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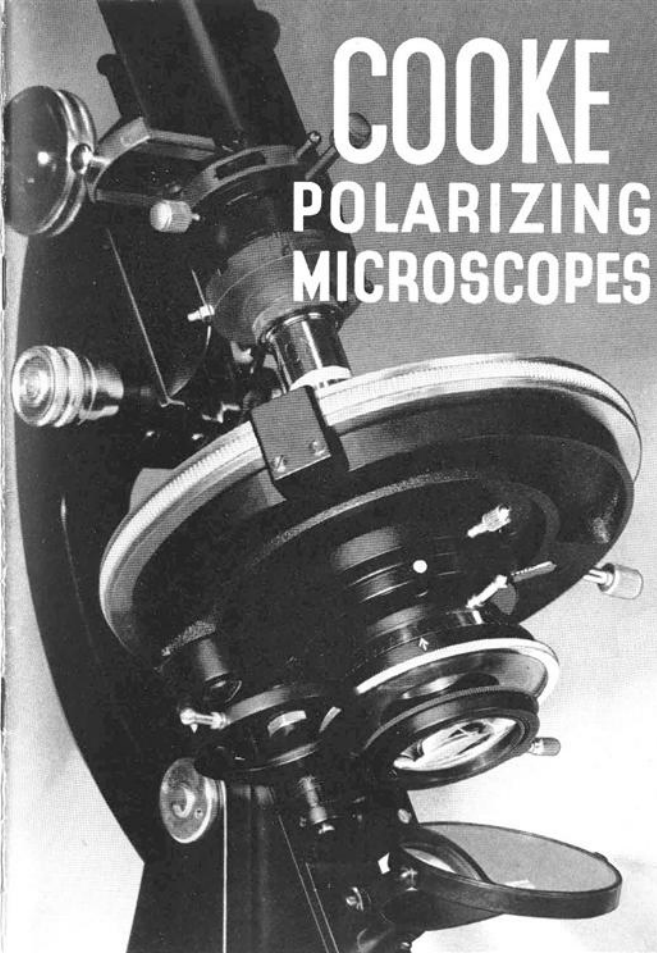
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COOKE POLARIZING MICROSCOPES



POLARIZING APPARATUS

Polaroid screens are employed as polarizing agents in all polarizing microscopes listed in this catalogue. These screens consist of a specially prepared film mounted between two glass discs, which has the property of polarizing the light in the same way as the Nicol prism formerly used exclusively for this purpose; it possesses, however, some advantages which have an important bearing upon the design of the instrument.

1. Due to the small thickness of the Polaroid screen as compared with the Nicol prism, when used over the eyepiece as an analyser the eye may be positioned close to the eyepiece, which is not possible when a Nicol prism is employed, hence the objection to the eyepiece analyser largely disappears.

2. The Nicol prism necessarily introduces some astigmatism into the system by virtue of its construction, and to eradicate this it is necessary to collimate the light before it passes through the prism and to reverse the process on emergence. Thus, two additional optical components are necessary to achieve freedom from astigmatism. The use of Polaroid screens obviates this complication entirely, furthermore, in all except the Elementary models, when the analyser is out of action, a compensating disc of glass is automatically introduced, hence the focusing adjustment is unaffected by the admission or removal of the analyser.

3. Owing to the difficulty and expense of constructing large Nicol prisms of aperture corresponding to that of an ordinary microscope condenser, it has been the practice to use a condenser of much smaller diameter, approximating to that of the prism, whilst retaining the usual numerical aperture. The resulting short focus condenser is, however, unable to illuminate a sufficiently large area to fill the field of the lower power objectives, and thus it becomes necessary to furnish an additional condensing system of low numerical aperture and long focal length. In practice, both systems are usually combined in a single component which is provided with a device for disengaging one element of the unit when using the low power objectives. The need for this complication is entirely dispensed with by the use of Polaroid screens which may be obtained in the largest useful size, and therefore the condenser may be of sufficiently long focus to fill the field of the lower power objectives and yet have the numerical aperture necessary to enable the high power objectives to be used to the best advantage. Condensers of this type are employed in all polarizing instruments described in this list.

As designs are constantly subject to revision the illustrations and particulars herein may not be correct in every detail.

SALES AND ENGINEERING AGENTS

THE R. Y. FERNER CO.**110 PLEASANT ST. BOSTON 48, MASS.**

COOKE POLARIZING MICROSCOPES

SALES AND ENGINEERING AGENTS

THE R. Y. FERNER CO.**110 PLEASANT ST. BOSTON 48, MASS.**

DEVELOPED AND MANUFACTURED BY

Cooke Troughton & Simms
LTD

York, London, Birmingham, Cape Town and Johannesburg

M7001



ELEMENTARY POLARIZING MICROSCOPE

This instrument, whilst possessing the essential features for elementary studies, is of the simplest form of construction. It is provided with Polaroid polarizer and analyser and a revolving graduated stage.

The stand is of sturdy construction and is fitted with a hinge which permits any inclination of the microscope between vertical and horizontal. Coarse and fine focusing adjustments are provided.

The stage is of 120 mm. diameter and possesses a rotary movement and clamp. It is graduated in 360 degrees, figured every ten degrees, and read by vernier to 6 minutes. An attachable mechanical stage (M7734, page 13) can be supplied except on instruments with revolving objective changers.

The substage contains an Abbe condenser, an iris diaphragm, a fitting for the insertion of a filter or diffuser, and a Polaroid polarizer. The polarizer is not provided with a graduated ring, but it can be turned in its mount, if desired. The arrangement is shown on pages 4 and 28 (M7364). Alternatively, a graduated polarizer with a catch at each 90° position may be substituted, as shown on pages 8 and 28 (M7363).

The 7× and 10× eyepieces, which contain cross lines, are retained in their proper axial position by a key and slot, and the cross lines are focused by turning the eye-lens cell.

The analyser (M7361), which is of Polaroid, is contained in a cap that is hinged to a sleeve which passes over, and is clamped to, the eyepiece tube, thus the analyser may be instantly thrown out of action. Further, the correct axial relationship of the analyser to the rest of the system is assured by a key in this sleeve which enters a slot in the body tube.



Analyser M7361

The objective mount is provided with a two-way centring adjustment which gives the means for optically centring the intersection of the eyepiece cross lines with the axis of rotation of the stage.

A conventional triple revolving objective changer may be fitted, as illustrated on page 4, or, alternatively, the cone changer system which provides an individual centring adjustment for each objective, when the mounts can be so adjusted that the axial alignment of cross lines and stage will not be appreciably disturbed by a change of objective. The arrangement is shown on page 9.

An aperture for the insertion of compensators, etc. is provided.

A reversible mirror having plane and concave sides is fitted.

The instrument is finished in crystalline and semi-bright enamel with bright parts plated.

A hardwood case is included which has provision for the accommodation of accessory equipment.

M7001 Elementary Polarizing Microscope, as described, with triple revolving objective changer.

M7010 Elementary Polarizing Microscope, as M7001, but with cone objective changer system with individual centring adjustment, as shown on page 9. Two centring cone adaptors (M7659) are included.

M7659 Additional centring cone adaptors for M7010.

M7368 Extra for substitution of graduated polarizer, with 90° catches (M7363) in place of ungraduated polarizer (M7364). These fittings are illustrated on page 28.

M7734 Attachable Mechanical Stage with movements of 30 mm. in two directions at right angles for use with M7010 only. A scale read by vernier to 0.1 mm. is provided for each movement. Will accommodate object slides of various sizes up to 3 in. × 1 in.

INTERMEDIATE POLARIZING MICROSCOPE

This microscope has been constructed to meet the need for a high-grade polarizing microscope, but without some of the refinements supplied on the Research model.

The Stand resembles that used in our well-known M1000 series of microscopes. It is fitted with an inclination joint to permit the microscope body to be tilted to any position between vertical and horizontal. The coarse focusing slide is of dovetail construction, and the rack teeth are cut obliquely so that several are simultaneously engaged, which results in smooth and regular movement. Means is provided to adjust the friction in order to prevent any tendency for the body to run down under its own weight. The fine focusing motion employs a bell crank lever of conventional design. The operating heads have a range of twenty revolutions and are graduated 60 divisions per revolution, 1 division = 0.002 mm. The end thrust on the worm is taken by a ball bearing.

The Object Stage is of circular design 120 mm. diameter and capable of rotation, and a clamp is provided. The stage is graduated to 360 degrees, figured every 10 degrees, and a vernier enables readings to 6 minutes to be taken. An attachable mechanical stage (M7734) can be supplied except on instruments with revolving objective changers.

Bertrand Lens. This unit is fitted to microscopes M7021 and M7031, and is brought into action by tripping a lever on the outside of the body (Provisional Patent referred to on page 10). It is characterised by the fact that refocusing of the objective is not necessary in order to view the conoscopic interference figure.

The Analyser is of Polaroid and is housed in a sliding mount which pierces the body; the mount also carries a glass compensator which automatically comes into action when the analyser is out of position, thus the focus is unchanged on removal of the analyser. The analyser is not rotatable in the standard instruments, but it may be fitted with 90° of movement if specially ordered (M7306).

Compensators. An aperture for the insertion of compensators, etc., between the analyser and the objective is provided.

Eye-piece fittings. The 7× and 10× eyepieces, which contain cross lines, are retained in their proper axial position by a key and slot, and the cross lines are focused by turning the eye lens cell.

Objectives and Eyepieces are not included under the above code numbers. They are listed on pages 29 and 30.

M7021



Centring Adjustment. The objective mount is provided with a two-way centring adjustment which gives the means for optically centring the eyepiece cross lines with the axis of rotation of the stage.

Objective Changers. Microscopes M7020 and M7021 are fitted with the conventional triple revolving changer which will receive any objectives screwed with the standard R.M.S. thread. Microscopes M7030 and M7031 are fitted with the cone changer system which provides an individual centring adjustment for each objective, and thus the various objectives can be so adjusted in their respective mounts that the axial adjustment of eyepiece cross lines and the stage is not appreciably disturbed by a change of objective.



Wave Plates. For workers requiring it the 25 mm., 8 mm., 4 mm. and 1.8 mm. objectives are supplied with a slot cut through the mount for the insertion of wave plates, etc. Such an objective is shown above.

The Substage contains an Abbe type condenser, an iris diaphragm, a fitting to receive a filter or diffuser, and a Polaroid polarizer. The polarizer has a rotary movement and is graduated at intervals of 15° with a catch at each 90° position. The Abbe condenser may be removed when desired.

The Mirror having plane and concave sides is reversible and is provided with the necessary adjustments.

Finish. The instrument is finished in crystalline and semi-bright black enamel with bright parts plated. A hardwood case is included which has provision for the accessory equipment.

SUMMARY

CODE	Objective Changer	Body
M7020	Triple	without Bertrand lens.
M7021	Triple	with Bertrand lens.
M7030	Cone	without Bertrand lens.
M7031	Cone	with Bertrand lens.

Extras :

M7306 90° rotation movement to analyser.

M7659 Additional centring cone adaptors. (Two are included with M7030 and M7031).

M7734 Attachable Mechanical Stage, see page 13.

Objectives and Eyepieces are not included under the above code numbers. They are listed on pages 29 and 30.

RESEARCH POLARIZING MICROSCOPE*

This instrument has been designed in consultation with, among others, officers of the Department of Scientific and Industrial Research, and embodies features due to Dr. A. F. Hallimond, of the Geological Survey and Museum, London, which are covered by Provisional Patent Application No. 24, 755/44 controlled by the Department of Scientific and Industrial Research.

Very careful consideration has been given to the Reports by the Petrological Microscope Committee instituted by the Geological Society of London and the Mineralogical Society of Great Britain and Ireland, issued to manufacturers through the British Scientific Instrument Research Association. The instrument here described corresponds closely with the Committee's recommendations for an Elementary and Advanced Student's stand.

The Stand is fitted with an inclination joint to permit the microscope body to be tilted to any position between vertical and horizontal. The coarse focusing slide is of dovetail construction and the rack teeth are cut obliquely so that several are simultaneously engaged, which results in smooth and regular motion. Means is provided to adjust the friction in order to prevent any tendency for the body to run down under its own weight.

The fine focusing motion employs a bell crank lever of conventional design, the operating heads have a range of twenty revolutions and are graduated 60 divisions per revolution, 1 division = 0.002 mm. The end thrust on the worm is taken by a ball bearing.

The body tube is made in two sizes, Microscopes M7040/60/80/100 for the reception of standard size eyepieces, and Microscopes M7050/70/90/110 for special large field eyepieces. The 7× and 10× eyepieces of both kinds have cross lines and a focusing adjustment.

Object Stage. The stage is of circular design 120 mm. diameter, capable of rotation and provided with a clamp. It has a circular scale divided in degrees and read by vernier to 6 minutes. An attachable mechanical stage (M7734) can be supplied except on instruments with revolving objective changers.

Bertrand Lens. This unit is fitted to Microscopes M7080/90/100/110 and is brought into action by tripping a lever on the outside of the body. It is characterised by the fact that refocusing of the objective is not necessary in order to view the conoscopic interference figure.

The Analyser is of Polaroid and is housed in a sliding mount which pierces the body; the mount also carries a glass compensator which automatically comes into action when the analyser is out of position, thus the focus is unchanged on removal of the analyser.

The analyser is not rotatable in the standard instrument, but it may be fitted with 90° of movement, if specially ordered (M7306).

* Described in Mineralogical Magazine, London, June, 1946, Vol. XXVII, No. 139, pages 175—185.

Compensators. There is provision for the insertion of compensators, etc., between the analyser and the objective.

Objective Centring. A two-way spring-opposed centring adjustment is fitted above the objective changer.

Objective Changers. Microscopes M7040/50/80/90 are fitted with a triple revolving changer which will receive any objective screwed with the standard R.M.S. thread. Microscopes M7060/70/100/110 are fitted with a quick-change system, as illustrated, which provides centring adjustment for each individual objective. The adaptor will also receive any objective screwed with the R.M.S. thread.



Wave Plates. For workers requiring it, the 25 mm., 8 mm., 4 mm. and 1.8 mm. objectives are supplied with a slot cut through the mount for the insertion of wave plates, etc. Such an objective is shown on page 9.

Condenser. An Abbe type condenser is fitted and can be removed at will.

Iris Diaphragm. This is situated below the Abbe condenser and is contained in the mount supporting the condenser.

Filter Holder. This is mounted immediately below the iris and will swing out of the optical train.

The Polarizer is of Polaroid and is held in a swing-out mount provided with a catch to secure positive registration. The polarizer is capable of rotation, the mount being graduated in 5° intervals and figured every 15 degrees. There is a spring catch at each 90° position.

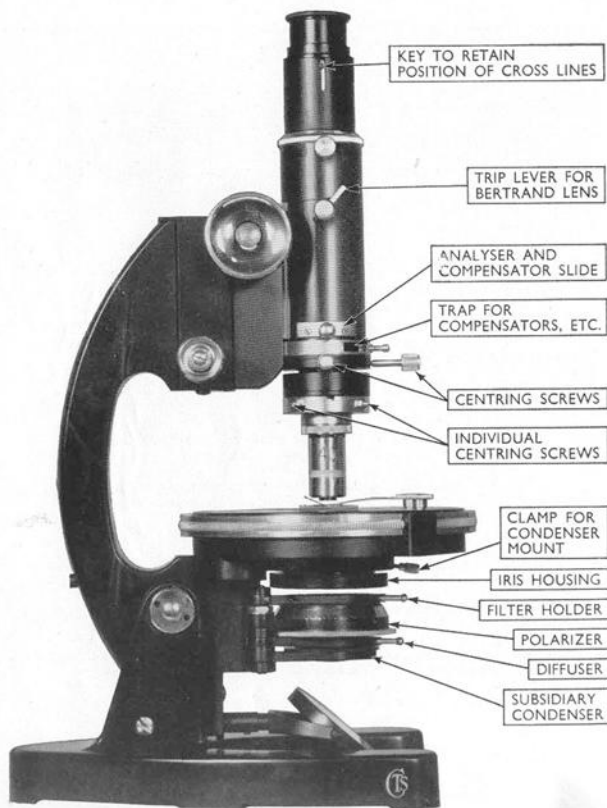
Diffuser. Beneath the polarizer is fitted a swing-out holder for a ground glass diffuser or other screens.

A subsidiary Condenser in a swing-out mount, for use with low power objectives, is provided.

The Mirror having plane and concave sides is reversible and is provided with the necessary adjustments.

Finish. The instrument is finished in semi-bright enamel and the bright parts are plated.

Case. A hardwood cabinet is provided.



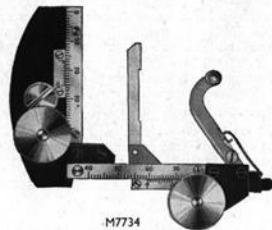
SUMMARY

CODE	Eye-piece Tubes	Objective Changer	Body
M7040	Normal field	Triple	without Bertrand lens.
M7050	Large field	Triple	without Bertrand lens.
M7060	Normal field	Quick change system	without Bertrand lens.
M7070	Large field	Quick change system	without Bertrand lens.
M7080	Normal field	Triple	with Bertrand lens.
M7090	Large field	Triple	with Bertrand lens.
M7100	Normal field	Quick change system	with Bertrand lens.
M7110	Large field	Quick change system	with Bertrand lens.

M7306 Extra for 90° rotation movement to analyser.

M7316 Additional objective adaptor with individual centring adjustment. (Two are included with M7060, M7070, M7100 and M7110).

M7734 Attachable Mechanical Stage with movements of 30 mm. in two directions at right angles for use with M7060, M7070, M7100 and M7110 only. A scale read by vernier to 0.1 mm. is provided for each movement. Will accommodate object slides of various sizes up to 3 in. × 1 in.



M7734

Objectives and Eyepieces are not included under the above code numbers. They are listed on pages 29 and 30.

ADVANCED POLARIZING MICROSCOPE

The construction of this instrument is similar to that of the M2000 series of biological microscopes, but it is fitted with polarizing equipment, which necessitates a special substage and body components incorporating the analyser, objective centring arrangement and a trap for the insertion of cover-plates. The microscope may be equipped for monocular or binocular vision, or both, and a third body containing a Bertrand lens is available for users requiring to examine interference figures. Normally, a circular revolving stage is supplied, but other types may be fitted to meet the requirements of clients.

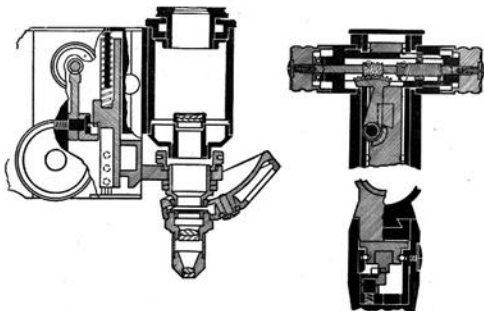
Bodies. The use of the binocular system will be preferred when long periods are to be spent at the microscope, though in the most critical examination there are sometimes advantages to be had in the use of the monocular tube, particularly having regard to the fact that with the binocular the available light is necessarily divided between the two eyes. The two bodies can be instantly interchanged, and it is quite usual for both to be supplied. The binocular is offered in two forms—straight or inclined—the reason for which is that both offer advantages and also have disadvantages, and the selection will depend on the nature of the work to be undertaken.

With the inclined type, the stage may be retained in a horizontal position, which is to be preferred when immersion objectives are in use, and is, indeed, necessary where the examination of fluid specimens is concerned. This type, however, is inconvenient when constant reference has to be made to the monocular tube containing the Bertrand Lens, which will, of course, be vertical. When the work is of such a nature as to demand this, the straight binocular may be preferred, in which case the eyepieces of monocular and binocular occupy the same position relative to the observer.

For work demanding exceptionally large fields, a special range of eyepieces has been designed, but these can only be used in the special monocular tubes (M7702 and M7726) as it is impracticable to design the binocular to accommodate these eyepieces. It follows then that when a large field monocular and also a binocular body are ordered it is necessary to duplicate the eyepieces to some extent.

An alternative type of monocular body containing a Bertrand lens may be supplied, and this similarly is made for use with either normal field eyepieces (M7725) or large field eyepieces (M7726).

The Stand. This is provided with an inclination joint to permit the microscope to be tilted to any position between vertical and horizontal, and a clamp is fitted to ensure rigidity. The coarse focusing slide is of dovetail construction, and the rack teeth are cut obliquely so that several are simultaneously engaged which results in smooth and regular motion. Means are provided to adjust the friction in order to prevent any tendency for the body to run down under its own weight.



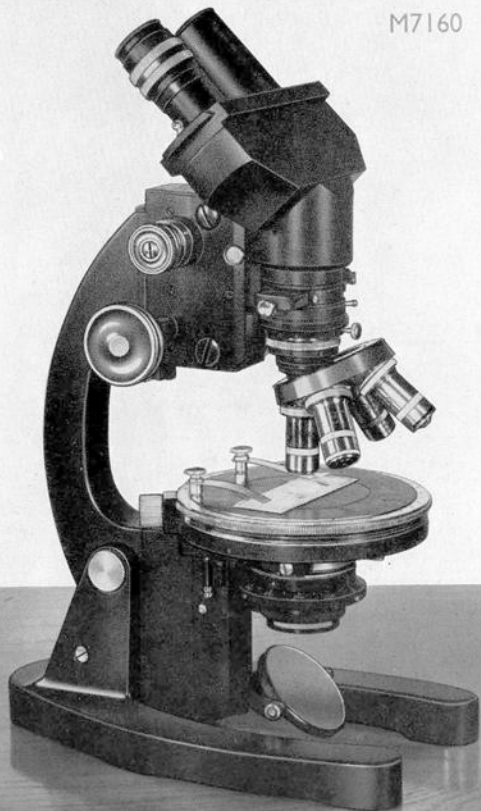
The fine focusing mechanism, Patent Nos. 467,926 and 525,970. The hatched portions are those which move on manipulation of the fine focusing.

The fine motion mechanism, which is of novel design, moves in ball bearings and is frictionless and "dead beat" in operation. A sector takes the place of the usual ball crank lever and carries an involute cam which imparts a uniform movement to the slide, a division of the scale thus has exactly the same value throughout the whole range of movement.

It is important that the fine motion mechanism should be relieved of all unnecessary work and of variable loads, and a new form of construction enables the bodies to be attached directly to the limb so that the focusing movement is applied only to the objective changer and objectives, thus breaking free from the tendency to overload the fine motion mechanism with the weight of the binocular body. By this means the tube length is varied one millimetre each way, which is far too small a change to affect appreciably the performance of even the most sensitive objective.

The limits of movement of the fine motion are clearly defined by means of limit lines, and stops are fitted. The motion is so lightly loaded that accidental contact between the objectives and the slide is unlikely to do any harm to the specimen or objective.

M7160



Object Stage. The stage (M7731) is of circular design, 120 mm. diameter, capable of rotation and fitted with a clamp. The revolving portion is mounted on a ball bearing which results in an exceedingly free motion that can be checked by the clamp screw. The circular scale is divided in degrees and read by a vernier to six minutes. An attachable mechanical stage (M7734) can be supplied (except on instruments with revolving objective changers), which has movements of 30 mm. in two directions at right angles. The stage is graduated in millimetres, and the scales are read by verniers to 0.1 mm.

The following stages, though not specifically designed for polarizing microscopes, may be substituted if desired.

M7735 Circular Mechanical

Stage 120 mm. diameter, with centring, rotary, lateral and transverse movements, lateral movement 51 mm., transverse movement 26 mm., each graduated in millimetres, reading by vernier to 0.1 mm. The circular scale is in degrees read by vernier to 6 minutes. Clamps are provided for the rotary and transverse movements.



M7736 Square Mechanical Stage

114 mm., with horizontal operating shafts, lateral movement 50 mm., transverse movement 30 mm., graduated in millimetres, reading by verniers to 0.1 mm., clamp to transverse movement. Two adjustable stage clips.



The Analyser. This is of Polaroid and is housed in a sliding mount which pierces the objective supporting unit; the mount also carries a glass compensator which automatically comes into action when the analyser is out of position and thus the focus is unchanged on removal of the analyser. The analyser is not rotatable in the standard instrument, but it may be fitted with 90° of movement if specially ordered (M7306)

Compensators. There is provision for the insertion of compensators, etc., between the analyser and the objective.

Objective Centring. A two-way spring opposed centring adjustment is fitted above the objective changer.

Objective Changers. Microscopes M7120/40/60 are fitted with a quadruple revolving changer which will receive any objective screwed with the standard R.M.S. thread. Microscopes M7130/50/70 are fitted with a quick-change system, as illustrated on page 11. The device provides a centring adjustment for each objective, thus the range of objectives may be made par-central. This device will receive any objective screwed with the R.M.S. standard thread.

Wave Plates. For workers requiring it, the 25 mm., 8 mm., 4mm., and 1.8 mm. objectives are supplied with a slot cut through the mount for the insertion of wave plates, etc. Such an objective is illustrated on page 9 and the objectives are listed on page 29, Nos. M7406 to M7431.

Condensers. An aplanatic (3-lens) condenser and iris diaphragm are fitted, and are provided with a focusing adjustment actuated by a rack and pinion, the latter being on the left side of the instrument.

The Polarizer. This is of Polaroid, capable of rotation, graduated at 15° intervals, with a catch at each 90° position. A slot for the insertion of a filter or diffuser below the polarizing agent is provided. The condensing and polarizing unit is illustrated on page 28 (M7363).

Bertrand Lens. This unit is fitted into the monocular bodies, M7725 (and M7726 for special large field eyepieces). The Bertrand lens is brought into action by tripping a milled head on the outside of the body. It is characterised by the fact that refocusing of the objective is not necessary in order to view the conoscopic interference figures.

The Mirror. The mirror, having plane and concave sides, is reversible, and is provided with the necessary adjustments.

Finish. The instrument is finished in semi-bright black enamel, and the bright parts are plated.

Case. A hardwood cabinet is provided.

Note on selection of equipment. The Advanced Polarizing Microscope is listed alternatively on page 19 with a quadruple objective changer and the quick-change system. The first pair include only monocular bodies, the second pair have straight binocular bodies, and the third pair inclined binocular bodies. Monocular bodies may be obtained for instruments having only binocular bodies, and monocular bodies for use with large field eyepieces can be supplied with all instruments. *Neither of the binocular bodies are constructed for use with large field eyepieces.*

Monocular bodies with Bertrand lenses for both normal and large field eyepieces can be supplied for any instrument. If both binocular and large field monocular bodies are ordered, it will be necessary to duplicate the range of eyepieces to some extent.

SUMMARY

CODE	Body	Objective Changer
M7120	Straight monocular (M7701)	Quadruple
M7130	Straight monocular	Quick change system
M7140	Straight binocular	Quadruple
M7150	Straight binocular	Quick change system
M7160	Inclined binocular	Quadruple
M7170	Inclined binocular	Quick change system

M7701 Straight Monocular Tube for M7140/50/60/70, for normal field eyepieces.

M7702 Straight Monocular Tube for all types, for large field eyepieces.

M7725 Straight Monocular Tube with Bertrand lens for normal field eyepieces.

M7726 Straight Monocular Tube with Bertrand lens for large field eyepieces.

Note: If on M7120 or M7130, M7725 or M7726 is supplied in lieu of M7701, the extra price of the equipment will be the difference between the price of M7725, or M7726 as the case may be, and M7701.

M7306 Extra for 90° rotation movement to analyser.

M7316 Additional objective adaptor with individual centring adjustment. (Three are included with M7130, M7150, and M7170).

M7734 Attachable Mechanical Stage, see page 13.

M7735 Revolving Mechanical Stage M1346 in lieu of Stage M7731.

M7736 Square Mechanical Stage M1341 in lieu of Stage M7731.

M7762 Substage having fittings for rapid interchange of condensers.

Objectives and Eyepieces are not included under the above code numbers. They are listed on pages 29 and 30.

M7250



UNIVERSAL POLARIZING MICROSCOPE*

The intention of this instrument is to cover as wide a range of microscopic application as possible, and with a full range of equipment it can be made to serve almost any purpose commonly met.

The general description of the Advanced type applies, and therefore will not be repeated here, but it has the following additional features :—

1. The microscope body and coarse and fine motion unit are connected to the stand by a dovetail slide and thus can be used in a position up to 2 inches above the normal, hence the size of object which can be accommodated under the objective is very considerable. The stand has been designed to accommodate the Federof universal stage, see illustration on page 22.

If desired, the complete unit can be removed and used without its stand on any special apparatus which may demand it.

2. The stage is provided with a vertical adjustment of 42 mm. actuated by a rack and pinion on the right side of the instrument, whilst, if the substage be removed altogether, the total possible movement of the stage in a vertical direction is increased to 75 mm. Hence, taking account of the possible upward movement of the microscope and the downward movement of the stage, an object of no less than 125 mm. high can be placed on the stage and focused by the microscope. For this reason the instrument is particularly suitable for all microscopy.

3. The stage is attached to the vertical adjustment unit by a dovetail slide, thus the user may possess a range of stages for a variety of purposes, all of which are instantly interchangeable.

4. The substage is similarly attached to the instrument, and is provided with a vertical motion actuated by a pinion on the left side of the instrument. The substage details are somewhat more elaborate than on the Advanced model, and are as illustrated on page 12. An Abbe type condenser is fitted, together with an iris diaphragm, and a filter mount immediately below. The polarizer is of Polaroid, and is held in a swing-out mount provided with a catch to secure a positive registration. The polarizer is capable of rotation, the mount being graduated at 5° intervals, and figured at every 15°. There is a spring catch at each 90° position. Beneath the polarizer is fitted a swing-out holder for a ground glass diffuser or other screens, and below is a subsidiary condensing lens in a swing-out mount for use with low power objectives.

This instrument may be fitted with the normal incident illuminator with polarizer listed on page 26, or with any of the incident illuminators listed in our general microscope catalogue CM1000A, pages 118 to 124.

* Described in Mineralogical Magazine, London, June, 1947, Vol. XXVIII, No. 197, pages 96—103.

M7210



SUMMARY

CODE	Body	Objective Changer
M7200	Straight monocular with Bertrand lens (M7725)	Quadruple
M7210	Straight monocular with Bertrand lens (M7725)	Quick change system
M7220	Straight monocular with Bertrand lens (M7725), straight binocular	Quadruple
M7230	Straight monocular with Bertrand lens (M7725), straight binocular	Quick change system
M7240	Straight monocular with Bertrand lens (M7725), inclined binocular	Quadruple
M7250	Straight monocular with Bertrand lens (M7725), inclined binocular	Quick change system

Extra : Monocular body with Bertrand lens for large field eyepieces (M7726) can be supplied in lieu of that for normal field eyepieces (M7725) in all above without alteration of price. When this is supplied in addition to a binocular body it will be necessary to duplicate the eyepieces.

M3341 Square Mechanical Stage M1341, as illustrated on page 17, but interchangeably mounted.

M7306 Extra for 90° rotation movement to analyser.

M7316 Additional objective adaptor with individual centring adjustment (Three are included with M7210, M7230 and M7250)

M7734 Attachable Mechanical Stage, see page 13.

M7740 Federof Stage with two axes, graduated.

M7760 Federof Stage with five axes, graduated.

N.B.—At the time of going to press the last two items are not being manufactured.

M7764 Substage having fittings for rapid interchange of condensers.

Objectives and Eyepieces are not included under the above code numbers. They are listed on pages 29 and 30.

MICROSCOPES FOR THE EXAMINATION OF OPAQUE OBJECTS UNDER POLARIZED LIGHT

The Intermediate, Research, Advanced and Universal Microscopes can be readily adapted for the examination of Ores and other opaque substances under polarized light, and the arrangement is shown in the illustration on page 24.

A normal incident illuminator containing a polarizing screen is required, and, as the intensity of the illumination necessary cannot be obtained from a lamp small enough to be supported by the instrument, it is necessary to employ an external source of light.

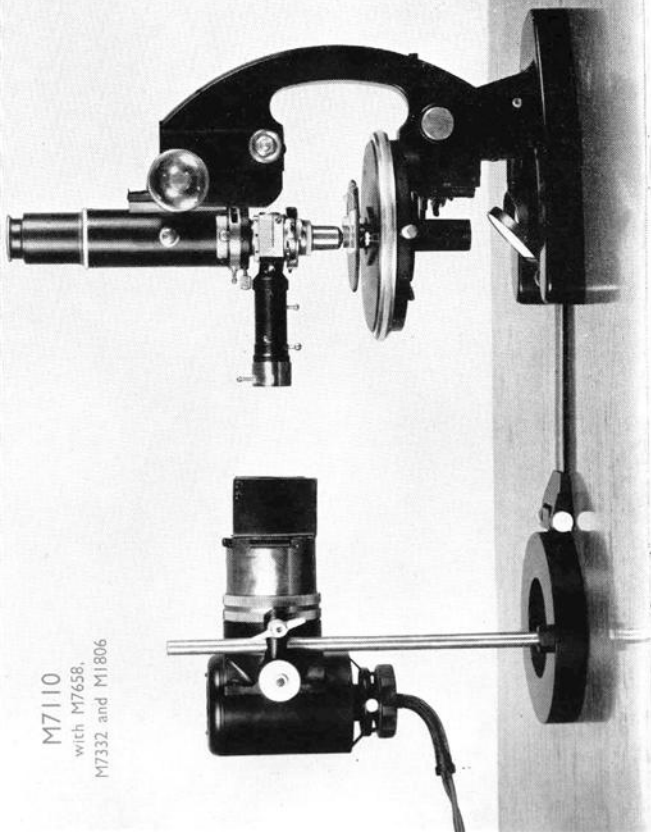
This implies that once the incident illuminator—which is carried by the body of the microscope—has been aligned with the light source the coarse focusing adjustment must not be used. It is thus necessary to have a means of putting the specimen into the focal plane already established without the use of the normal coarse focusing adjustment, and this is secured by employing a superstage with a vertical movement (M7332).

The superstage is attached to the revolving stage by screws, the condenser having been previously removed and the substage fittings swung out of the working position. The height adjustment is made by revolving the superstage or by holding it in position and turning the stage.

The incident illuminator is inserted between the two-way centring adjustment and the objective changer system. It contains an iris diaphragm for controlling the area of the specimen illuminated, and a condensing lens with an adjustment in order that the iris may be focused on the specimen and the area illuminated thereby defined. The reflector plate is subjected to an electro-chemical process whereby its power of reflectivity is much greater than that of an ordinary air-glass surface, and it is provided with an axial adjustment for aligning the incoming beam with the optical axis of the microscope. A polarizing screen of Polaroid provided with a movement of 90° is fitted.

The lamp equipment recommended is M1806. The bulb is of the compact filament type and consumes 6 amps. at 8 volts, the current being derived from a transformer operating on an alternating mains supply. A condenser with a focusing adjustment is fitted and also an iris diaphragm which serves to control the intensity of the illumination of the object. The microscope stands are drilled for the attachment of this lamp stand which ensures that the alignment of the lamp and the microscope are not accidentally disturbed. The lamp has adjustments for height, elevation and azimuth.

M7110
with M7658,
M7332 and M1806



The following equipment may be obtained for use with existing instruments, the illuminator M7657 being suitable for use with Intermediate type microscopes, and the illuminator M7658 for the Research, Advanced and Universal models.

It should be noted that the revolving type of changer cannot be used in conjunction with either of these illuminators, therefore users desiring to adapt these illuminators to instruments so fitted will require one objective adaptor for each objective to be used in the illuminator, namely, for the Intermediate model M7659, or for the Research, Advanced and Universal models M7316.

M7657 Normal Incident Illuminator Unit with polarizing screen, iris diaphragm and condensing lens, for use with Intermediate Microscopes M7020/21/30/31.

M7658 Normal Incident Illuminator Unit with polarizing screen, iris diaphragm and condensing lens, for use with Research Microscopes M7040 to M7110, and Advanced and Universal types, M7120 to M7170 and M7200 to M7250.

M7659 Additional objective adaptor for M7657.

M7316 Additional objective adaptor for M7658.

M7332 Superstage with 1 inch vertical adjustment for use on stage M7331.

M1806 High-power Lamp and Stand with connecting link.
(N.B. The design has been revised since the illustration on page 24 was made.)

E845 Transformer for 200/250 volts 50 cycles—8 volts.

E848 Transformer for other mains voltages.

E850 Spare lamp bulb 8 volts 6 amps. S.E.S.

M1763 Filter, green.

M1764 Filter, neutral.

M1765 Filter, ground glass.

For the convenience of users whose work is confined to examinations under incident light, and therefore do not require substage equipment, the following sets are listed:—

M7035 Intermediate Microscope as M7030 but without substage equipment and with incident illuminator and polarizer (M7657) and rising superstage (M7332).

M7065 Research Microscope as M7060 but without substage equipment and with incident illuminator and polarizer (M7658) and rising superstage (M7332).

POLARIZING UNITS

for use on Cooke Microscopes not built specifically as polarizing instruments



M7361
Eyepiece analyser
non-revolving

M7362
Eyepiece analyser
revolving, graduated

M7360
Substage Polarizer
unit

Polarizing equipment as illustrated on this page can be adapted for use on most Cooke microscopes and, as will be observed, there are several combinations to suit individual needs, as follows:—

1. **Analyser M7361 with Polarizer M7360** where both polarizer and analyser can be instantly thrown out of action, but once the instrument has been set up neither can be revolved. The illustration on page 5 shows the analyser out of action, and the polarizer and filter may be swung out of action by a sideways movement, a catch being provided to hold the polarizer in the working position.

2. **Analyser M7362 and Polarizer M7360.** In this case the analyser has a rotary movement and is graduated in 15° intervals.

3. **Analyser M7361 and Polarizer M7364.** This polarizer has a rotary movement and a holder for filter or diffuser, but is not graduated and does not swing out of position.

4. **Analyser M7361 with Polarizer M7363.** This polarizer resembles M7364 but is graduated in 15° intervals and is provided with a catch at each 90° position.

Eyepieces with cross lines (M7508)—7× and M7516—10× will fit any standard Cooke microscope and these are provided with an adjustment for focusing the cross lines.



M7363
Polarizer
showing condenser



M7364
Polarizer

The eyepiece analysers M7361 and M7362 require that a slot shall be cut along the body tube to receive the key which prevents the analyser housing and the eyepiece with cross lines from turning with reference to the microscope body. This slot can be cut by any competent mechanic and it is only necessary to ensure that the slot is in the right place in order that the analyser and eyepiece cross lines (if any) are properly related to the instrument.

The Polarizer M7360 can be fitted to any instrument having standard condenser mounts (M1375-non-centring, or M1376—centring). Purchasers wishing to apply this unit to the condenser mount M1375 should, however, mention this, as an additional extension tube (M7375) is then required. The polarizers M7363 and M7364 will receive the standard condenser as supplied with the instrument, and the whole fitting is inserted into the substage in place of the normal condenser mount (M1375 or M1376).

M7361 Analyser unit, non-revolving type, with hinged throw-out device.

M7362 Analyser unit, revolving type, graduated to 15° intervals.

M7360 Polarizer, non-revolving type, with sideway movement and filter holder.

M7364 Polarizer, revolving type, with filter holder, not graduated.

M7363 Polarizer, as M7364 but graduated in 15° intervals and with catch at each 90° position.

OBJECTIVES

The following achromatic objectives are suitable for use on any of the Polarizing Microscopes herein described.

They are all computed for use at 160 mm. tube length and each is engraved with the initial magnification produced at that tube length, the numerical aperture and the serial number.

To determine the magnification at the eye, the objective initial magnification is multiplied by the factor engraved upon the eyepiece, and when a binocular body is used this product should be multiplied by 1.7x.

In order to facilitate the recognition of objectives, and especially when mounted upon the changer, the several powers are marked with a colour band, viz.: 16 mm. grey, 12 mm. dark blue, 8 mm. light blue, 4 mm. light green, 1.8 mm. red.

Code No.	Nominal Focal Length		Numerical Aperture	Initial Power	Working Distance mm.	Colour Band
	in.	mm.				
‡M7801	1 1/2	33	0.1	3	43.0	—
*M7806	1	25	0.15	5	17.0	—
†M7811	1 1/4	16	0.28	10	5.0	Grey
M7816	1 1/4	12	0.42	15	1.5	Dark Blue
M7818	1 1/4	8	0.45	20	2.2	Light Blue
*M7820	1 1/4	4	0.85	40	0.49	Light Green
†M7821	1 1/4	4	0.65	40	0.71	Light Green
*M7822	1 1/4	4	0.65	40	0.83	Light Green
†M7823	1 1/4	4	0.85	40	0.37	Light Green
M7831	1 1/2	1.8	1.30	95	0.12	Red

The following objectives are provided with a slot for the insertion of wave plates, etc., as illustrated on page 8.

Code No.	Nominal Focal Length		Numerical Aperture	Initial Power	Working Distance mm.	Colour Band
	in.	mm.				
‡M7906	1	25	0.15	5	17.0	—
M7918	1 1/4	8	0.45	20	2.2	Light Blue
*M7920	1 1/4	4	0.85	40	0.49	Light Blue
†M7921	1 1/4	4	0.65	40	0.71	Light Green
*M7922	1 1/4	4	0.65	40	0.83	Light Green
†M7923	1 1/4	4	0.85	40	0.37	Light Green
M7931	1 1/2	1.8	1.30	95	0.12	Red

† M7821, M7823, M7921, M7923 are suitable for use only with specimens having a cover-glass.

* M7820, M7822, M7920 and M7922 are for use with uncovered specimens.

The performance of all other objectives is unaffected by the presence of a cover-glass.

It is recommended that objectives to be used with normal incident illumination should be coated for which an additional charge is made.

‡ M7801 and M7906 are not parfocal with the remainder of the range.

Achromatic objectives only should be used for quantitative work using polarized light, but for other visual or photographic work, objectives of the Fluorite and Apochromatic series offer some advantage on account of their superior correction. The objectives available are:-

Code No.	Type	Nominal Focal Length		N.A.	Initial Power	Working Distance	Colour Band
		in.	mm.				
M1436	Fluorite	$\frac{3}{16}$	3.75	0.95	45	0.23	Yellow and Black Red and Black
M1441	Oil imm.	$\frac{1}{16}$	1.8	1.30	95	0.12	
M1446	Apo.	$\frac{1}{8}$	16	0.30	10	5.0	Grey and White Blue and White Green and White
M1448	Dry	$\frac{1}{8}$	8	0.65	20	0.5	
M1451		$\frac{1}{8}$	4	0.95	40	c	
M1456	Apo. imm.	$\frac{1}{16}$	2.2	1.32	80	0.12	Red and White

Objectives marked a are for use with covered specimens only, that marked c has a correction collar.

The above require compensating eyepieces which are listed below.

EYEPIECES

The 7 \times and 10 \times Huyghens and large field eyepieces are fitted with cross lines and focusing adjustment to the eye lens; the others are not so provided. In the case of 7 \times and 10 \times paired eyepieces for binocular bodies one eyepiece only has cross lines and focusing adjustment. All eyepieces are marked with the magnification factor.

Huyghens type for use with Microscopes M7001, M7010, M7020, M7021, M7030, M7031, M7035, M7040, M7060, M7065, M7080, M7100 and for advanced and Universal Microscopes, except when only a large monocular tube is ordered.

M7508	7 \times	} with focusing adjustment and cross lines	M7509	7 \times	} paired eyepieces for binoculars
M7516	10 \times		M7517	10 \times	
M1521	12.5 \times		M1522	12.5 \times	

M1535 Eyepiece, compensating, 10 \times , designed to receive micrometers or gratules in metal mounts.

Large Field type for use with microscopes M7050, M7070, M7090, M7110 and for Advanced and Universal Microscopes for use with large monocular tubes only.

M7506	7 \times	} with focusing adjustment and cross lines	M6516	12.5 \times
M7511	10 \times		M6521	15 \times
M7513	10 \times	with focusing adjustment and fixed eyepiece micrometer.		

SUNDRIES

M7585	Quartz Wedge, 6 orders in mount	M7586	Sensitive tint plate (quartz)
M7587	Mica $\frac{1}{2}$ wave plate	M7592	as M7586 but rotatable in mount
M7593	as M7587 but rotatable in mount	M7590	as M7585 but graduated
M7591	Nakamura half-shadow plate for use in determining the power of rotation of a substance.		

CONDENSERS

M7882	Abbe type Condenser (2-lens), N.A. 1.20 (supplied with Elementary, Intermediate and Research Microscopes).
M7883	Aplanatic Condenser (3-lens), N.A. 1.40 (supplied with Advanced and Universal Microscopes).
M7886	Achromatic Condenser, N.A. 1.00.
M7891	Achromatic Oil Immersion Condenser, N.A. 1.30.

SLOTTED OCULAR (Dick and Wright type)



Quartz wedges and micrometers are most conveniently inserted in the focal plane of the ocular because they can then be used equally well on the image and on the interference figure. (The required slots were provided by very few makers and Wright accordingly designed his well-known eyepiece for insertion in the ordinary microscope tube. A special Bertrand lens was usually needed and the analysing Nicol prism above the eyelens inevitably restricted the field and the eye distance available). In this position it is possible to see the cross wires and to read the graduations on the wedge without tripping the Bertrand lens into position and thus losing sight of the specimen.

With Polaroid it is now possible to construct a sliding analyser within the eyepiece thus eliminating the inconvenience of an external analyser. A special 10 \times positive ocular has been designed with an unusually great eye distance and width of field. This adds very greatly to the comfort of workers who wear spectacles. The equipment is carried in a tubular fitting which replaces the ordinary eyetube of the Cooke Microscope so that the tube length is unaltered. It is possible, therefore, to employ the standard Bertrand lens with its selecting diaphragm. A microscope so fitted is capable in fact of performing normal routine work with the greatest comfort and accuracy. Many workers may indeed prefer to adopt the present form of slotted eyepiece for regular use.

M7570 Slotted Ocular (Dick and Wright type) for attachment to Cooke Polarizing Microscopes, including sliding analyser and slot for wide quartz wedge.

Accessories.

M7571 Extra wide Quartz Wedge, 6 orders, graduated, designed to permit observation over almost the whole field.

M7572 Adaptor to permit the use of standard narrow wedges M7585 and M7590.