

# **OMT TOOLMAKERS MICROSCOPE**

**This is a copy of a set of notes which came with the instrument**

**There were 3 other documents with it. Some were simply advertising pamphlets.**

**These have been copied and saved in files called**

- 1/ OMT-Notes**
- 2/ OMT-Pamphlet1**
- 3/ OMT-Pamphlet2**
- 4/ OMT-Booklet**

Peter Smith



INSTRUCTION BOOK



TOOLMAKER'S  
MICROSCOPE

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OPTICAL MEASURING TOOLS LTD 314 MONTROSE AVENUE TRADING ESTATE SLOUGH BUCKS



INSTRUCTION BOOK for



TOOLMAKER'S  
MICROSCOPE

*Mr. Gooding  
Newall Machine Tools 544 6713.*

SERIAL NO. ....

CERTIFICATE REFERENCE NO. ....

DATE. ....

INSTRUMENT SUPPLIED TO. ....

The operator in charge of the O.M.T.  
TOOLMAKER'S MICROSCOPE has the  
greatest need for this publication. Extra  
copies will be gladly furnished on request.



## UNPACKING & CLEANING INSTRUMENT ON ARRIVAL AT WORKS

This is a delicate, precision instrument and, as such it has been packed with great care to avoid any damage during transit to your works. It has arrived at your works in two cases, one contains the main instrument and the other holds the equipment.

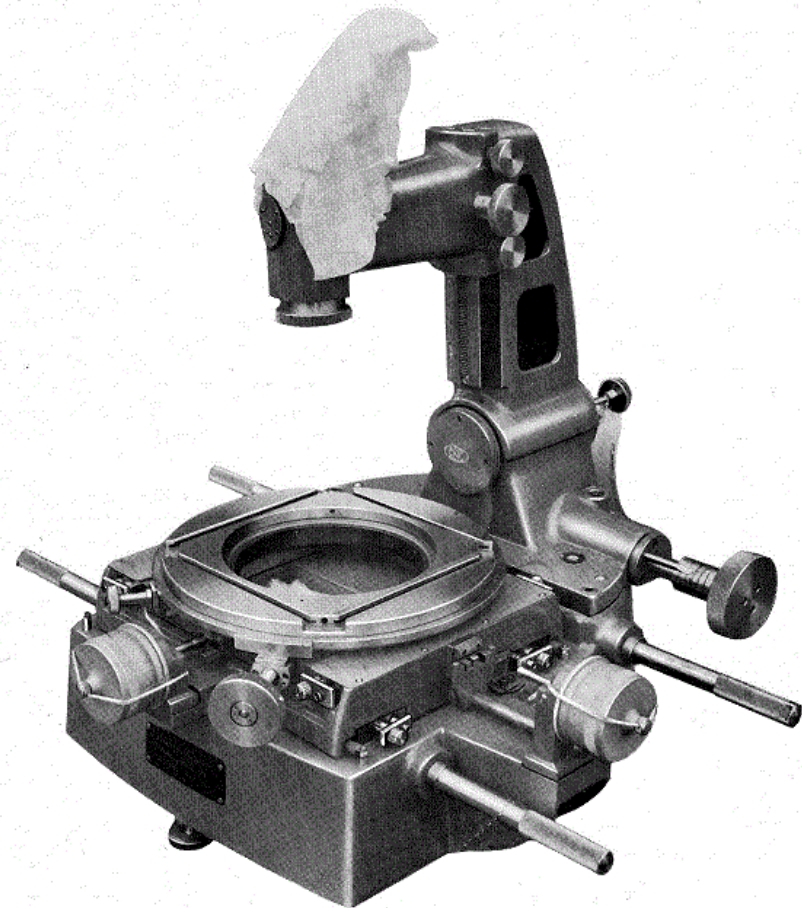
The instrument is fastened by blocks in the case to obviate any jar or movement during shipment; these should be removed as carefully as possible, especial care being taken not to mark the instrument by bars or jemmies used for prising the blocks away. There are four lifting handles which screw in tapped holes on each side of the base casting and the microscope should be lifted from the case by hand, *not by crane*.

Having taken the instrument out, it will be noticed that the carriage ways are held in position by angle pieces (painted red), see illustration No. 1, and by stops inserted in the end of the carriage ways. An Allen Key is provided to remove these, and the diagram gives their position. When these are removed it is necessary to screw in the eight ball guide stops, one in the end of each Vee guide. If at any time the instrument has to be moved any distance, these restrainers should be replaced. The protective grease coating can be easily removed by Kerosene, paraffin or petrol.

The equipment is packed in a separate case and the items should be taken out, cleaned and then restored in the compartments provided.

The glass workplate, it will be noted, is packed separately in the packing case and, after cleaning both sides thoroughly with chamois leather cloth, insert it into the recess provided in the worktable. Screw the four clamping screws only sufficiently tight to prevent the workplate from rotating.

Set the instrument on the table or bench on which it will be used and by adjusting the three feet, level the instrument to the spirit level built into the main base.



View showing instrument with carriage stops  
in position for transportation.

ILLUSTRATION No. 1

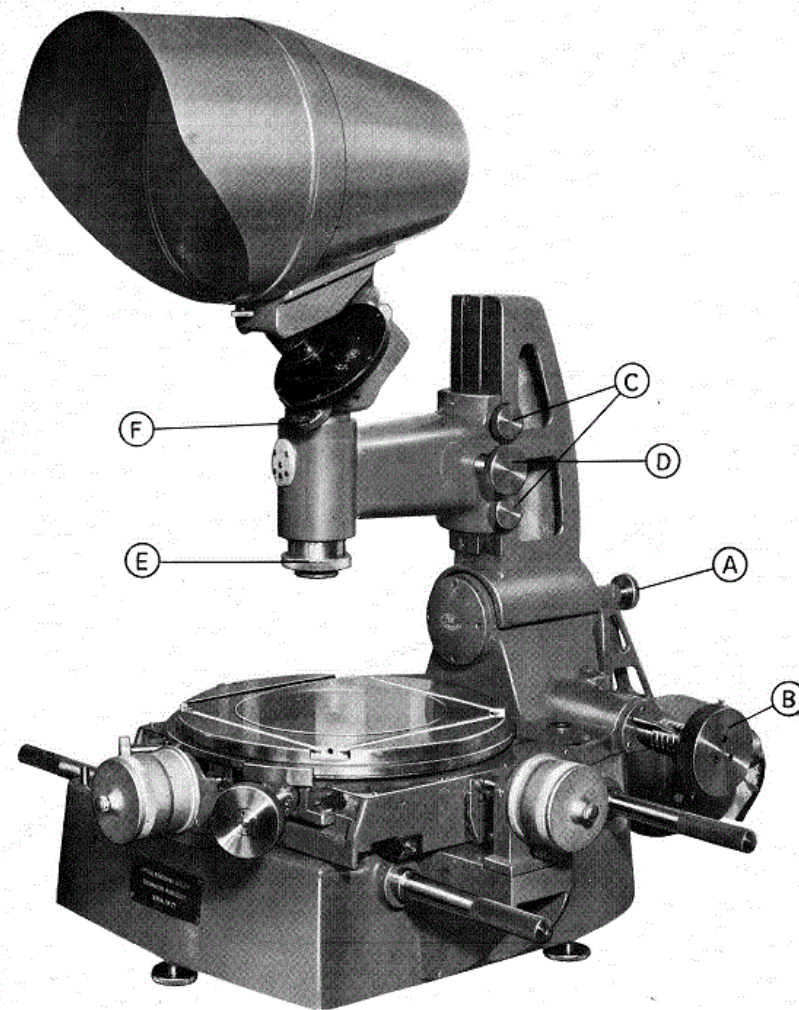
## SETTING UP INSTRUMENT FOR INSPECTING THREADED WORK

For inspecting screw threads of Whitworth, B.A., Metric, U.S.S., or any other formation, it is necessary to use the respective template ocular, containing the full range of these threads. This should be positioned in the hole on the top of the microscope arm in line with the table movement by means of the spring loaded plunger and is locked by the captive screw. In the top of the ocular head is a hole to carry the projection prism unit. When fitting this, make sure that the white lines on the rotating eyepiece marked "P" are coincident; the prism unit can then be located in its correct position by the pin provided. Next insert the projector hood into the stirrup hole provided on the microscope arm and position over the ocular by means of the key and slot provided. See illustrations Nos. 2 and 3.

At the rear of the instrument insert the projector lighting unit, locating on the screwed peg and tightened by means of a knurled nut (A). On the upper face of the ocular head will be found the magnification notation thus "3x" or "1x" as the case may be. The corresponding objective to this magnification should then be taken and be screwed into the bottom of the microscope tube.

Illumination is effected by a 6 volt 24 watt lamp, the filament of which should be adjusted relative to the optical axis, by means of the following procedure.

Set the rake scale on the column to zero by revolving the knurled wheel (B). Place on to the glass worktable, directly under the microscope tube, the lamp centring gauge with the inserted circular plate uppermost so that the light beam completely covers the aperture. The diaphragm should then be opened to its fullest extent, the adjustment of which is effected by the large knurled ring (G) attached to the lighting unit at the rear of the base of the instrument.



Setting up instrument for inspecting threaded work.

ILLUSTRATION No. 2



## SETTING UP INSTRUMENT (continued)

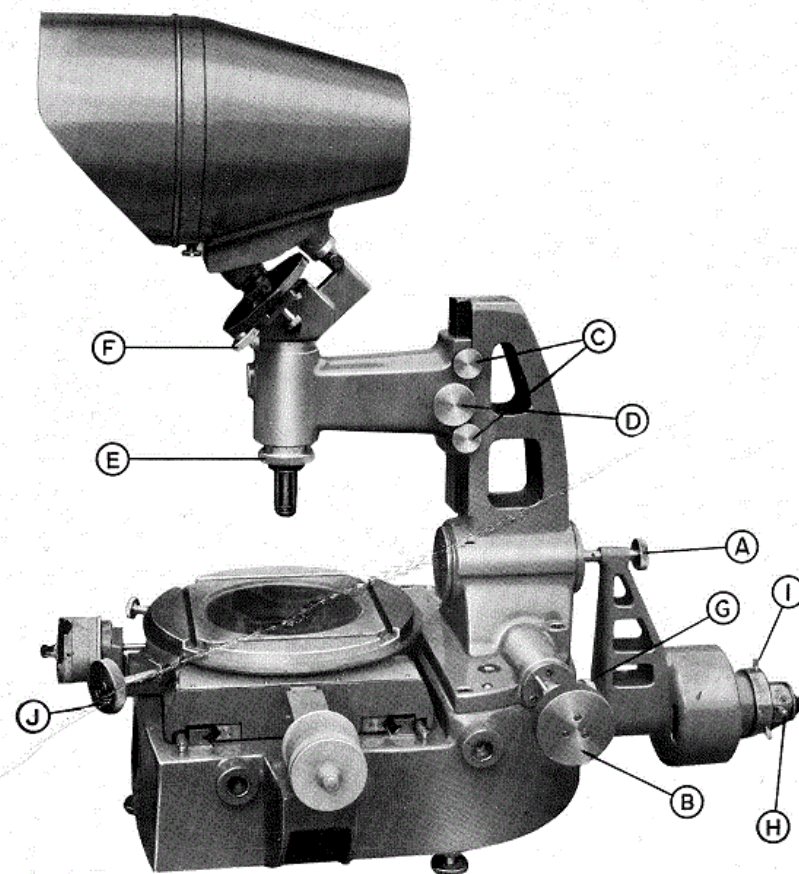
The two locking screws (H) on the lamp housing should then be released and the lamp moved either in or out until a sharp image of the filament is seen on the glass screen of the gauge.

Directly in front of the two locking screws will be found three adjusting screws (I). These should be manipulated until the filament is truly central in the light beam. Set the diaphragm adjusting ring to the line marked "S" and the instrument is ready for use.

Mount the threaded work to be checked in the centres cradle and set the rake scale on the column to the approximate helix angle. By slackening the two small knurled head screws (C) on the right side of the microscope arm, coarse adjustment can then be made for focussing by means of the large knobs (D) one on each side of the microscope arm and until an image of the work is projected on the ground glass projection screen. Lock the arm in that position and by means of the large knurled ring (E) at the bottom of the microscope tube finely adjust until the image has a sharp and distinct outline.

By means of the knurled thumb screw (F) on the underneath side of the ocular head, revolve the graticule until the  $90^\circ$  cross line is coincident with the zero graduation of the angular scale on the right hand side of the screen.

Using the transverse micrometer, bring the image of the outside diameter of the thread to the crossline and adjust the worktable circumferentially by the knurled knob (J) until the crossline and the image of the tops of the thread representing the outside diameter are parallel.



View showing instrument with template ocular and 6x objective, and showing components referred to in paragraph "Setting up instrument for inspecting threaded work."

ILLUSTRATION No. 3

## SETTING UP INSTRUMENT (continued)

Turn the fine adjustment focussing ring until the image of the thread is "out of focus." It will now be observed that there is a clear and narrow diffused band of light on the inside of the flanks of the image. This will in all probability be unsymmetrical or thin on one flank and wide on the other, showing that the light beam is not set correctly to the helix angle of the thread. This should be corrected by altering the rake or helix adjustment of the column until the diffused band is equidistant from both flanks. Now turn the focussing adjustment ring until the image is in focus and equally sharp on both flanks.

Revolue the graticule by means of the thumb screw until the reference line of the respective thread form required is brought coincident with the zero graduation on the angular scale. If the thread under inspection is correct, its projected image and the respective thread form on the graticule, can be brought into absolute coincidence. If incorrect, the graticule can be slightly rotated and the thread-form be brought into coincidence when errors in the flank angle can be observed on the angular scale, also errors in the various elements such as radii on top and bottom of the thread, flank straightness and depth of thread.

## TO MEASURE FULL AND CORE DIAMETERS OF A THREAD

For measurement of this thread element the rake scale should be set at the correct helix angle of the thread under inspection in the manner previously described and the crossline of the template ocular used. By means of the knurled knob on the ocular, revolve the graticule until the broken line of the crossline is coincident with the zero on the angular scale. Then rotate the transverse micrometer until the image of the crest of the thread to be inspected breaks this crossline. Note the micrometer reading. Continue revolving the transverse micrometer until the image of the opposite thread crest appears on the screen. Note on the rake adjustment scale the number of degrees the column has been tilted from zero and tilt the same amount in the opposite direction. The image can now be brought to break into the crossline of the graticule and the micrometer reading taken. The difference between the two readings will give the major diameter of the thread. To measure the minor or core diameter of a thread, adopt the same procedure as above, but, instead of bringing the crest of the thread to the graticule crossline, the root of the form should be used.



## TO MEASURE EFFECTIVE DIAMETER OF A THREAD

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With the reference line coincident with the zero of the angular scale and the image of the projected thread conforming to its respective form on the template ocular, note the reading on the transverse micrometer. Next, rotate the transverse micrometer until thread form of the opposite side of the screw appears on the screen. If the diameter of the workpiece under inspection is over 1", slip gauges will have to be used between the carriage and the transverse micrometer anvil. The image seen on the screen will be hazy, a condition which is caused by the fact that by moving the workpiece across the light beam the instrument is now set to the opposite rake angle. To remedy this, note on the rake adjustment scale the number of degrees the column has been tilted from zero, and tilt the same amount in the opposite direction, and the beam is once again set to the correct helix angle of the thread.

The thread form image can now be brought into coincidence with the standard outline and the reading on the micrometer noted. The difference between the two readings is the effective diameter.

## TO MEASURE PITCH OF A THREAD

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Bring the image into coincidence with the standard outline and note longitudinal micrometer reading. Rotate micrometer until the next thread form is coincident with the standard outline and again note micrometer reading. The difference between these two readings is the pitch of the screw, and at the same time it can be noted if the pitch is longer or shorter than its nominal value.

Continue rotating the micrometer so as to bring each thread successfully into the standard outline and note results.

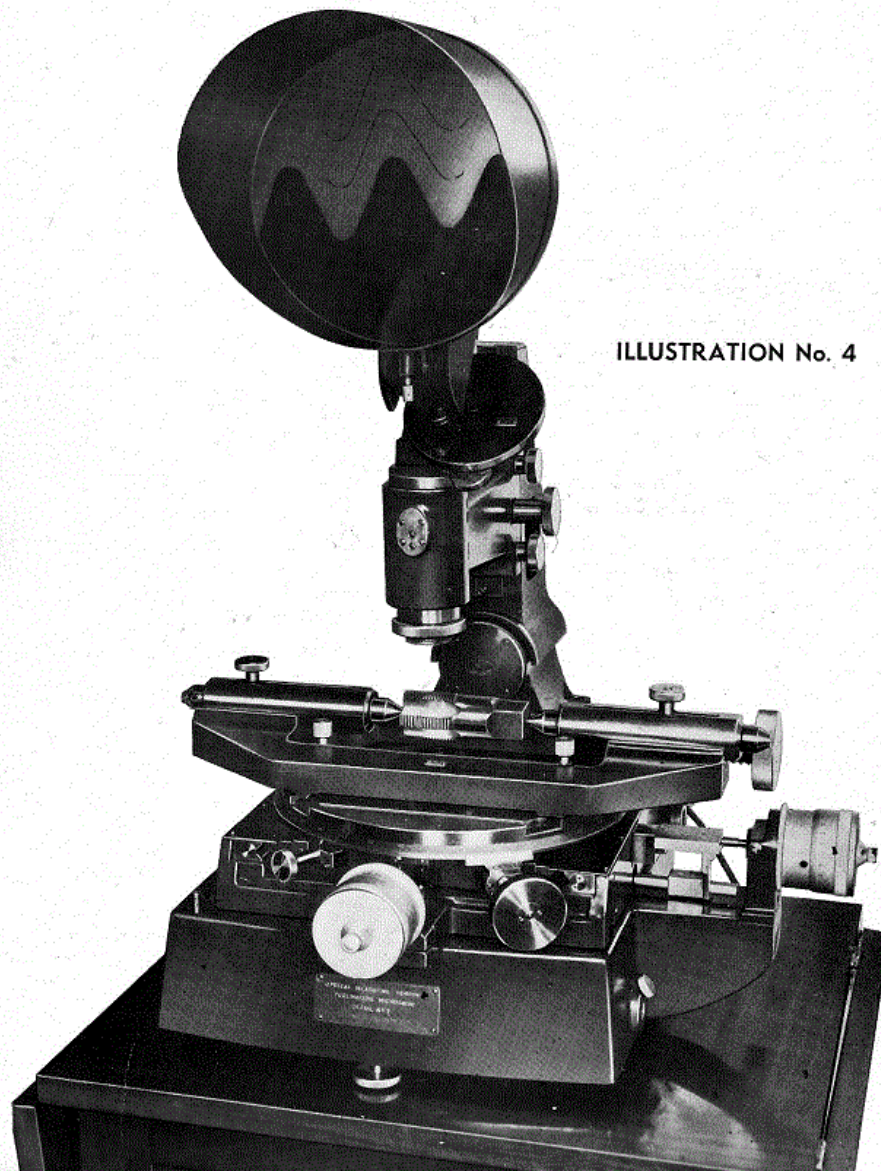
Rotate the screw on its centres through  $180^\circ$  and take a second set of readings in exactly the same manner as the first. Take the mean of the two sets of results and so eliminate the effect in the pitch measurements of any want of truth of the centres of the screw with the axis of the thread.

(See Illustration 4).



View showing instrument  
set up for checking a tap.

ILLUSTRATION No. 4



## CHECKING FLAT CONTOURS, PLATE GAUGES OR ANGLE WORK, ETC.

For checking this type of work, it is necessary to change the template ocular and in its place fit the protractor ocular. The fitting is exactly the same, but the bulb and holder for the illumination of the minute scale must be screwed into the boss directly under the minute scale eyepiece. This illumination is by a 6 volt 3 watt lamp. The rake scale should be set at zero. See illustration No. 5.

For the checking of a plate form gauge (Fig. 1) carry out the following procedure.

Clamp the gauge to the worktable by means of the clamp bar and dogs provided and adjust microscope arm until an image of the gauge faces of the work appear sharply defined on the ground glass screen.

Observe the protractor scale through the small eye-piece provided for this purpose on the ocular head and rotate the template by means of the knurled head on the left-hand side of the ocular until a zero setting is obtained. Adjust the worktable circumferentially until face A is parallel and coincident with the horizontal line on the template along the whole of its length (Fig. 2). Tighten up friction screw. All measurements are now taken without further reference to the transverse micrometer and this setting should not be subsequently altered.



## CHECKING FLAT CONTOURS, ETC.

(continued)

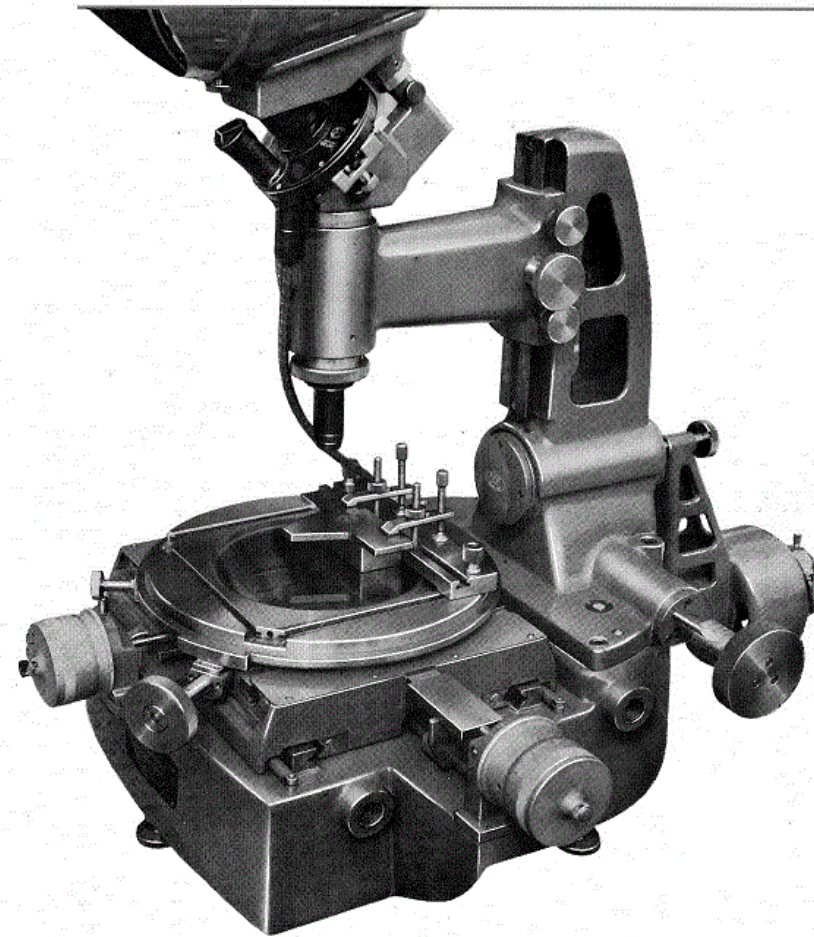
Rotate the knurled head on the ocular until the template has moved through  $27^\circ$ . Traverse longitudinal micrometer and bring face B into coincidence with the centre broken line on the template. Any error in the angle of the work will be easily detected and the template should now be moved slightly from its position until the gauge face and the standard broken line are in accurate coincidence (Fig. 3) Note angular reading and reading of micrometer.

Return template to its zero position.

By means of the projection cast on the left-hand side of the main slide move table lengthwise until an image of face C appears on the screen and position by inserting a standard slip block between the micrometer anvil and the fixed anvil on the compound table. The size of this slip block to be added to the micrometer reading already obtained.

Rotate the template through  $42^\circ$  and bring face C into accurate coincidence with the centre broken line on the template and if necessary move template slightly from its position to obtain this coincidence (Fig. 4). Note angular reading and micrometer reading.

Thus we have obtained the measured values of the  $27^\circ$  and  $42^\circ$  angles and the difference between the two micrometer readings is the measured length of A terminated by the points of intersection of sides B and C.



View showing the instrument set up for inspecting plate gauge work, using clamping bar, protractor ocular and 6x objective.

ILLUSTRATION No. 5



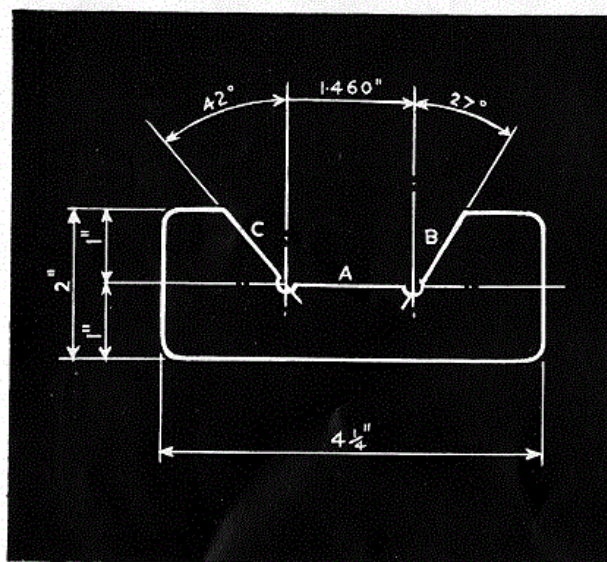


FIG. 1

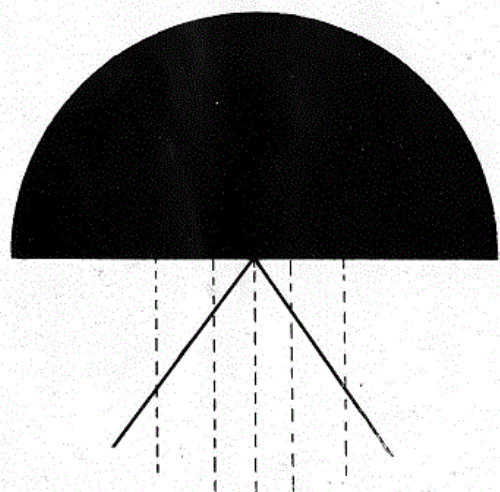


FIG. 2

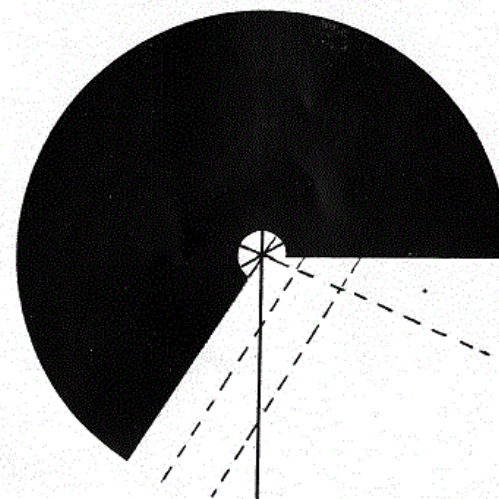


FIG. 3

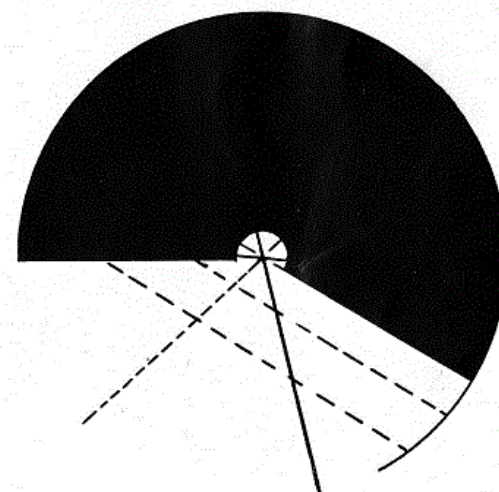


FIG. 4



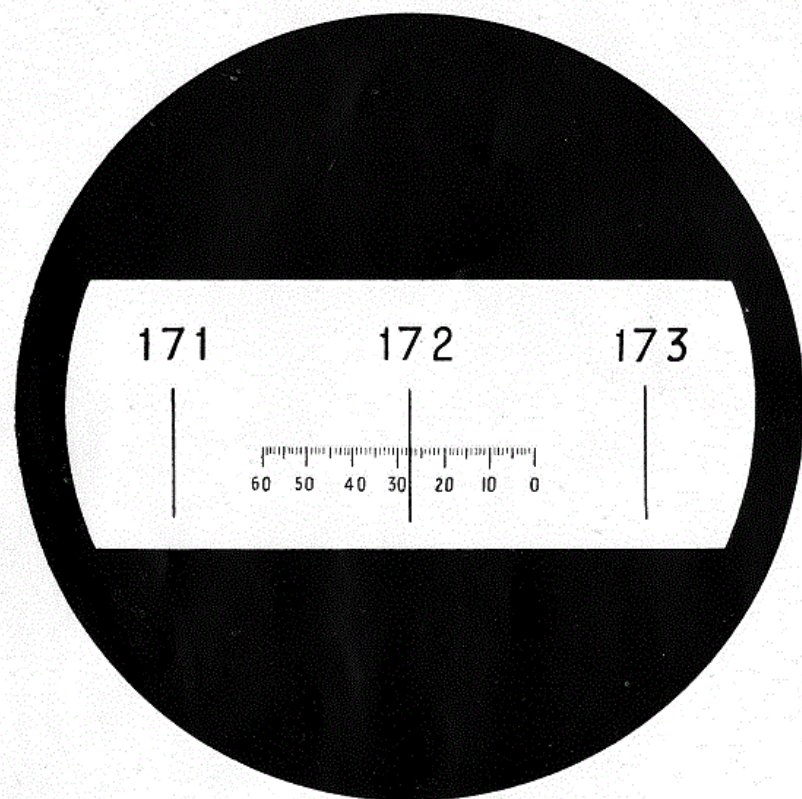
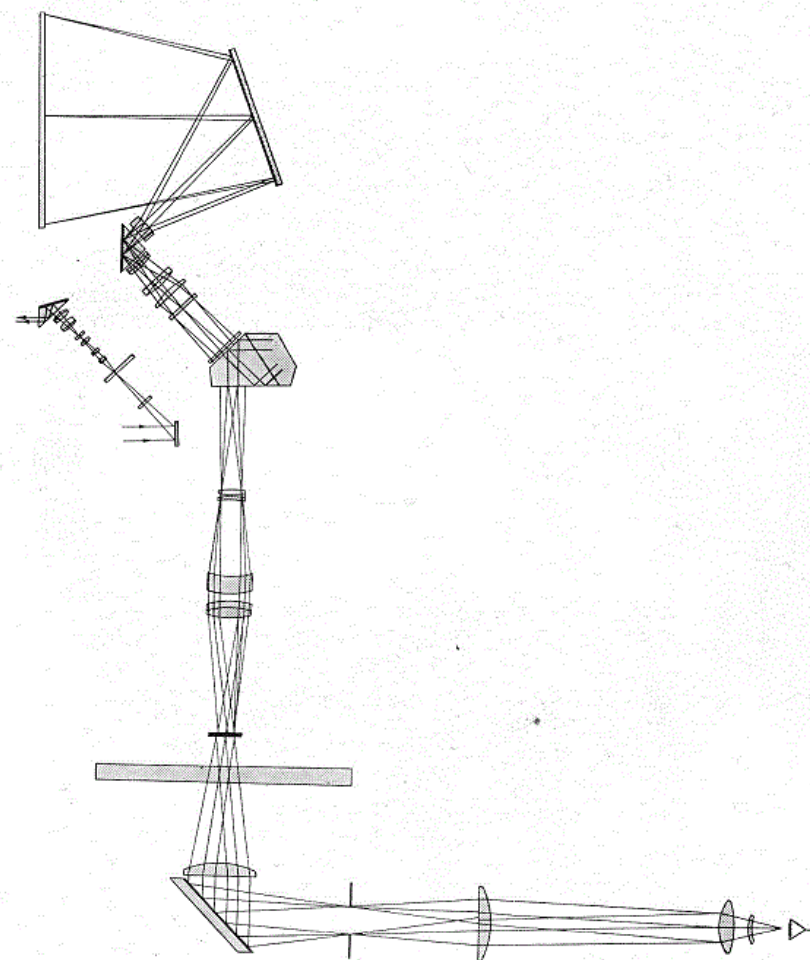


FIG. 5

PROTRACTOR SCALE AS  
VIEWED THROUGH THE  
EYEPIECE



OPTICAL LAYOUT FOR  
TOOLMAKER'S MICROSCOPE



## USE OF THE SURFACE LIGHTING UNIT

This unit is designed for the measurement of engraved lines on a surface where it is impossible to have the light beam passing around the work to be checked, for comparison of surface finishes, the checking of spacings of "blind" holes, etc. See illustration No. 6.

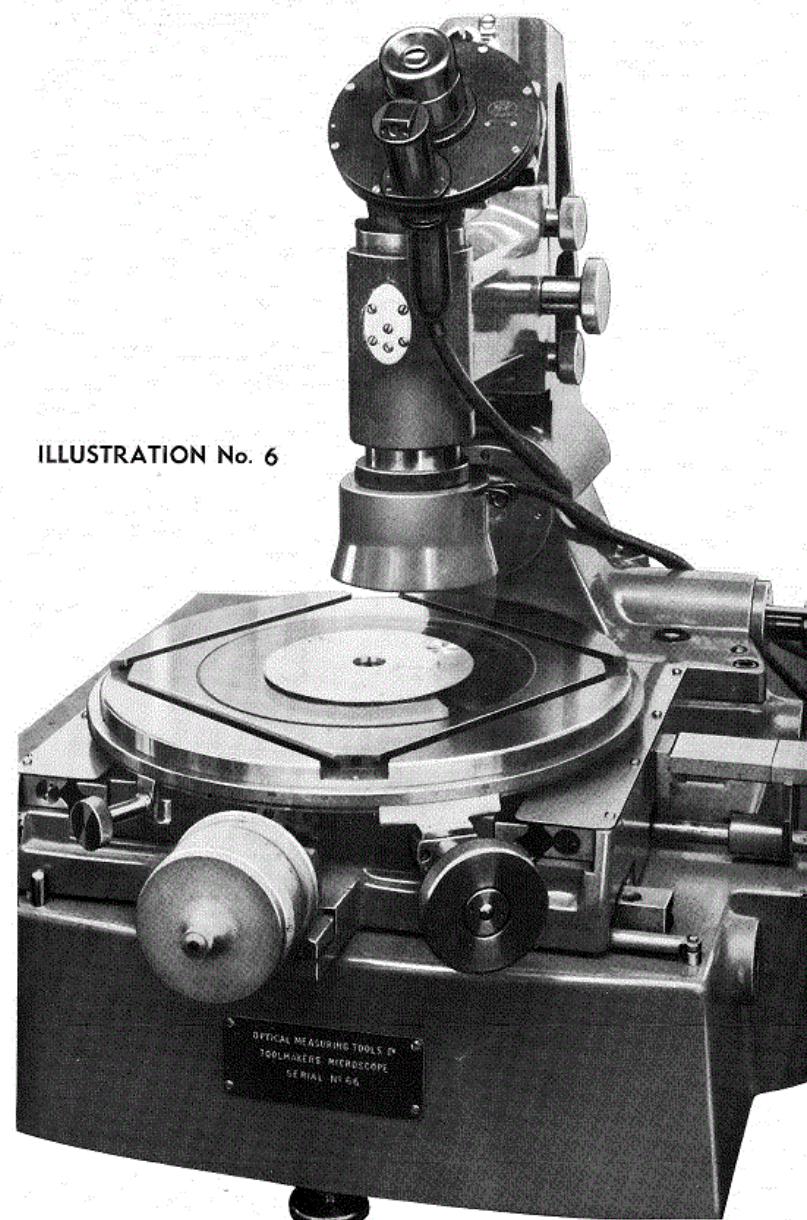
For this type of work the Projection lighting unit is discarded and the templet ocular is used. Fasten this on the Prism box in the normal way, remove the Projection Prism and in its place fit the eyepiece. Take the Surface Lighting unit and place this on the bottom of the appropriate objective. You will find a turned groove around the knurled portion of this and in this groove the Surface Lighting unit will fit by means of the circlip. Connect the flex to the transformer, place the object to be checked on the workplate and focus in the normal way, viewing the work through the eyepiece in the ocular. Spacings, angles, etc., are taken in exactly the same way as with the projection system fitted.

If necessary all the settings and checks on the work previously described can be viewed through the ocular instead of being projected.

To use the instrument in this way, remove the projection lighting unit and in its place fit the green filter lamp. Take away the projection hood and remove the projection prism and in its place put the ocular eyepiece. All settings and readings are taken in the same way previously described.

It is not necessary to centre the filament of this lamp.

ILLUSTRATION No. 6



Close-up showing protractor ocular with external illumination.



## GENERAL INFORMATION AND POINTS REQUIRING CAREFUL ATTENTION

Before using the instrument for any work, make sure the lamp filament is correctly centred.

Ensure that all outside optics are clean and free from dirt or finger marks. This would seriously affect the sharpness of the image.

*NEVER* rub the surface of the mirror in the projection hood. Should this need clearing use a camel hair brush or very soft chamois leather, and then dust the mirror very lightly.

Avoid scratching the glass workplate. Scratches would tend to scatter the light.

Never move the instrument from one shop to another without first fixing in position the small angle pieces and stops.

Do not loosen *any* of the screws. By doing so you may affect the accuracy of the instrument and will nullify any guarantee, written or implied, that may be given.

## AVAILABLE EQUIPMENT

Toolmakers' Microscope with Projection Lighting Unit.  
Projection Hood.  
Protractor Ocular.  
Template Ocular.  
Green Filter Lighting Unit.  
Centres Cradle.  
Adjustable Vee Supports.  
Vee Clamp Bar.  
Surface Lighting Unit.  
Lamp Centring Gauge.  
Centres Focussing Gauge.  
Clamp Bar with Two Clamps.  
Scale Rule.  
Transformer.  
Set of Slip Gauges consisting of:  
English—two 1", one 2", one 3", one 4" and one 5", or  
Metric—two 25m/m., one 50m/m., one 75m/m., one 100m/m and one 125m/m.  
Polished Equipment Cases, or  
Polished Mahogany Stand with fittings to carry equipment.

## OBJECTIVE SYSTEMS

1x giving magnification of	10x on the projection screen.
3x " " " "	30x " " " "
6x " " " "	60x " " " "
10x " " " "	100x " " " "

## TEMPLATE OCULARS

- (OGO120) WHITWORTH (BSW AND BSF), B.A. AND C.E.I. AND ANGLES  
WHITWORTH (T.P.I.)—6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 19, 20, 22, 24, 26, 28, 32, 40, 48, 60.  
B.A.—0 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14.  
C.E.I. (T.P.I.)—20, 24, 26, 32, 40, 44, 56, 62.  
ANGLES—60°, 55°, 47°, 30°, 90°.  
All at 3x.
- (OGO122) AMERICAN, U.S.S., WHITWORTH AND ANGLES  
AMERICAN, U.S.S. (T.P.I.)—6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 20, 22, 24, 28, 30, 32, 36, 40, 44, 48, 50, 56, 64, 72, 80.  
WHITWORTH—6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 19, 20, 22, 24, 26, 28, 32, 40, 48, 60.  
ANGLES—55°, 60°, 90°.  
All at 3x.
- (OGO121) INTERNATIONAL METRIC, WHITWORTH AND ANGLES  
INTERNATIONAL METRIC M/M Pitch—0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0.  
WHITWORTH (T.P.I.)—4, 4½, 5, 6, 7, 8, 9, 10, 11, 12, 14, 16, 18, 19, 20, 22, 24, 26, 28, 32, 40, 48, 60.  
DOUBLE ANGLES—55°, 60°, 30°, 40°, 90°.  
Vertical and Horizontal Scales.  
4 mm. long, subdivided .02 mm. divisions.  
All at 3x.
- (OGO123) NATIONAL ACME U.S.A. AND EDISON B.S.S.  
NATIONAL ACME (T.P.I.)—2, 4, 5, 8, 10, 12, 14, 16, 1x.  
EDISON B.S.S.—E40, E27, E14, E10. 1.5x.
- (OGO125) RADIUS OCULAR, METRIC  
M/M RADII—From 25 mm. to 80 mm. inclusive in increments of 1 mm.  
ANGLE 90°—Cross Line. 1x.
- (OGO124) RADIUS OCULAR (METRIC)—0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.5, 1.8, 2.0, 2.2, 2.5, 2.8, 3.0, 3.2, 3.5, 3.8, 4.0, 4.2, 4.5, 4.8.  
All at 3x.  
5.0, 5.2, 5.5, 6.0, 6.5, 7.0, 8, 9, 10, 12, 15, 18, 20, 22, 25, 28, 30, 32, 35, 38, 40, 42, 45, 48, 50, 55, 60.  
From 5.0 to 60 1x.  
ANGLE 90°—Cross Line.
- (OGO126) RADIUS OCULAR (ENGLISH)  
1/64" to 13/64" rad. in increments of 1/64". 3x.  
7/32" to 3/4" rad. in increments of 1/64". 1x.  
ANGLE 90°—Cross Line.