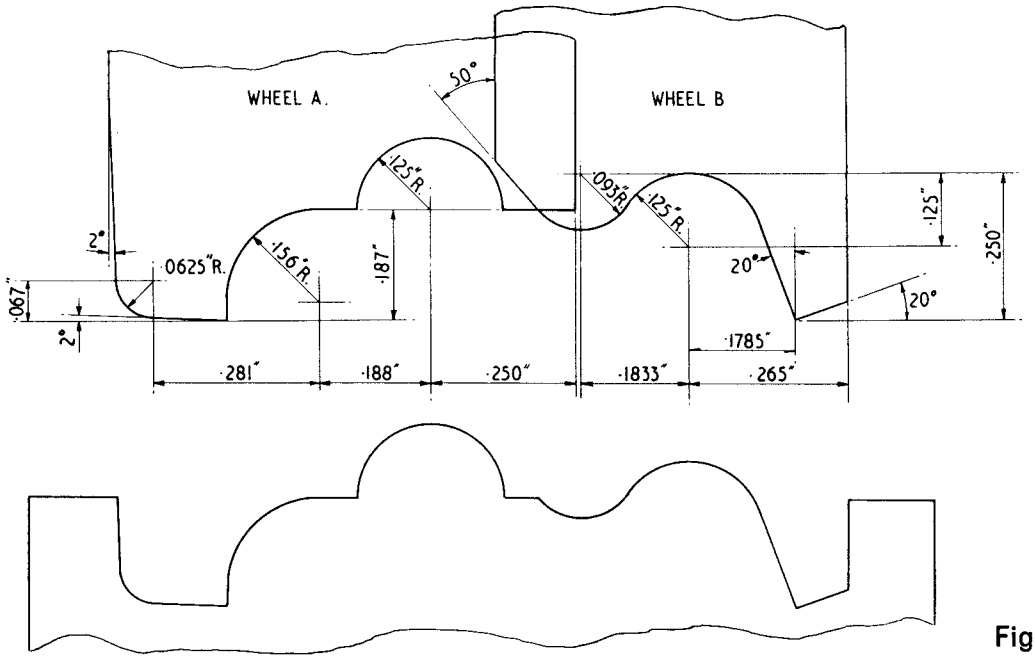


Fig. 17

2. Move the cross slide to bring the right hand side of the wheel on the centre line of the graticule. Position the radius arm against the 90° angle setting stop and lock in position using the locking knob. Bring the diamond into contact with the side face of the wheel and dress lightly by raising the right hand centralizing stop and using the tangent slide. With the diamond in this position set the cross slide to zero by loosening locking ring, positioning the micrometer at zero and re-tightening. Both datum faces are now fixed.

3. Withdraw the diamond from the wheel using the depth control slide. Remove the diamond and fit a female radiusing diamond 256D. Set the diamond point to a radius of 0.125 inches forward of the graticule centre line and feed 0.265 inches to the left to the centre line of the 0.125 inch radius. Set the left hand angle setting stop to 70° and the right hand angle setting stop to 45° (the radius blend angle). Form the 0.125 inch radius by feeding in the diamond on the depth control slide and at the same time swinging the diamond arm through the complete arc. At each end of the arc raise the appropriate centralizing stop and dress the 45° and 70° angle. Feed into a depth of 0.125 inches beyond the original depth control slide zero setting. The depth and size of the form can be checked using the graticule.

4. Withdraw the diamond. Set the diamond point to zero on the graticule and the right hand angle setting stop to 20° Feed the diamond 0.1785 inches to the right. With the diamond against the 20° angle setting stop and locked in position with the angle locking knob, feed in the diamond on the depth control slide to dress the 20° angle. The two angles should come to a sharp point when the depth control setting is zero. Withdraw the diamond.

5. Move the diamond to the left, 0.2618 inches to the centre line of the 0.093 inch radius. Set the right hand angle setting stop to 45° and the left hand angle setting stop to 50°. Feed in the diamond using the depth control slide and dress the 0.093 inch radius until it blends with the 0.125 inch radius. At the same time form the 50° tangent. This completes the dressing of the first wheel.

Wheel A

6. Set the standard diamond to zero radius on the graticule, set the right hand angle setting stop to 90° and the left hand angle setting stop to 0°. With the diamond arm on the zero setting stop, held in position with the angle locking knob, dress the front face of the wheel and set the depth control slide to zero in this position. Similarly with the diamond arm on the 90° setting stop, held in position with the angle locking knob, dress the right hand side face of the wheel and set the cross feed slide to zero in this position. Both datum faces are now fixed.

7. Withdraw the diamond from the wheel using the depth control slide. Remove the diamond and fit a female radiusing diamond 256D. Set the diamond point to a 0.125 inch radius forward of the graticule centre line. Set both the left and right hand angle setting stops to 92° and move the diamond approximately 0.250 inches to the left of the centre of the 0.125 inch radius using the cross-slide. Feed the diamond forward using the depth control slide, at the same time swinging the diamond through the complete arc. Feed the diamond forward a total distance of 0.187 inches plus 0.125 inches. The depth of the form can be checked with the graticule.

Withdraw the diamond and set the diamond point to zero radius on the graticule. Set both the angle setting stops to 0°. Lift the right centralizing stop and dress to remove the excess wheel to the right of the 0.125 inch radius to a depth of 0.187 inches read from the depth control slide micrometer.

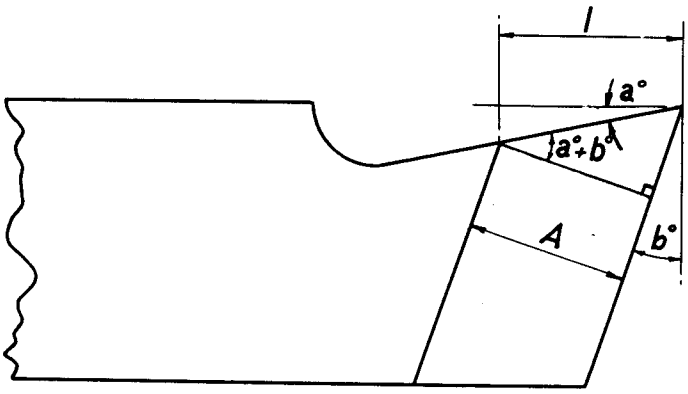
8. Withdraw the diamond and feed to the left 0.188 inches to the centre of the 0.156 inch radius. Set the diamond point to a radius 0.156 inches forward of the graticule centre line. Set the right hand angle setting stop to 90° and the left hand angle setting stop to 0°. Form the 0.156 inch radius by swinging through the 90° arc and lifting the centralizing stops to form the 90° tangents either side using the tangent slide. Feed forward 0.031 inches to reach the required depth of 0.187 inches.

9. Withdraw the diamond and move it 0.281 inches to the left. Set the diamond to a radius of 0.150 inches to the rear of the graticule centre line. Set the angle setting stops to 88° and 2° to the left. Set the front edge of the grinding wheel 0.067 inches below the graticule centre line so that the centre line of the 0.0625 inch radius as shown in the diagram is on the centre line of the graticule. Feed the diamond in using the radius setting slide so that the radius being formed is gradually decreasing in size. At the same time form the 2 tangents to the radius. Continue until the diamond point reaches a radius of 0.0625 inches. At this point the 2° tangent on the front edge should meet the 90° tangent.

Correcting Form Tools

When dressing wheels which are to be used for forming cutting tools that have front and top rake, it is necessary to make correction to the depth of the form on the wheel.

Figure 18



	CONSTANT (A)		
a°	b=6°	b=8°	b=10°
2°	.9909	.9854	.9787
3°	.9890	.9830	.9757
4°	.9872	.9805	.9727
5°	.9854	.9781	.9696
6°	.9835	.9756	.9666
8°	.9798	.9707	.9604
10°	.9761	.9657	.9542
12°	.9723	.9607	.9479
15°	.9665	.9530	.9383

By using the following formulae the amount of correction necessary can be determined.

$$A = \frac{1}{\cos a} \times \cos(a+b) = \frac{\cos(a+b)}{\cos a}$$

where A=the depth of the form required on the grinding wheel
1=the depth of the form required to be turned.
for example: A tool having a 5° top rake and an 8° front rake alters a depth of 0.25″ by

$$\frac{\cos(5°+8°)}{\cos 5°} = 0.9781$$

0.250″ x 0.9781″=0.2445″, the true depth of form on the grinding wheel.

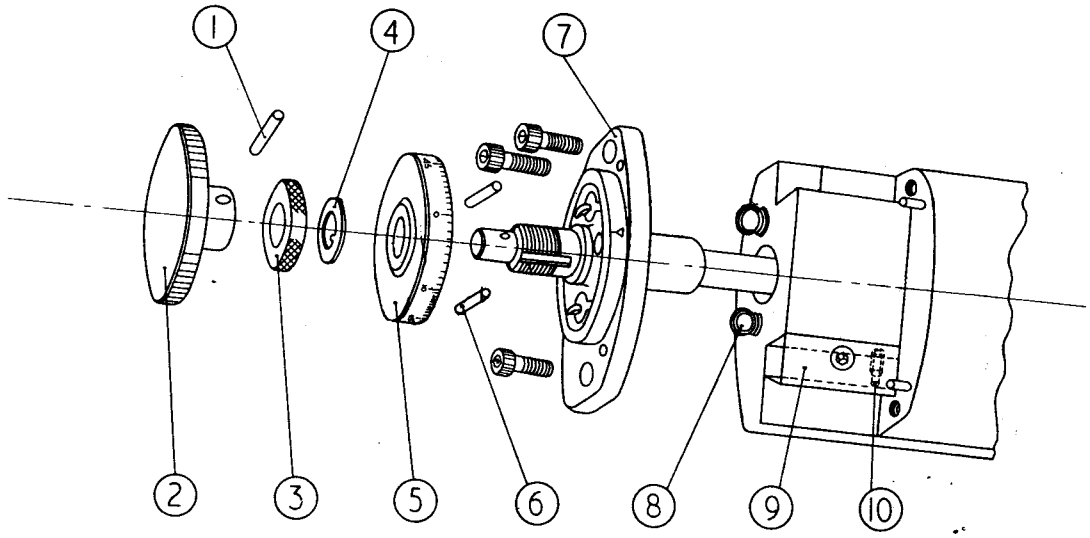
MAINTENANCE

The slides

To get the best results from the Optidress check all slides regularly and adjust for wear if necessary. The slides are fitted with adjustable sections on the male dovetail slides.

Cross-slides ((Fig. 19)

(Fig. 19)



When adjusting the cross slides use the following method:

a. Remove the taper pin (1) (Fig. 19) and take away the hand wheel (2).

b. Unscrew the lock nut (3) and remove it together with the tag washer (4) and micrometer dial (5).

c. Remove the two pins (6) retaining the backlash eliminating springs.

d. Remove the three cap screws retaining the index plate (7) and take away complete with the measuring screws (8). It will be necessary to turn the measuring screw until it is free of the machine nut.

e. Take the slides apart and thoroughly clean with paraffin.

f. Slacken the three cap screws retaining the adjustable dovetail section (9).

g. Lightly adjust the two grub screws (10) in the side of the dovetail section until the wear is taken up.

h. Tighten the three cap screws and re-check the fit of the dovetail. It is possible that the tightening of the screws will alter the fit slightly. If this happens the dovetail piece should be tapped lightly with a mallet, until the adjusting screws are in contact with the register face.

i. Lightly smear the slides with oil and re-assemble in the reverse order.

Radius Setting Slide (Fig. 20).

This can be dismantled and adjusted by lifting the centralizing stops (6), undoing the two cap screws (7) retaining the index plate and then following the sequence given for the cross-slides leaving out a, b and c.

Tangent Slide

This slide is operated by a rack and pinion and the following procedure should be used for adjustment.

a. Remove the six screws (1 Fig. 20), three on each side of the slide, and allow the transparent cover to slide into the house.

b. Remove the four screws (3) holding the two covers (2) and lift the covers in the direction of the arrow (A) clear of its retaining pegs. Remove the cover.

c. Remove the two screws (4) from each of the two end stops and remove the stops.

d. Take the slides apart and thoroughly clean with paraffin.

e. Adjust the dovetail keys as described above from f onwards. When re-assembling the slide be sure that the transparent cover is tight over the slide. The cover is tensioned by loosening the 8 BA screw in the end of the spindle (5) and turning the spindle (5) in the direction of the arrow (B) a maximum of nine turns. Then re-tighten the 8 BA screw.

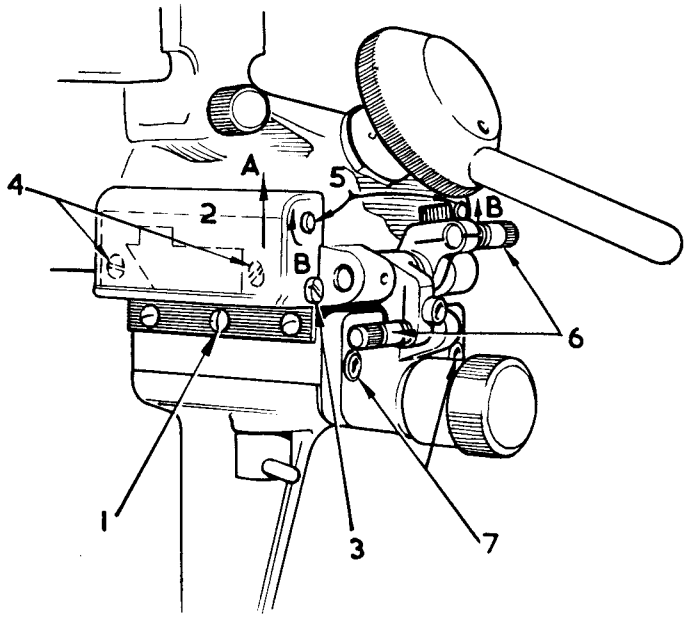
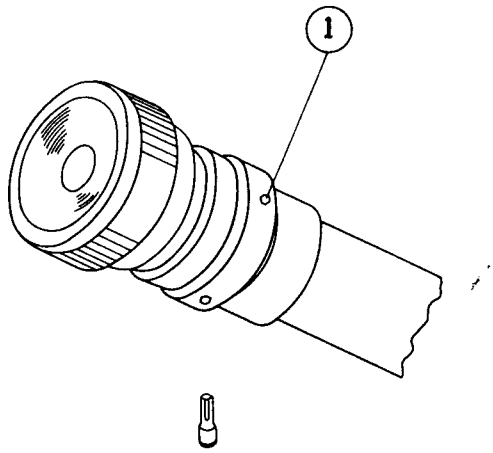


Fig. 20

The Microscope (Fig. 21)



With use, the axis of the microscope may become out of line with that of the diamond pivot so that it is necessary to adjust the graticule.

The microscope graticule is held between four adjustable grub screws (1). These should be slackened and tightened alternately until the axis of the graticule is true to that of the diamond. Tighten these screws only sufficiently to hold the graticule and slacken only one screw at a time otherwise the graticule will go out of adjustment.

Illuminator (Fig. 22)

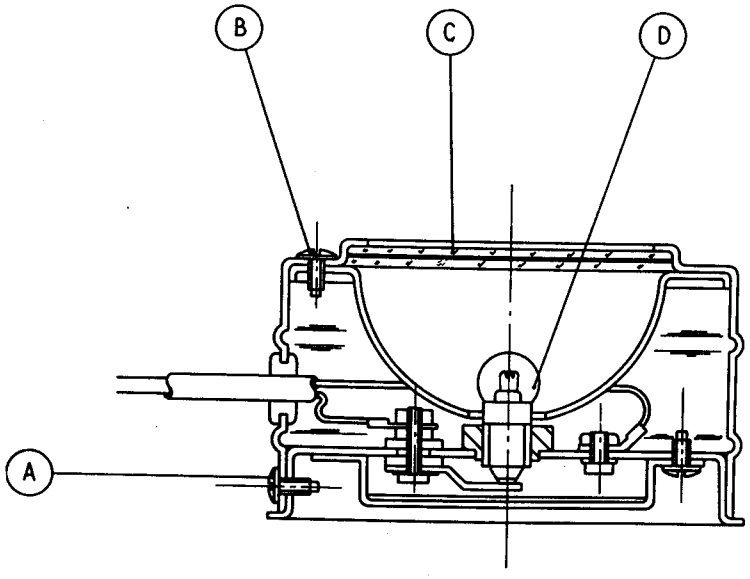
To renew the bulb (D) remove the three screws (A).

To renew the diffusion screen (C) remove the three screws (B) also. Do not overtighten these screws when re-assembling.

Replacement bulbs are 6v 3w M.E.S. 11 mm.

The transformer is 200 — 250v input 6v — 15va output.
or 100 — 120v input 6v — 15va output.

Fig. 22



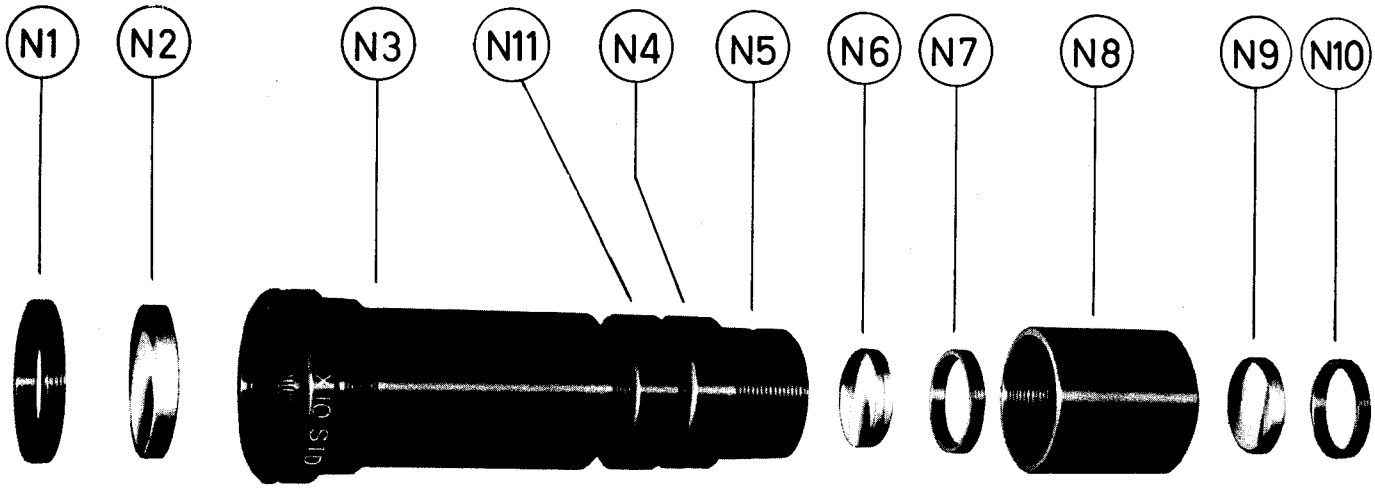
OBJECTIVE LENS SERIES II (Fig. 23)

If it should be necessary to dismantle the objective lens cell for cleaning or adjustment use the following instructions for assembly and adjustment:

a) Assembly

When re-fitting lenses or cover glasses it is important that the locking rings that retain them in their cells are not over-tightened. Over-tightening will cause strain in the glasses and impair their optical quality.

Fig. 23



1. The achromatic lens N.9 is fitted in its cell N.8 with the curved surface facing downwards.

2. The achromatic lens N.6 is fitted in its cell N.5 with the curved surface facing upwards.

3. The lens cells N.5 and N.8 complete with lenses are then screwed together until the inner cell N.5 butts up to the end shoulder of the outer cell N.8.

4. The cells are then unscrewed 4 complete turns — this gives a good initial setting.

5. The 2 cells with lock rings N.4 are then screwed into the objective body N.3 three or four turns.
6. Refit the objective cover glass N.2 and lock ring N.1.
Before attempting to adjust the objective for magnification or focus, make sure that the cover glass is fitted correctly. The completely assembled objective is then ready for setting and adjustment.

b) Adjustment to obtain correct magnification

1. Adjust the eyepiece to bring the graticule sharply into focus.
2. Fit a test bar (0.375 inches diameter for English graduations or 10 mm diameter for metric graduations) in the Optidress diamond arm.
3. Slide the objective into the microscope until the image of the test piece appears sharp in the eyepiece.
4. Carefully hold the objective in the focused position and check the size of the image against the graticule scale.
5. If this image is small when compared against the graticule it will be necessary to screw the lens cell N.5 into the cell N.8 and so bring the lenses closer together. The lens cells should be adjusted one complete turn and then the size of the image checked again against the graticule scale. This is repeated until the correct magnification is obtained. When the magnification is nearly correct, smaller increments than one complete turn will be necessary to avoid going past the correct magnification.
If the image is larger when compared with the graticule the opposite method of adjustment should be used.
6. The locking ring N.4 must be locked against the lens cell N.5. Take care not to upset the adjustment of the two cells.

c) Setting the objective body

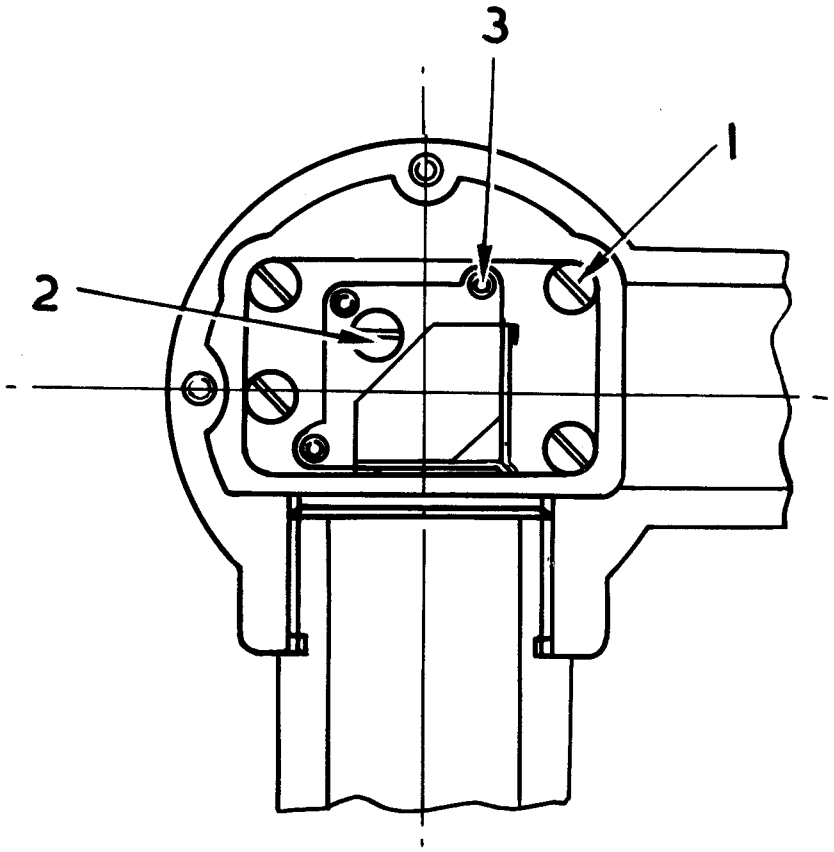
1. Screw the two upper cells N.8 and N.5 into the objective body N.3 approximately $\frac{3}{8}$ inch (9,5 mm).
2. Screw the objective body complete with lens cells into the microscope tube until the image of the test piece appears sharp in the eyepiece.
3. Continue screwing the objective body into the microscope tube and carefully note the number of complete turns and parts of a turn necessary to bring the shoulder of the objective onto its seating.

4. Remove the objective from the microscope.
5. Screw the locked lens cells N.5 and N.8 into the objective body the identical amount of turns noted in 3.
6. Lock the cells in the objective body with the second locking ring N.11.
7. Refit the objective into the microscope and check for size and magnification.
8. Lock the objective firmly into the objective tube.

d) Adjustment for re-centering the optical axis

1. Adjust the 4 graticule centralizing screws (Fig. 21) so that the graticule mount is held centrally to the eyepiece.
2. Remove the prism cover plate.
3. Fit a diamond into the diamond arm.
4. Adjust the diamond point to pivot about the optical axis, that is a point where the tip of the diamond remains in a fixed position in relation to the graticule when pivoted through the 180° of arc.
5. Slightly slacken the 4 large headed screws (1 Fig. 24) retaining the prism back plate.

Fig. 24



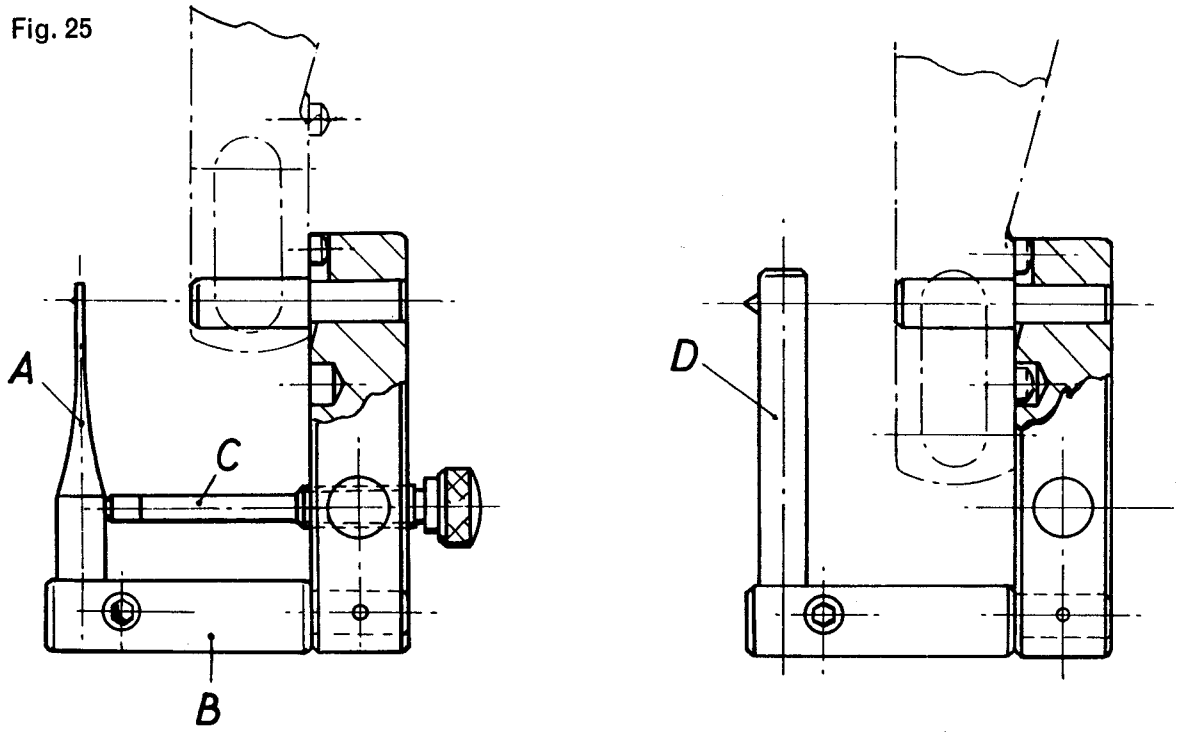
6. Tilt the prism plate to bring the image of the diamond point coincident with the horizontal axis of the graticule when set at both 90° positions.
7. Carefully tighten the 4 large headed screws.
8. Slacken the screw (2 Fig. 24) retaining the prism mount to the back plate two complete turns.
9. Adjust the top right jacking screw (3 Fig. 24) to bring the diamond point coincident with the vertical axis of the graticule when set at 0°.
10. Tighten the prism mount retaining screw.
11. Check accuracy of centralisation. If within 2 divisions *i.e.* 0.01 inch English graduation, 0,2 mm Metric graduation, complete with centralisation by displacing the graticule the desired amount with the four graticule centralising screws (Fig. 21).
The same procedure for objective adjustment applies to X10 extended focus objectives.

USING THE 180° FEMALE RADIUS DRESSING ATTACHMENT

Fitting the Diamond Holder

The 180° radiusing attachment is used in place of the standard diamond when forming full 180° female radii. The attachment locates on the diamond arm in one of two positions as shown in Fig. 25. The diamond holder locates on dowel pins and is locked in position with a knurled screw.

Fig. 25



Fitting and setting the diamond

The diamond (A Fig. 25 rat-tail and D Fig. 25 Chisel Point) locates in a hole in the diamond holder (B) and is automatically aligned with the centre line of the microscope. The diamond point will require positioning about its axis to ensure that the 180° turn corresponds to the 180° ordinate on the graticule as seen through the microscope. Set the two angle setting stops (3 Fig. 2) to 90° either side of the centre and then rotate the diamond so that when the diamond arm is against the 90° stops the diamond point is on the horizontal ordinate in either direction. When the diamond is set correctly lock it in position.

Diamond Sizes

Four diamond sizes are available, these are given in the following table:

Number	*Description*	*Minimum Radius*
T663 256B	Rat Tail Diamond	0.034″ (0,87 mm)
T663 256C	Rat Tail Diamond	0.078″ (1,98 mm)
T663 256D	Rat Tail Diamond	0.117″ (2,95 mm)
T663 271	Chisel Point Diamond	0.250″ (6,35 mm)

Using the Diamond Steady

The smaller diamonds, particularly 256B, may chatter if used unsupported. To overcome this provision has been made for inserting a steady in the diamond holder (C Fig. 25). The steady comes into contact with the diamond and when screwed in causes it to deflect sufficiently to dampen the movement of the diamond. It is important that the diamond is deflected by the correct amount. Too much deflection will cause chatter in the same way as an unsupported diamond. Experiment will determine the correct amount of deflection but as a guide a deflection of .002 inches, that is two-fifths of a division shown on the graticule (0,050 mm or half a division for metric instruments), should produce a smooth cutting action.

Rates of Feed

When forming female radii the best rate of feed for each pass of the diamond will vary according to the size of the radius. As a guide the average feed for a .050 inch (1,25 mm) radius would be .001 inches (0,025 mm) per pass.

Types of Grinding Wheel

When forming wheels which include female radii do not use wheels with a grit coarser than 100 or harder than H or G. Coarse grit wheels are not suitable for forming small radii and may tear the diamond from its seating.

VARIATIONS OF THE OPTIDRESS

Micrometer adjustment for the radius setting slide. *(Now fitted as standard)*

The horizontal and vertical scales of the graticule are marked in 0.005 inch or 0,01 mm divisions. To position the diamond accurately between these spaces a micrometer adjustment can be fitted into the radius slide in place of the plain thimble.

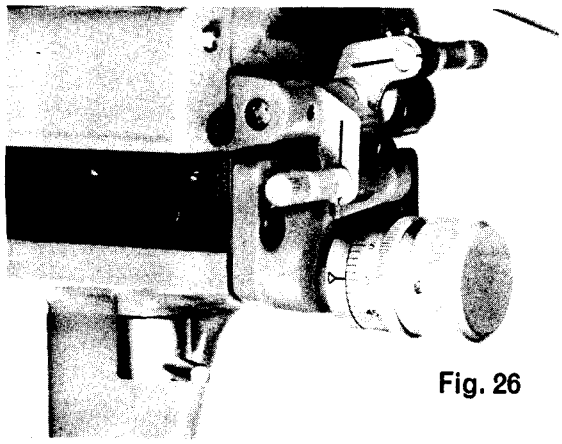


Fig. 26

A detachable diamond arm

When the Optidress is used fitted to a Tool & Cutter Grinder it can be supplied with a diamond arm that is detachable so that the working area is left free during grinding. When the arm is relocated it fits against a positive stop and does not require adjustment.

Diamonds

The Optidress is supplied with the following diamonds as optional extra.

Type	*Shank Diameter*	*Diamond Radius*	*Overall Length*	*Number*
Rougher	0.375″ (10 mm)	0.020″ (0,50 mm)	3″ (75 mm)	T663-36
Finisher	0.375″ (10 mm)	0.010″ (0,25 mm)	3″ (75 mm)	T663-37

An alternative diamond holder is available with the diamond mounted at an angle of 15°. This is a more expensive mounting but results in longer diamond life.

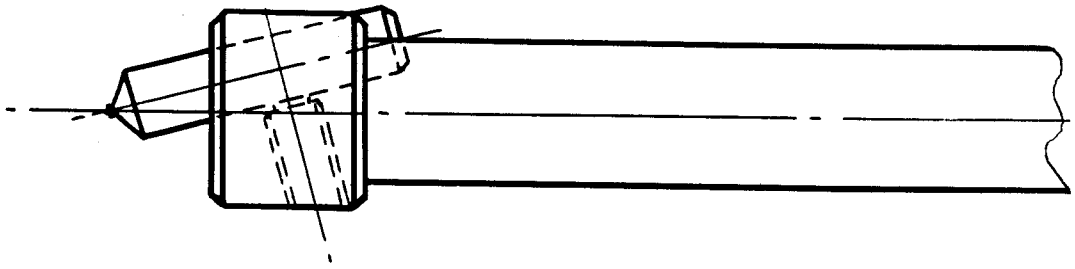


Fig. 27

Auxiliary Stops

Auxiliary Stops can be fitted to the angle setting ring to supplement the angle setting stops. These enable intermediate angles to be set and will lift clear when not required.