# Beck Microscopes

# BECK MICROSCOPES


## R. & J. BECK, Ltd.

*Head Office & Showrooms:*
69 MORTIMER STREET, W. 1
Telephone: MUSEUM 3608
Telegrams:
"OBJECTIVE, WESDO,
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## FOREWORD.

In presenting this new edition of our catalogue of microscopes and apparatus, we believe that the range of instruments will be found to cover all requirements, except for petrological and metallurgical purposes, from the simple microscope required for elementary school use to the elaborate instrument for the most exacting research.

As new methods in microscopic work have been evolved, we have produced apparatus to meet the requirement. The Beck Barnard ultra violet microscope, the Beck high power focussing dark ground illuminator, the Ring illuminator and our series of Apochromatic object glasses are a few of our recent productions which embody the latest ideas and methods in microscopy.

For routine work we think that our No. 29 series of microscopes represent a combination of sound design and construction and economy in cost which has not hitherto been attained.

Microscopes for petrology and metallurgy are described in a separate catalogue.

## BUSINESS TERMS.

(1) All prices are strictly nett for cash.

(2) Payment should be made by cash with order where no account has been opened in our ledgers. Where it is desired that a ledger account be opened, London references should accompany order to prevent delay.

(3) All goods made to order or experimental work must be paid for half in advance and half on delivery. We take no responsibility as to the performance of experiment models or work.

(4) Prices are subject to alteration on account of fluctuation in cost of labour and materials.

(5) All goods are carefully packed, and a charge is made for packing cases, which, when returned empty, will be credited at full price if in good condition.

(6) Goods are delivered free in the London district only, and are sent carriage forward elsewhere unless specially ordered otherwise.

(7) We do not hold ourselves in any way responsible for damage to goods in transit, although every care is expended in the packing. Our risk terminates on the goods leaving our London warehouse. We can insure goods at customer's expense if instructed to do so.

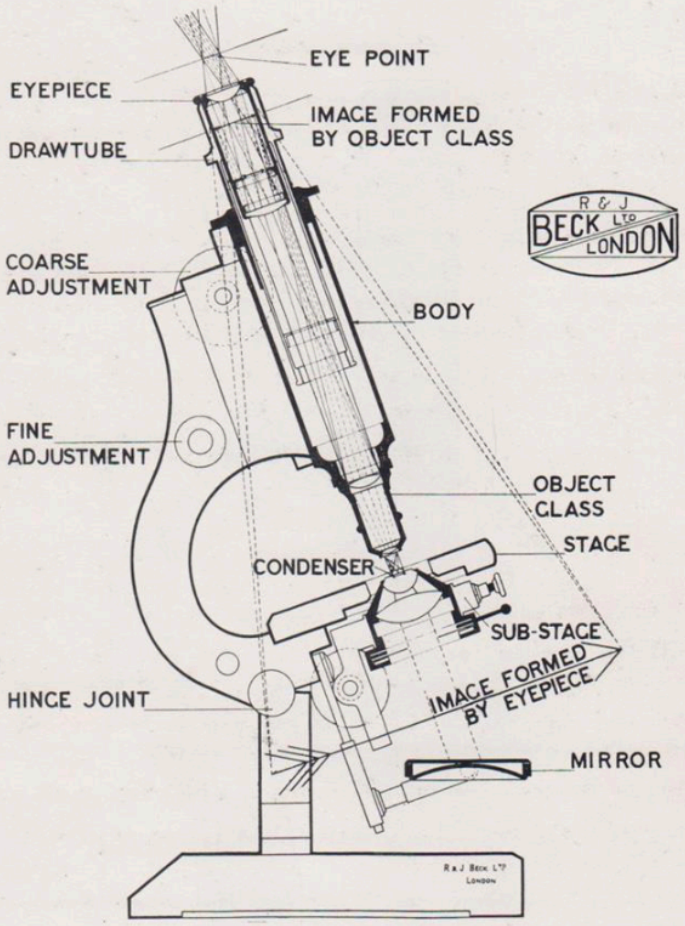
(8) We cannot consider complaints as to the execution of any order unless it is lodged within three months.

(9) Code.—In cabling or telegraphing orders it is only necessary to quote catalogue number.

It should be borne in mind in ordering goods to be sent abroad that they are liable to be delayed in transit, and the orders should be placed sufficiently in advance to allow for this.

Goods are despatched without any avoidable delay, and if in stock can generally be forwarded on the same day as the receipt of order.

**This catalogue cancels previous lists.**

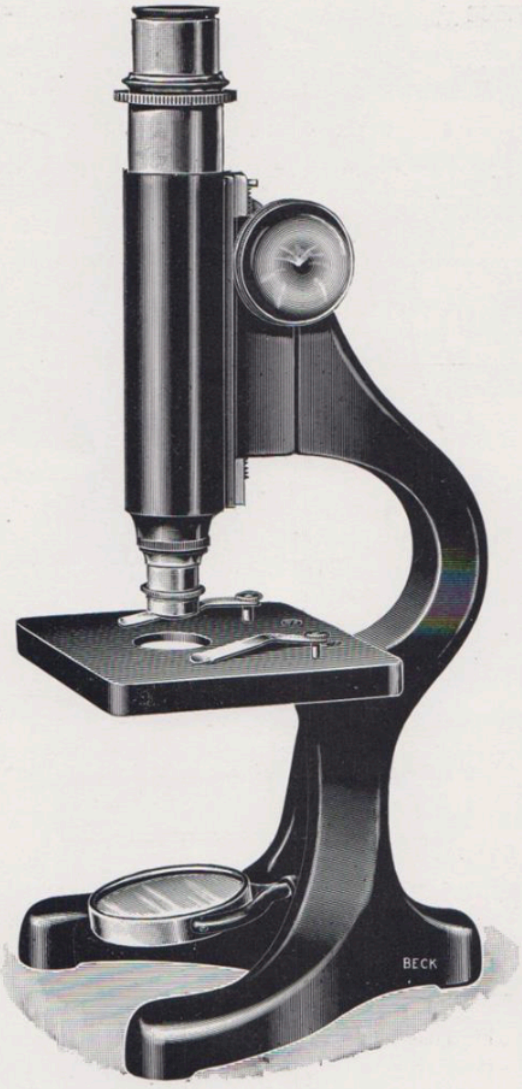



## Magnification and Field of View

**at 160 m.m. tube length**

| Object Glass | | Eyepiece X 6 | | Eyepiece X 10 | | Eyepiece X 15 | |
|---|---|---|---|---|---|---|---|
| inches | m.m. | Magnification | Field of View (inches) | Magnification | Field of view (inches) | Magnification | Field of view (inches) |
| 1½ | 32 | 25 | ·175 | 45 | ·125 | 65 | ·10 |
| ⅔ | 16 | 62 | ·066 | 110 | ·047 | 155 | ·04 |
| ⅓ | 8 | 115 | ·038 | 200 | ·028 | 285 | ·025 |
| ⅛ | 4 | 285 | ·015 | 490 | ·010 | 690 | ·009 |
| ⅛ 1/25 | 3 | 380 | ·012 | 650 | ·009 | 950 | ·008 |
| 1/12 1/25 | 2 | 530 | ·007 | 900 | ·005 | 1275 | ·0045 |

We shall be pleased to send a copy of a wall chart, 20 in. × 30 in., of which the above is a facsimile, to any institution to whom it would be of service.




No. 10 London Microscope.

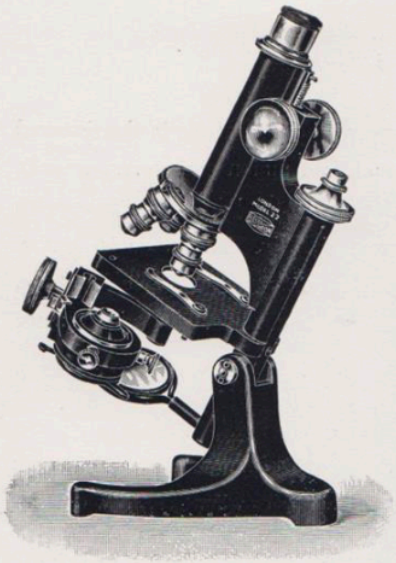
# No. 10 London Microscope.

This microscope is a simple instrument of the vertical type, without joint for inclination and with one focussing adjustment by means of a specially cut rack and pinion giving very smooth motion free from backlash, capable of focussing object glasses up to $\frac{1}{6}$ in. The base with the handle-shaped limb is made in a solid casting, giving great rigidity. The stage is square, and is provided with stage clips for holding specimens. The body-tube has an adjustable drawtube. The mirror is plane on one side and concave on the other, and is held in gimbals. The instrument is finished in acid resisting stoved black enamel.

The eyepieces and object glasses are of our standard series.

This microsope will be found to be suitable for use in schools and educational establishments for elementary botany, zoology and similar work, and is also an excellent instrument for workshop use where the highest powers are not necessary.

| | | | |
|---|---|---|---|
| **No. 10A.** | Stand only ... ... ... ... ... ... ... | £3 10 0 | |
| | No. 3260, 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... | 1 4 0 | |
| | No. 3231A, $\frac{2}{3}$ in. Object glass 16 m/m. without box ... ... | 0 12 0 | |
| | | | £5 6 0 |
| **No. 10B.** | Stand only ... ... ... ... ... ... ... | £3 10 0 | |
| | No. 3260. Eyepiece, 42 m/m. (×6) ... ... ... ... | 0 12 0 | |
| | No. 3231A. $\frac{2}{3}$ in. Object glass, 16 m/m. without box ... | 0 12 0 | |
| | No. 3234A. $\frac{1}{6}$ in. Object glass, 4 m/m. without box ... ... | 2 13 0 | |
| | | | £7 7 0 |
| **No. 10C.** | Stand only, in oak case with lock and key ... ... ... | £4 7 6 | |
| | No. 3260. 2 Eyepieces, 42 m/m (×6) and 25 m/m (×10) ... | 1 4 0 | |
| | No. 3231A. $\frac{2}{3}$ in. Object glass, 16 m/m without box ... | 0 12 0 | |
| | No. 3234A. $\frac{1}{6}$ in. Object glass, 4 m/m without box ... ... | 2 13 0 | |
| | No. 3300. Double nosepiece ... ... ... ... ... | 1 1 0 | |
| | | | £9 17 6 |
| No. 3815. | Oak case with lock and key ... ... ... ... ... ... ... | | 0 17 6 |
| No. 3310. | Cylindrical substage fitting ... ... ... ... ... ... ... | | 0 5 0 |
| No. 3308. | Iris diaphragm ... ... ... ... ... ... ... ... ... | | 0 4 6 |
| No. 3285. | Abbe condenser ... ... ... ... ... ... ... ... ... | | 1 9 6 |



Stand No. 22 C.




No. 22 London Microscope.

Stand No. 22B.

# No. 22 London Microscope.

The No. 22 London Microscope is of simple design but of the highest quality and of the full standard size. No essential adjustments have been omitted to enable it to be produced at a low price, but the construction has been simplified and all elaboration of parts eliminated.

**Base, pillar and limb.** The base and pillar are in one heavy iron casting. The base has a large spread, making the microscope stand firmly, either in the vertical or in an inclined position. The limb is hinged into the top of the pillar, so that the microscope can be used at any angle, from the vertical to the horizontal. These parts are finished in stoved black enamel, which withstands the action of acids.

**Stage.** The stage is large, measuring 4 in. x 3½ in., and is therefore of a sufficient size to permit of a petri dish or culture plate being placed upon it. It is of solid construction, and rigidly attached to the limb of the microscope.

**Focussing adjustments.** The microscope has a coarse adjustment, actuated by helical rack and pinion. The greatest care is taken in the perfect smoothness of working of the slides in which the body moves, so that any shake or backlash is obviated. Comparatively high powers can be focussed with it. The fine adjustment is of a simple but very strong and effective design. It is constructed in such a manner that a smooth working focussing adjustment giving no backlash is obtained. It is actuated by a large milled head, giving a sufficiently delicate movement for use with an oil immersion object glass. It is readily accessible to either hand, a quality which every slow motion should possess.

**Body tube.** This is of the standard length and has an extending drawtube, marked so that the tube length can be readily set at 160 m/m., for which the object glasses are corrected.

**Mirror.** A double mirror, plane and concave, is fitted into the lower end of the limb. It is in a semi-circular fitting which rotates, and in which the mirror turns on its axis.

**Substage.** The microscope is made in three forms. The simple form No. 22A has no substage. The No. 22B has a substage, which is focussed by a spiral screw, and which can be swung aside when not in use. The No. 22C has a complete substage, focussed by rack and pinion, and provided with centring adjustment. This substage can also be swung out of the optic axis of the microscope. On the simple stand, No. 22A, a revolving dome-shaped diaphragm with a number of apertures of varying sizes can be supplied.

**Nosepieces.** Double or triple nosepieces of the dustproof pattern, can be supplied, so that the object glasses are protected from dust settling on their back lenses, if left on the microscope.

**Condenser.** We supply either large or small Abbe condensers on these microscopes. In the Model No. 22C, with centring substage, an achromatic condenser can be fitted, at a corresponding increase in price, if desired. To this microscope also a dark ground illuminator can be fitted.

**Object glasses.** All object glasses are of our standard series, the performance of these has gained them a world-wide reputation.

**Eyepieces** are of the Huyghenian type, of our standard quality.

**Stage clips** are fitted to the stage for holding specimens in position.

**Mechanical stage** can be fitted, the pattern being illustrated on page 72

**Case.** The instrument is supplied in either a stiff canvas case with carrying handle, or oak or polished mahogany cabinet, as specified in price list.

# No. 22 London Microscope.

| | | | |
|---|---|---|---|
| **No. 22A (0).** | Stand without substage in canvas covered case .. .. | £5 2 6 | |
| No. 3260. | Eyepiece, 42 m/m. (×6) .. .. .. .. | 0 12 0 | |
| No. 3230A. | 1½ in. Object glass, 32m/m. without box ... .. | 1 3 0 | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m. without box ... .. | 0 12 0 | |
| | | ——— | £7 9 6 |
| **No. 22A (1).** | Stand without substage in canvas covered case .. .. | £5 2 6 | |
| No. 3260. | Eyepiece, 42 m/m. (×6) .. .. .. .. | 0 12 0 | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m. without box .. .. | 0 12 0 | |
| No. 3234A. | ⅙ in. Object glass, 4 m/m. without box .. .. | 2 13 0 | |
| | | ——— | £8 19 6 |
| **No. 22A (2).** | Outfit No. 22A (1) .. .. .. .. .. .. .. | £8 19 6 | |
| No. 3300. | Double nosepiece .. .. .. .. .. | 1 1 0 | |
| | | ——— | £10 0 6 |
| **No. 22B (1).** | Stand, with swing-out focussing substage, in canvas covered case .. .. .. .. .. .. .. .. | £6 0 6 | |
| No. 3260. | Eyepiece, 42 m/m. (×6) .. .. .. .. | 0 12 0 | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m. without box .. .. | 0 12 0 | |
| No. 3234A. | ⅙ in. Object glass, 4 m/m. without box .. .. | 2 13 0 | |
| No. 3285. | Abbe condenser and iris diaphragm.. .. .. | 1 9 6 | |
| | | ——— | £11 7 0 |
| **No. 22B (2).** | Stand, with swing-out focussing substage, in mahogany cabinet .. .. .. .. .. .. .. .. | £7 5 6 | |
| No. 3260. | 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) .. | 1 4 0 | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m. .. .. .. .. | 0 16 6 | |
| No. 3234A. | ⅙ in. Object glass, 4 m/m. .. .. .. .. | 2 17 6 | |
| No. 3235A. | 1/12 in. Object glass, 2 m/m. oil immersion ... .. | 5 10 0 | |
| No. 3285. | Abbe condenser and iris diaphragm .. .. .. | 1 9 6 | |
| No. 3301. | Triple nosepiece .. .. .. .. .. | 1 10 0 | |
| | | ——— | £20 13 0 |

| | | |
|---|---|---|
| No. 3816. | Oak case in place of canvas covered case .. .. .. .. .. | £0 7 6 |
| No. 3817. | Mahogany cabinet in place of canvas covered case.. .. .. .. | 1 5 0 |
| No. 3184. | Circular revolving diaphragm to No. 22A .. .. .. .. .. | 0 5 0 |
| No. 3365. | Detachable mechanical stage to any above models .. .. .. | 6 0 0 |

For particulars of high power binocular attachments see pages 44 to 47.

Any apparatus can be added or omitted at a corresponding addition or reduction of price.

# No. 22 London Microscope.

**No. 22C (0).** Stand with rack and pinion focussing, centring and swing-out substage, in oak case .. .. .. .. .. £9 0 0

| | | | | |
|---|---|---|---|---|
| No. 3260. | 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) .. | 1 | 4 | 0 |
| No. 3231A. | ⅔ in. Object glass, 16 m/m. .. .. .. .. | 0 | 16 | 6 |
| No. 3234A. | ⅙ in. Object glass 4 m/m. .. .. .. .. | 2 | 17 | 6 |
| No. 3285. | Abbe condenser and iris diaphragm .. .. .. | 1 | 9 | 6 |
| No. 3300. | Double nosepiece .. .. .. .. .. | 1 | 1 | 0 |
| | | | | £16 8 6 |

**No. 22C (1).** Stand with rack and pinion focussing, centring and swing-out substage, in mahogany cabinet .. .. .. .. £9 17 6

| | | | | |
|---|---|---|---|---|
| No. 3260. | 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) .. | 1 | 4 | 0 |
| No. 3231. | ⅔ in. Object glass, 16 m/m. .. .. .. .. | 1 | 10 | 0 |
| No. 3234A. | ⅙ in. Object glass, 4 m/m. .. .. .. .. | 2 | 17 | 6 |
| No. 3235A. | 1/12 in. Object glass, 2 m/m., oil immersion .. .. | 5 | 10 | 0 |
| No. 3286. | Abbe condenser and iris diaphragm .. .. .. | 2 | 10 | 0 |
| No. 3301. | Triple nosepiece .. .. .. .. .. | 1 | 10 | 0 |
| | | | | £24 19 0 |

**No. 22C (2).** Stand with rack and pinion focussing, centring and swing-out substage, in mahogany cabinet .. .. .. .. £9 17 6

| | | | | |
|---|---|---|---|---|
| No. 3260. | 3 Eyepieces, 42 m/m. (×6), 25 m/m. (×10), and 17 m/m. (×15) .. .. .. .. .. | 1 | 16 | 0 |
| No. 3231. | ⅔ in. Object glass, 16 m/m. ... .. .. .. | 1 | 10 | 0 |
| No. 3234. | ⅙ in Object glass, 4 m/m. .. .. .. .. | 3 | 15 | 0 |
| No. 3235. | 1/12 in. Object glass, 2 m/m. oil immersion .. .. | 8 | 10 | 0 |
| No. 3296. | High power dark ground illuminator, in substage fitting .. .. .. .. .. .. | 2 | 10 | 0 |
| No. 3298. | Stop for 1/12 in. object glass .. .. .. .. | 0 | 2 | 6 |
| No. 3288. | Achromatic condenser .. .. .. .. .. | 5 | 15 | 0 |
| No. 3305. | Mechanical stage .. .. .. .. .. | 6 | 0 | 0 |
| No. 3301. | Triple nosepiece .. .. .. .. .. | 1 | 10 | 0 |
| | | | | £41 6 0 |

For particulars of high power binocular attachments see pages 44 to 47

Any apparatus can be added or omitted at a corresponding addition or reduction of price.

# No. 29 London Microscope.

Every point in the design and manufacture of a microscope, which tends to make it efficient and serviceable, has been considered and incorporated into the No. 29 London microscope, but in such a way that the price remains moderate. The whole instrument is of particularly solid construction, so that flexure in the parts is obviated and wear through use is reduced to a minimum.

Various models of the No. 29 Microscope are made, the chief differences being in the substages of which there are several forms, a simple focussing substage operated by a spiral screw, a non-centring form focussed by rack and pinion, a centring model focussed by rack and pinion, and a substage in which the apparatus is changed by means of Akehurst slides. Models No. 29, F and G also have a new simplified mechanical stage.

This microscope is so made that all apparatus, such as mechanical stages, condensers and dark-ground illuminators, nosepieces, object glass changers and extra object glasses and eyepieces, can be added as occasion arises, without the necessity of returning the instrument for fitting. By this means the No. 29 London microscope can be purchased in its simplest form and built up as desired into a complete instrument for high power work.

The following is a specification of the microscope :—

**Base and pillar** are in a heavy solid casting with large spread ($7\frac{1}{2} \times 5\frac{1}{2}$ in.), making the microscope stand firmly in either the vertical or horizontal position. The limb is hinged into the top of the pillar so that the instrument can be used at any angle from the vertical to the horizontal.

**Limb** is made in a solid casting, and is of an exceptionally robust construction, obviating flexure in the metal. It is shaped for conveniently lifting the instrument without risk of damage to the adjustable parts.

**Stage** is of extra large size, measuring about $4\frac{1}{2}$ in. square, so arranged that the distance from its centre to the limb is $3\frac{1}{4}$ in., so that the whole of a 6 in. petri dish or culture plate can be examined. Stage clips for holding specimen in position are provided.

**Focussing adjustments.** The microscope has a coarse adjustment, actuated by helical rack and pinion. The greatest care is taken in the perfect smoothness of working of the slides in which the body moves, so that any shake or backlash is obviated. Comparatively high powers can be focussed with it. The fine adjustment is of a very strong and effective design. It is constructed in such a manner that a smooth-working focussing adjustment giving no backlash is obtained. It is actuated by two milled heads, one on each side of the limb, thus being readily accessible to either hand.

**Body tube.** This is of the standard length and has an extending drawtube, marked so that the tube length can be readily set at 160 m/m., for which the object glasses are corrected. If desired the drawtube can be graduated in millimetres at an extra cost.

**Mirror.** A double mirror, plane and concave, is fitted into the lower end of the limb. It is in a semi-circular fitting which rotates, and in which the mirror turns on its axis.

**Substages.** The substage is made in various forms in the different models. No. 29A has a simple tubular substage. No. 29B has a substage with focussing adjustment actuated by spiral screw, and which can be swung aside when not in use. No. 29C has a substage which is focussed by rack and pinion, and which also has an adjustment for centring the condenser or dark-ground illuminator. No. 29D has a similar substage to No. 29C, but it has not the centring adjustment. No. 29E has a substage in which the apparatus is on dovetailed fittings which slide into the substage and are clamped firmly into position by a screw. This method of changing the apparatus is very effective, and enables a condenser to be interchanged with a dark-ground illuminator with ease, and with no derangement of the adjustments of the instrument. To facilitate this, the stage of the microscope on to which this form of substage is fitted is cut away in the front, so that the condenser or dark-ground illuminator can be withdrawn without altering the focussing adjustment of the substage. The substage is focussed by rack and pinion, but has no centring adjustment, the centring arrangements, when required, being on the slides themselves, so that each piece of apparatus can be individually centred.

**Nosepieces.** Double or triple nosepieces can be supplied, of the dustproof pattern, so that the object glasses are protected from dust settling on their back lenses, if left on the microscope.

**Condensers** of various types are supplied on these instruments. For general work Abbe condensers are fitted or for high power work achromatic condensers and dark-ground illuminators are supplied. The latter should be used on the model with centring adjustment to the substage, or fitted with centring adjustments to slides for use with the Akehurst type substage.

**Object glasses.** All object glasses are of our standard series, the performance of which has gained them a world-wide reputation.

**Eyepieces** are of the Huyghenian type, of our standard quality.

**Mechanical stage.** On all models a detachable mechanical stage illustrated on page 72 giving 1 in. vertical and 2½ in. horizontal travel can be fitted. This stage is readily attached and detached. The mechanical stage has a pin which is inserted into a hole in the stage of the microscope. A clamp screw fixes the mechanical stage firmly in position, drawing it up against the back edge of the stage so that there is no tendency for it to shift its position once it is clamped. The movements of this mechanical stage are actuated by specially cut racks and pinions with fine teeth, giving a very delicate motion. In the Nos. 29F and G, a built-in mechanical stage of a new and simple type is fitted. This gives a travel in either direction of ½ in., and is of very robust construction. It will be noticed that the price of this mechanical stage is very moderate, and it is intended for the use of microscopists to whom a mechanical motion to the stage is necessary, but who do not require the large travel given by the detachable mechanical stage. The smaller amount of travel is sufficient for making blood counts and for the examination of mounted specimens, as it is seldom that more is required and the slide can be readily moved on the surface of the flat top-stage where different portions of the slides have to be examined in succession.

**Case.** The instrument is supplied in oak case with lock and key, or for tropical climates, a teak case specially screwed.




No. 29 London Microscope.

Stand No. 29 B.

# No. 29 London Microscope.

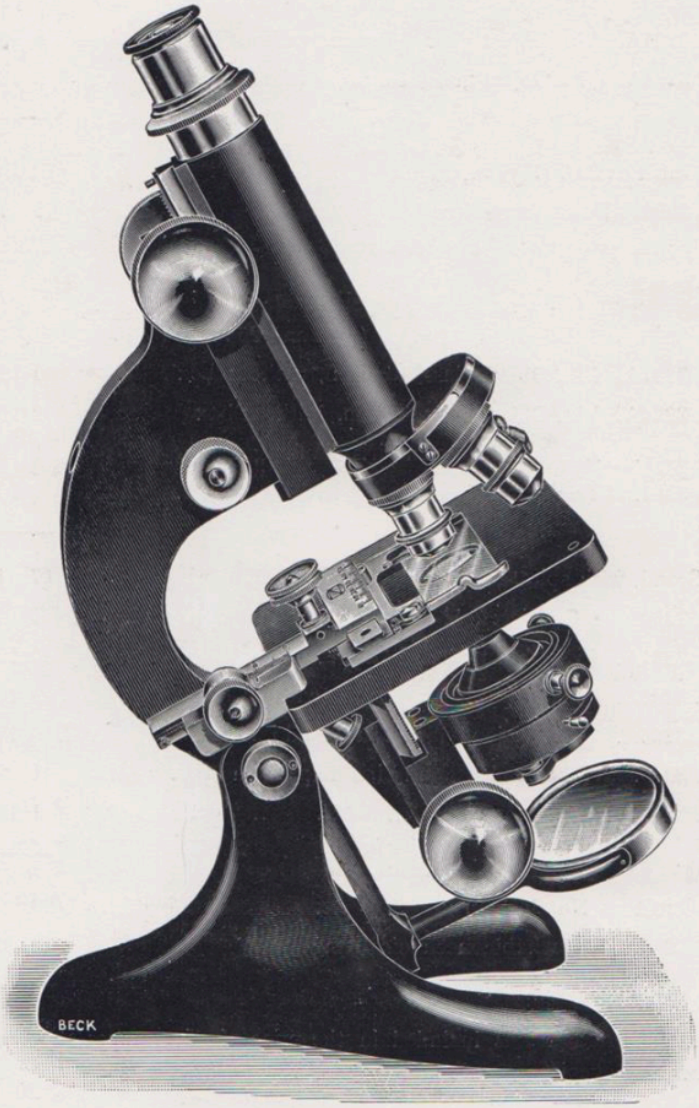
| | | | |
|---|---|---|---|
| **No. 29A (1).** | Stand, with tubular substage and iris diaphragm ... | £6 13 0 | |
| No. 3260. | Eyepiece, 42 m/m. (×6) ... ... ... ... | 0 12 0 | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m., without box ... | 0 12 0 | |
| No. 3234A. | ⅙ in. Object glass, 4 m/m., without box ... | 2 13 0 | |
| | | ——— | £10 10 0 |
| **No. 29A (2).** | Outfit as 29A (1) ... ... ... ... ... ... | £10 10 0 | |
| No. 3300. | Double nosepiece ... ... ... ... ... | 1 1 0 | |
| | | ——— | £11 11 0 |
| **No. 29B (1).** | Stand, with spiral focussing substage ... ... ... | £7 1 6 | |
| No. 3260. | 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) | 1 4 0 | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m., without box ... | 0 12 0 | |
| No. 3234A. | ⅙ in. Object glass, 4 m/m., without box ... | 2 13 0 | |
| No. 3285. | Abbe condenser and iris diaphragm ... ... | 1 9 6 | |
| No. 3301. | Triple nosepiece ... ... ... ... ... | 1 10 0 | |
| | | ——— | £14 10 0 |
| **No. 29B (2).** | Stand, with spiral focussing substage ... ... ... | £7 1 6 | |
| No. 3260. | 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) | 1 4 0 | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m., without box ... | 0 12 0 | |
| No. 3234A. | ⅙ in. Object glass, 4 m/m., without box ... | 2 13 0 | |
| No. 3235A. | 1/12 in. Object glass, 2 m/m. oil immersion ... | 5 10 0 | |
| No. 3285. | Abbe condenser and iris diaphragm ... ... | 1 9 6 | |
| No. 3301. | Triple nosepiece ... ... ... ... ... | 1 10 0 | |
| | | ——— | £20 0 0 |
| **No. 29B (3).** | Outfit as No. 29B (2) ... ... ... ... ... | £20 0 0 | |
| No. 3305. | Detachable mechanical stage ... ... ... | 6 0 0 | |
| | | ——— | £26 0 0 |

An oak case with lock and key is included in the price of microscopes supplied complete with object glasses and eyepieces,

| | | | |
|---|---|---|---|
| No. 3818. | Teak cabinet in place of oak case, screwed, for tropical climates extra ... | £1 5 0 | |
| No. 3304. | Graduations to draw-tube in millimetres extra ... | 0 7 6 | |

For particulars of high power binocular attachments see pages 44 to 47.

Any apparatus can be added or omitted at a corresponding addition or reduction of price.




No. 29 London Microscope

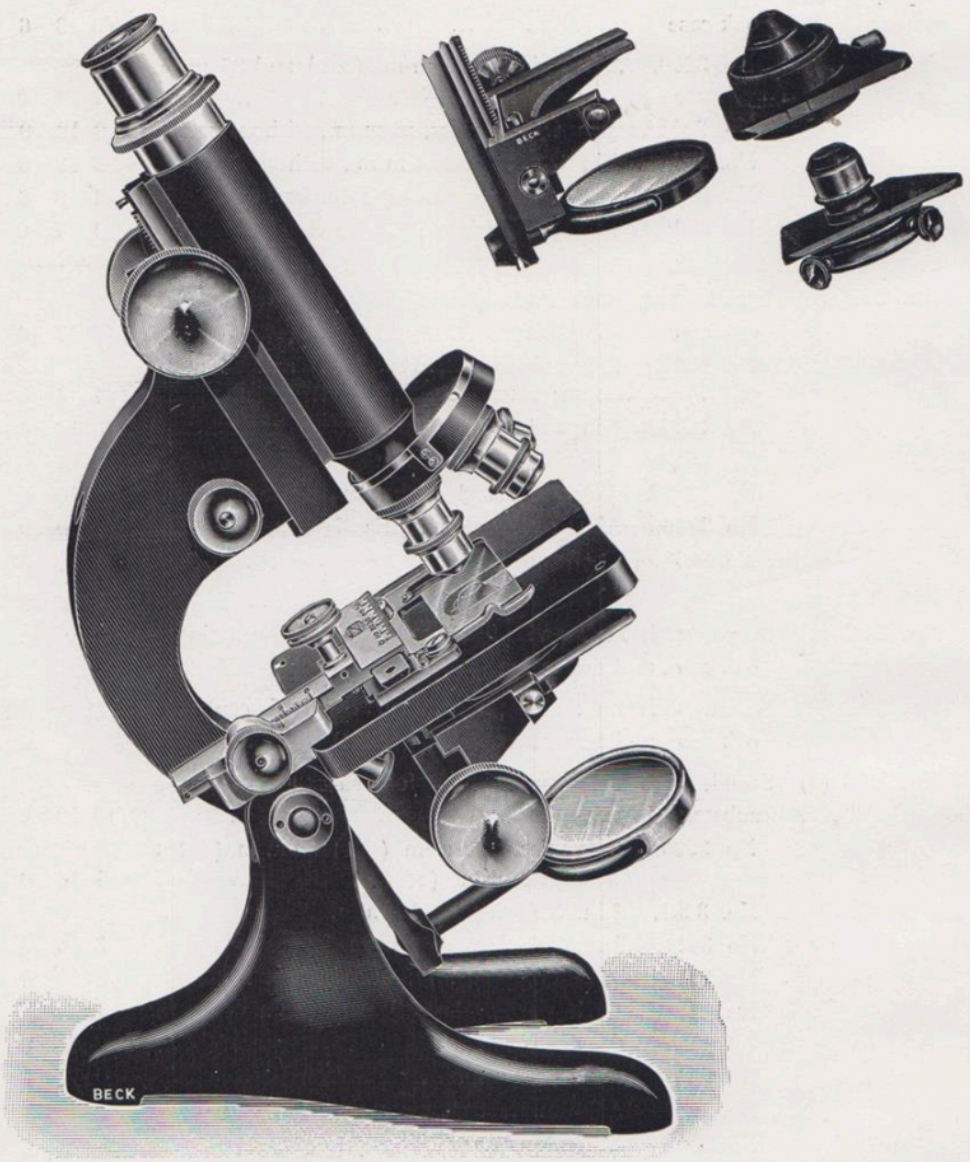
Stand No. 29 C.

# No. 29 London Microscope.

| | | | | |
|---|---|---|---|---|
| **No. 29D (1)** | Stand, with rack and pinion focussing substage, in oak case ... ... ... ... ... ... ... | £9 13 6 | | |
| No. 3260. | 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... ... ... ... ... | 1 4 0 | | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m., without box... | 0 12 0 | | |
| No. 3234A. | ⅙ in. Object glass 4 m/m., without box ... | 2 13 0 | | |
| No. 3285. | Abbe condenser and iris diaphragm ... | 1 9 6 | | |
| No. 3300. | Double nosepiece ... ... ... ... | 1 1 0 | | |
| | | ——— | £16 | 13 0 |
| **No. 29D (2)** | Stand, with rack and pinion focussing substage, in oak case ... ... ... ... ... ... ... | £9 13 6 | | |
| No. 3260. | 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... ... ... ... ... | 1 4 0 | | |
| No. 3231A. | ⅔ in. Object glass, 16 m/m. ... ... | 0 16 6 | | |
| No. 3234A. | ⅙ in. Object glass, 4 m/m. ... ... | 2 17 6 | | |
| No. 3235A. | $\frac{1}{12}$ in. Object glass, 2 m/m., oil immersion | 5 10 0 | | |
| No. 3286. | Abbe condenser and iris diaphragm ... | 2 10 0 | | |
| No. 3301. | Triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | ——— | £24 | 1 6 |
| **No. 29C (1)** | Stand, with rack and pinion focussing and centring substage, in oak case, and apparatus as No. 29D (1) ... ... ... ... | | £17 | 13 0 |
| **No. 29C (2)** | Stand, with rack and pinion focussing and centring substage, in oak case, and apparatus as No. 29D (2) ... ... ... ... | | £25 | 1 6 |
| **No. 29C (3)** | Stand, with rack and pinion focussing and centring substage, in oak case ... ... ... ... ... | £10 13 6 | | |
| No. 3260. | 3 Eyepieces, 42 m/m. (×6), 25 m/m. (×10) and 17 m/m. (×15) ... ... ... | 1 16 0 | | |
| No. 3231. | ⅔ in. Object glass, 16 m/m. ... ... | 1 10 0 | | |
| No. 3234. | ⅙ in. Object glass, 4 m/m. ... ... ... | 3 15 0 | | |
| No. 3235. | $\frac{1}{12}$ in. Object glass, 2 m/m. oil immersion | 8 10 0 | | |
| No. 3296. | High power dark ground illuminator, in substage fitting ... ... ... ... | 2 10 0 | | |
| No. 3298. | Stop for $\frac{1}{12}$ in. object glass ... ... | 0 2 6 | | |
| No. 3288. | Achromatic condenser ... ... ... | 5 15 0 | | |
| No. 3305. | Mechanical stage ... ... ... ... | 6 0 0 | | |
| No. 3301. | Triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | ——— | £42 | 2 0 |
| No. 3818. | Teak cabinet in place of oak case, screwed, for tropical climates ... extra | | £1 | 5 0 |
| No. 3304. | Graduations to drawtube in millimetres ... ... ... ... extra | | 0 | 7 6 |

For particulars of high power binocular attachments see pages 44 to 47.

Any apparatus can be added or omitted at a corresponding addition or reduction of price.




No. 29 London Microscope

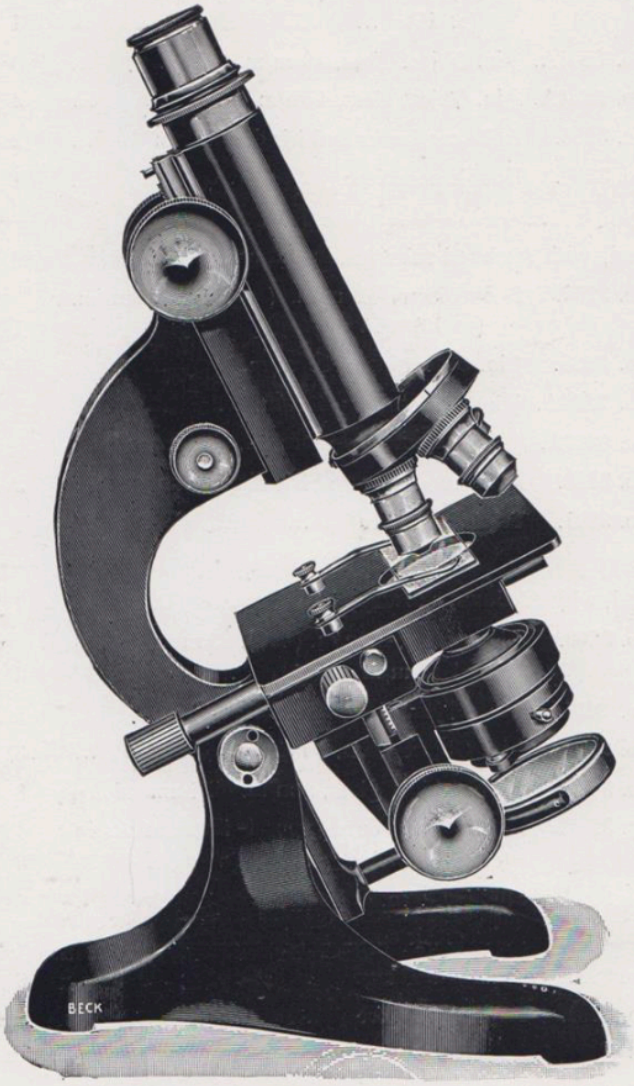
Stand No. 29 E.

# No. 29 London Microscope.

| | | | | |
|---|---|---|---|---|
| **No. 29E (1)** | Stand, with Akehurst substage, in oak case ... ... | £10 13 6 | | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (× 10) ... ... ... ... ... | 1 4 0 | | |
| | No. 3231A. ⅔ in. Object glass, 16 m/m. ... ... | 0 16 6 | | |
| | No. 3234A. ⅙ in. Object glass, 4 m/m. ... ... ... | 2 17 6 | | |
| | No. 3286. Abbe condenser and iris diaphragm ... | 2 10 0 | | |
| | No. 3300. Double nosepiece ... ... ... ... | 1 1 0 | | |
| | | | £19 | 2 6 |
| **No. 29E (2)** | Stand, with Akehurst substage, in oak case ... ... | £10 13 6 | | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (× 10) ... ... ... ... ... | 1 4 0 | | |
| | No. 3231. ⅔ in. Object glass, 16 m/m. ... ... | 1 10 0 | | |
| | No. 3234A. ⅙ in. Object glass, 4 m/m. ... ... ... | 2 17 6 | | |
| | No. 3235A. 1/12 in. Object glass, 2 m/m., oil immersion | 5 10 0 | | |
| | No. 3286. Abbe condenser and iris diaphragm ... | 2 10 0 | | |
| | No. 3301. Triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | | £25 | 15 0 |
| **No. 29E (3)** | Stand, with Akehurst substage, in oak case ... ... | £10 13 6 | | |
| | No. 3260. 3 Eyepieces, 42 m/m. (×6), 25 m/m. (×10) and 17 m/m. (×15) ... ... ... | 1 16 0 | | |
| | No. 3231. ⅔ in. Object glass, 16 m/m. ... ... | 1 10 0 | | |
| | No. 3234. ⅙ in. Object glass, 4 m/m. ... ... ... | 3 15 0 | | |
| | No. 3235. 1/12 in. Object glass, 2 m/m. oil immersion | 8 10 0 | | |
| | No. 3297. High power dark ground illuminator, in centring fitting ... ... ... ... | 3 7 6 | | |
| | No. 3298. Stop for 1/12 in. object glass ... ... | 0 2 6 | | |
| | No. 3288. Achromatic condenser in centring fitting ... | 6 10 0 | | |
| | No. 3305. Mechancial stage ... ... ... ... | 6 0 0 | | |
| | No. 3301. Triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | | £43 | 14 6 |
| No. 3818. | Teak cabinet in place of oak case, screwed, for tropical climates ... extra | | £1 | 5 0 |
| No. 3304. | Graduations to drawtube in millimetres ... ... ... ... extra | | 0 | 7 6 |

For particulars of high power binocular attachments see pages 44 to 47.

Any apparatus can be added or omitted at a corresponding addition or reduction of price.




No. 29 London Microscope.

Stand No. 29 F.

# No. 29 London Microscope.

| | | | | |
|---|---|---|---|---|
| **No. 29F (1)** | Stand, with built-in mechanical stage and rack and pinion focussing substage, in oak case ... ... ... | £12 13 6 | | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... ... ... ... ... | 1 4 0 | | |
| | No. 3231A. ⅔ in. Object glass, 16 m/m. ... ... | 0 16 6 | | |
| | No. 3234A. ⅙ in. Object glass, 4 m/m. ... ... ... | 2 17 6 | | |
| | No. 3285. Abbe condenser and iris diaphragm ... | 1 9 6 | | |
| | No. 3300. Double nosepiece ... ... ... ... | 1 1 0 | | |
| | | | £20 | 2 0 |
| **No. 29F (2)** | Stand, with built-in mechanical stage and rack and pinion focussing substage, in oak case ... ... ... | £12 13 6 | | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... ... ... ... ... | 1 4 0 | | |
| | No. 3231. ⅔ in. Object glass, 16 m/m. ... ... | 1 10 0 | | |
| | No. 3234A. ⅙ in. Object glass, 4 m/m. ... ... ... | 2 17 6 | | |
| | No. 3235A. 1/12 in. Object glass, 2 m/m., oil immersion | 5 10 0 | | |
| | No. 3286. Abbe condenser and iris diaphragm ... | 2 10 0 | | |
| | No. 3301. Triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | | £27 | 15 0 |
| **No. 29F (3)** | Stand, with built-in mechanical stage and rack and pinion focussing substage, in oak case ... ... ... | £12 13 6 | | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... ... ... ... ... | 1 4 0 | | |
| | No. 3231. ⅔ in. Object glass, 16 m/m. ... ... | 1 10 0 | | |
| | No. 3234. ⅙ in. Object glass, 4 m/m. ... ... ... | 3 15 0 | | |
| | No. 3235. 1/12 in. Object glass, 2 m/m., oil immersion | 8 10 0 | | |
| | No. 3286. Abbe condenser ... ... ... ... | 2 10 0 | | |
| | No. 3301. Triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | | £31 | 12 6 |
| **No. 29G (3)** | Stand, with built-in mechanical stage and rack and pinion focussing and centring substage, in oak case ... | £13 13 6 | | |
| | No. 3260. 3 Eyepieces, 42 m/m. (×6), 25 m/m. (×10) and 17 m/m. (×15) ... ... ... | 1 16 0 | | |
| | No. 3231. ⅔ in. Object glass, 16 m/m. ... ... | 1 10 0 | | |
| | No. 3234. ⅙ in. Object glass, 4 m/m. ... ... ... | 3 15 0 | | |
| | No. 3235. 1/12 in. Object glass, 2 m/m. oil immersion | 8 10 0 | | |
| | No. 3296. High power dark ground illuminator, in substage fitting ... ... ... ... | 2 10 0 | | |
| | No. 3298. Stop for 1/12 in. object glass ... ... | 0 2 6 | | |
| | No. 3288. Achromatic condenser ... ... ... | 5 15 0 | | |
| | No. 3301. Triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | | £39 | 2 0 |
| No. 3818. | Teak cabinet in place of oak case, screwed, for tropical climates ... extra | | £1 | 5 0 |
| No. 3304. | Graduations to drawtube in millimetres ... ... ... ... extra | | 0 | 7 6 |

For particulars of high power binocular attachments see pages 44 to 47.

Any apparatus can be added or omitted at a corresponding addition or reduction of price.

# No. 32 Pathological Microscope.

This microscope is a model specially suited for medical research work with both transparent and dark ground illumination. Its limb with course and fine adjustments, is similar to the No. 29 London microscope, as described on pages 10 and 11.

The base and pillar are in one heavy casting, with large spread, the pillar having a joint for inclination, with stops for the vertical or horizontal position.

The stage is built into the instrument and so constructed that the whole top plate travels, by means of mechanical motions operated by milled drums on the left hand side. These milled drums do not project above the level of the stage, so that large flat objects can be used without obstruction. The travel is 1½ in. in the horizontal and 1 in. in the vertical direction. A sliding ledge or Topley top plate can be used, as described on page 23. A model (No. 31) is also made where the front part of the stage is cut away, so that substage apparatus may be withdrawn without moving the substage (see page 24).

The body is of 1·4 in. diameter and carries an adjustable drawtube which is graduated in millimetres. The lower end of the drawtube is threaded to carry a low power object glass or erecting glass.

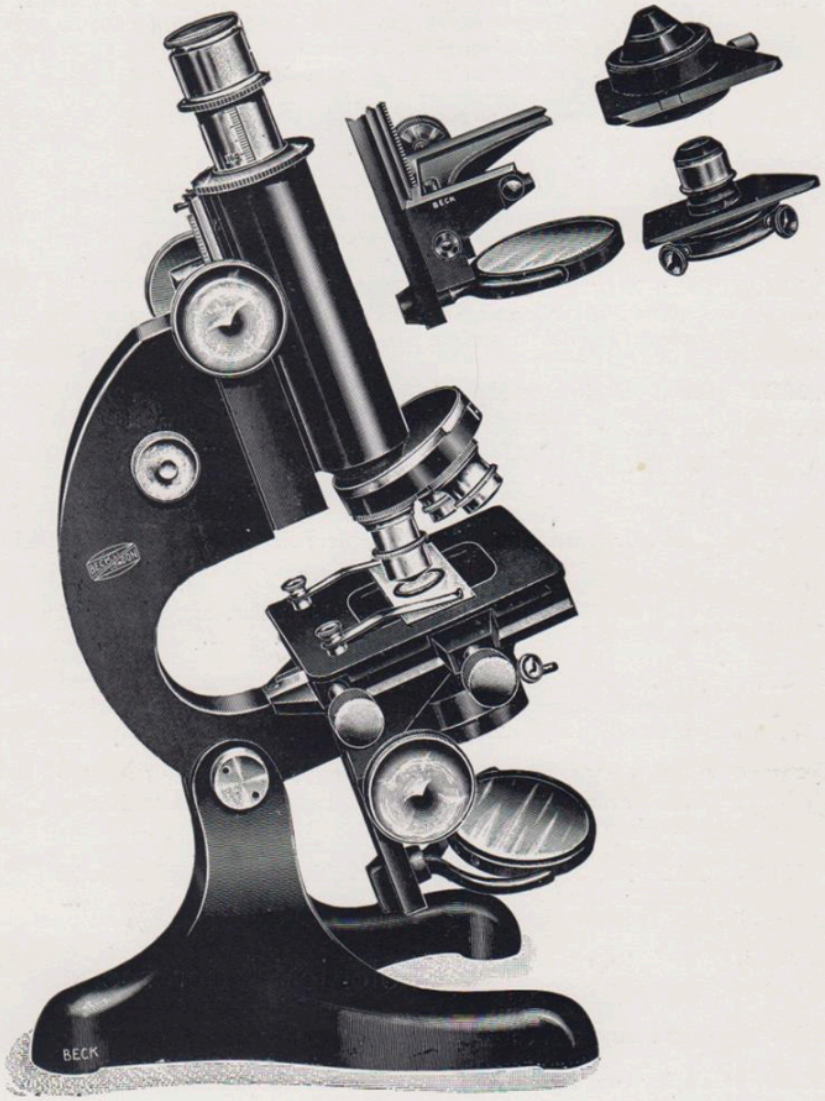
The coarse adjustment is by means of a helical rack and pinion giving a very smooth movement, so that no shake occurs and comparatively high powers can be focussed by its means. The fine adjustment is of particularly robust construction and gives a movement which is smooth in action and shows no loss of time.

The substage is focussed by rack and pinion, and the substage apparatus is interchanged by means of dovetailed slides. Each piece of apparatus is fitted on to a slide which is slid into the substage and clamped by means of a screw, thus making the process of changing easy and ensuring that the apparatus takes up its correct position.

The mirror is double, plane and concave, and of 2 in. diameter and is mounted so that it can be rotated and and also turned upon its axis.

The microscope is contained in a mahogany cabinet witn lock and key and carrying handle.

The Beck high power binocular can be fitted.




No. 32 Pathological Microscope.

# No. 32 Pathological Microscope.

| | | | | |
|---|---|---|---|---|
| **No. 32.** | Stand only in case ... ... ... ... ... ... ... | | | £21 0 0 |
| **No. 32A.** | Stand only in case ... ... ... ... ... ... ... | £21 0 0 | | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... | 1 4 0 | | |
| | No. 3231A. ⅔ in. Object glass, 16 m/m. ... ... ... | 0 16 6 | | |
| | No. 3234A. ⅙ in. Object glass, 4 m/m. ... ... ... | 2 17 6 | | |
| | No. 3286. Abbe condenser ... ... ... ... ... | 2 10 0 | | |
| | No. 3300. Dust-tight double nosepiece ... ... ... | 1 1 0 | | |
| | | | | £29 9 0 |
| **No. 32B.** | Outfit No. 3740A but with No. 3235A 1/12 in. (2 m/m.) Object glass, N.A. 1. and No. 3301 dust-tight triple nosepiece in place of double nosepiece No. 3300 ... ... ... ... | | | £35 8 0 |
| **No. 32C.** | Outfit No. 3740A, but with No. 3235, 1/12 in. (2 m/m.) Object glass, N.A. 1·3, and No. 3301 dust-tight triple nosepiece in place of double nosepiece No. 3300 ... ... ... ... | | | £38 8 0 |
| **No. 32D.** | Stand only in case ... ... ... ... ... ... ... | £21 0 0 | | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... | 1 4 0 | | |
| | No. 3231. ⅔ in. Object glass, 16 m/m. ... ... ... | 1 10 0 | | |
| | No. 3234. ⅙ in. Object glass, 4 m/m. ... ... ... | 3 15 0 | | |
| | No. 3235. 1/12 in. Object glass, 2 m/m., oil immersion ... | 8 10 0 | | |
| | No. 3286. Abbe condenser ... ... ... ... ... | 2 10 0 | | |
| | No. 3301. Dust-tight triple nosepiece ... ... ... ... | 1 10 0 | | |
| | | | | £39 19 0 |
| **No. 32DB.** | Outfit No. 32D with high power binocular, angular model and 2 extra eyepieces ... ... ... ... ... ... | | | £54 13 0 |
| **No. 32E.** | Outfit as No. 32D, but with No. 3296 high-power dark ground illuminator in centring fitting and with stop for 1/12 in. object glass ... ... ... ... ... ... ... ... | | | £43 6 6 |
| **No. 32F.** | Outfit as No. 32D, but with No. 3294 high-power focussing dark ground illuminator in centring fitting, and with stop for 1/12 in. object glass ... ... ... ... ... ... | | | £46 4 0 |
| **No. 32FB.** | Outfit No. 32F, with high-power binocular, angular model and 2 extra eyepieces ... ... ... ... ... ... | | | £60 18 0 |

# No. 31 Pathological Microscope.

| | | | |
|---|---|---|---|
| **No. 31.** | Stand only with cut-out stage ... ... ... ... ... | | £23 0 0 |
| No. 3750. | Topley top stage added to any of the above sets ... extra | | 0 17 6 |
| No. 3751. | Sliding ledge ... ... ... ... ... ... extra | | 1 10 0 |
| No. 3752. | Verniers to the mechanical stage ... ... ... ... extra | | 1 10 0 |

Any apparatus can be added or omitted at a corresponding increase or reduction in price.

Sets of apparatus are supplied as Nos. 32A. to 32FB.

# No. 3740 Pathological Microscope.

This microscope is of large size suited for research work and advanced students' work in bacteriological, medical and general work. It has several new and important features. The stage is of the built-in mechanical model where the entire top plate is moved both in the horizontal and vertical directions and can be cleared of all obstructions so that a culture plate or petri dish can be placed upon it and moved by means of the mechanical stage. The milled heads are under flush with the level of the top of the stage so that they do not prevent a large object lying flat upon the stage.

The substage apparatus is interchanged by means of dovetailed slides. The use of cylindrical fittings for changing the substage apparatus has great disadvantages, in that such fittings are difficult to change and generally necessitate the entire dislocation of the adjustments of the microscope. Now that dark ground illumination is practically a necessity in many branches of microscopy, it is frequently necessary to change rapidly from one form of illumination to another. With substage fittings of the cylindrical form this is troublesome, but the method adopted in the Pathological microscope enables this change to be made rapidly and with the minimum disturbance of the adjustments of the instrument. The precision with which the substage apparatus takes its position is also much greater and a properly fitted dovetailed slide with an efficient clamping screw is a most accurate method of positioning a fitting.

The Pathological microscope has been carefully examined and criticised by a number of experts in medical microscopy and many suggestions made by them have been included. It has been adopted at the new London School of Hygiene and Tropical Medicine where the large equipment of microscopes consists of Beck Pathologicals.

**Base and pillar** are of one heavy casting, the base being of the horseshoe pattern resting on three points, and having a spread of 5½in. by 7¼in. The pillar has joint for inclination with stops for the vertical and horizontal positions.

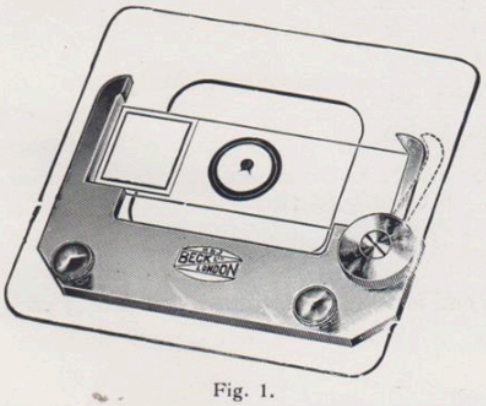



Fig. 1.

**Stage** is of the built-in mechanical model where the whole top plate travels. It has a movement of 1in. in the vertical direction and 1½in. in the horizontal. It is operated by two milled drums at the side of the instrument, which do not project above the level of the top of the stage, so that very large flat objects can be placed upon the stage without obstruction. A sliding ledge can be fitted to the stage if desired. For objects mounted upon 3in. × 1in. slips, stage clips are provided, or the Topley top stage can be employed. The construction of this can be seen by the diagram (Fig. 1). It is fixed to the stage by means of screws which engage in the stage clip holes. It can therefore be used to position slides upon the stage in conjunction with the verniers which can be fitted if required. The Topley top stage affords a very easy and certain method of holding the slip and can be

readily removed when a clear stage is desired for the accommodation of petri dishes or troughs. The whole mechanical stage is of a particularly robust construction and the mechanical motions give smooth and easy movements free from backlash. The Pathological microscope (No. 3741) is also made with the front part of the stage cut away as illustrated in Fig. 2. By this means the substage apparatus can be withdrawn from the instrument without any movement of the substage, so that a condenser and a dark ground illuminator can be interchanged without any movement of the rack and pinion and with practically no disturbance of the adjustments of the instrument.

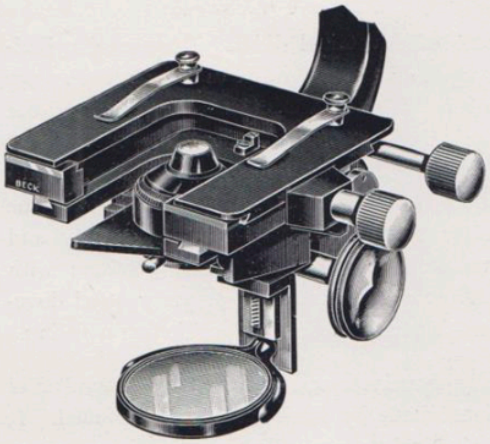


Fig. 2.

**Limb** is of solid construction and of a convenient shape for lifting the instrument.

**Body** is of a large size, 2in. in diameter, and carries an adjustable drawtube which is divided in millimetres, enabling any tube length from 140 m/m to 200 m/m to be used. The lower end of the drawtube has a standard R.M.S. thread to carry an erecting lens or a very low power object glass if desired.

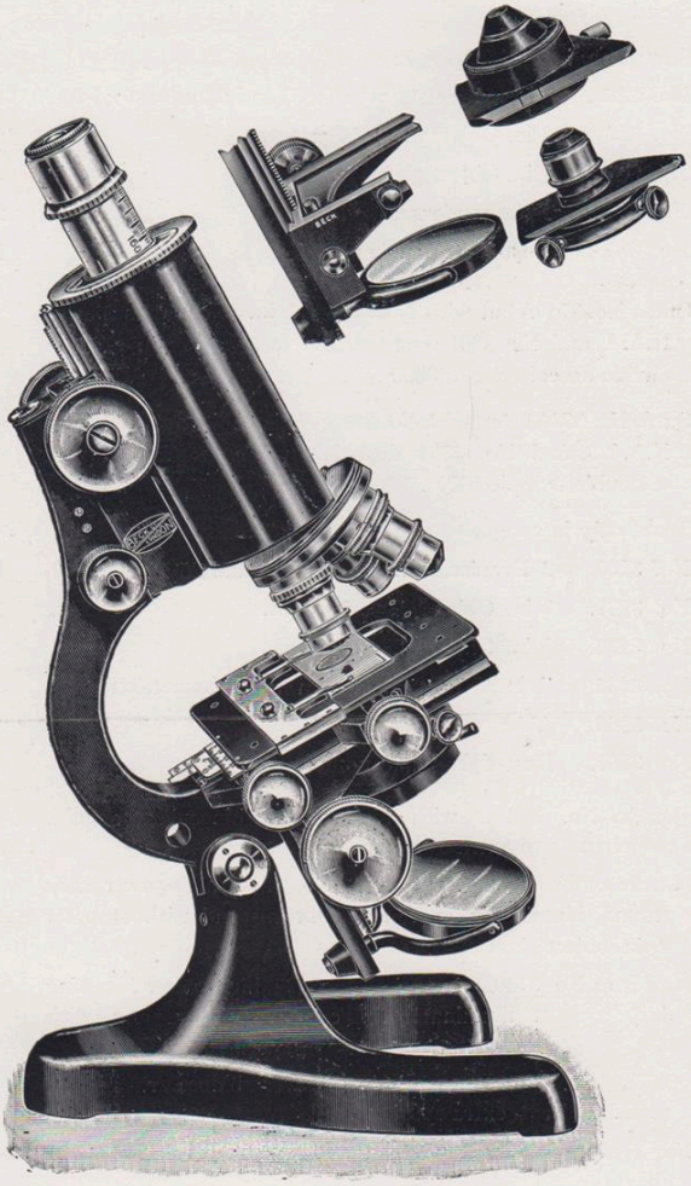
**Coarse adjustment** is by means of spiral rack and pinion cut on specially made machines to ensure an accurate and smooth movement. The milled heads are 1½ in. diameter.

**Fine adjustment** is on a patented design and is operated by two milled drums, one on each side of the limb. The adjustment works with levers and point contact, and only by this means can the necessary delicacy be obtained. The friction is reduced to a minimum, and all drag and heavy movement and backlash is thus obviated.

**Substage** is one of the principal new features of this microscope. As referred to before, cylindrical systems for changing substage apparatus are not entirely satisfactory, especially when frequent and rapid changes may be necessary. The substage of the Pathological microscope employs dovetailed slides, the principle of which can be seen from the illustration on page 25. Each piece of apparatus is fitted to a slide with a projection for holding, and is slid into the dovetail in the substage itself and clamped in position by a screw with milled head. By this system the changing is easy and certain as the slide is forced up against one side of the dovetail and must therefore take up its correct position. The substage is focussed by rack and pinion.

**Mirror** is double, plane and concave, of 2 in. diameter.

The instrument is contained in a polished mahogany cabinet with carrying handle.



No. 3740 Pathological Microscope.

# No. 3740 Pathological Microscope.

| | | | | |
|---|---|---|---|---|
| No. 3740. | Stand only in case ... .. ... ... ... ... | | | £23 0 0 |
| No. 3740A. | Stand only in case ... ... ... ... ... ... ... | £23 | 0 0 | |
| | No. 3260. 2 Eyepieces, 42 m/m (×6) and 25 m/m. (×10) ... | 1 | 4 0 | |
| | No. 3231A. ⅔ in. Object glass, 16 m/m. ... ... ... | 0 | 16 6 | |
| | No. 3234A. ⅙ in. Object glass, 4 m/m. ... .. ... ... | 2 | 17 6 | |
| | No. 3286. Abbe condenser ... ... ... ... ... | 2 | 10 0 | |
| | No. 3300. Dust-tight double nosepiece ... ... ... | 1 | 1 0 | |
| | | | | £31 9 0 |
| No. 3740B. | Outfit No. 3740A but with No. 3235A 1/12 in. object glass 2 m/m. N.A. 1, and No. 3301 dust-tight triple nosepiece in place of double nosepiece, No. 3300 ... ... ... ... ... | | | £37 8 0 |
| No. 3740C. | Outfit No. 3740A, but with No. 3235, 1/12 in. object glass 2 m/m. N.A. 1.3, and No. 3301 dust-tight triple nosepiece in place of double nosepiece No. 3300 ... ... ... ... ... | | | £40 8 0 |
| No. 3740D. | Stand only in case ... ... ... ... ... ... ... | £23 | 0 0 | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) | 1 | 4 0 | |
| | No. 3231. ⅔ in. Object glass, 16 m/m. ... ... ... | 1 | 10 0 | |
| | No. 3234. ⅙ in. Object glass, 4 m/m. ... ... ... | 3 | 15 0 | |
| | No. 3235. 1/12 in. Object glass, 2 m/m. oil immersion ... | 8 | 10 0 | |
| | No. 3286. Abbe condenser ... ... ... ... ... | 2 | 10 0 | |
| | No. 3301. Dust-tight triple nosepiece ... ... ... | 1 | 10 0 | |
| | | | | £41 19 0 |
| No. 3740D.B. | Outfit No. 3740D with high power binocular, angular model and two extra eyepieces ... ... ... ... | | | £56 13 0 |
| No. 3740E. | Outfit as No. 3740D, but with No. 3296, high-power dark ground illuminator in centring fitting and with stop for 1/12 in. object glass ... ... ... ... ... ... | | | £45 6 6 |
| No. 3740F. | Outfit as No. 3740D, but with No. 3294, high-power focussing dark ground illuminator in centring fitting, and with stop for 1/12 in. object glass ... ... ... ... ... | | | £48 4 0 |
| No. 3740F.B. | Outfit No. 3740F with high power binocular, angular model and two extra eyepieces ... ... ... ... | | | £62 18 0 |
| | No. 3750. Topley top stage added to any of the above sets ... ... ... ... ... extra | | | 0 17 6 |
| | No. 3751. Sliding ledge .. ... .. .. extra | | | 1 10 0 |
| | No. 3752. Verniers to the mechanical stage ... .. extra | | | 1 10 0 |

Any apparatus can be added or omitted at a corresponding increase or reduction in price.

| | | | | |
|---|---|---|---|---|
| No. 3704H. | Stand in case ... ... ... ... ... ... ... | £23 | 0 | 0 |
| | Nos. 3266, 3268 and 3270. 6 Compensating eyepieces, 45 m/m. (×6), 22 m/m. (×11) 10 m/m. (×25) ... | 14 | 4 | 0 |
| No. 3781. | High power binocular, angular model ... ... | 13 | 10 | 0 |
| No. 3240. | 1½ in. Apochromatic object glass, 40 m/m. ... | 4 | 10 | 0 |
| No. 3241. | ⅔ in. Apochromatic object glass, 16 m/m. ... | 7 | 15 | 0 |
| No. 3242. | ⅓ in. Apochromatic object glass, 8 m/m. ... | 9 | 10 | 0 |
| No. 3245. | ⅙ in. Apochromatic object glass, 4 m/m. .. | 12 | 0 | 0 |
| No. 3247. | ⅛ in. Apochromatic object glass, oil immersion, 3 m/m., N.A. 1.2 with stop ... ... ... | 15 | 0 | 0 |
| No. 3248. | 1/12 in. Apochromatic object glass, oil immersion, 2 m/m., N.A. 1.3 ... ... ... ... | 18 | 0 | 0 |
| No. 3291. | Beck dry and immersion achromatic condenser, in centring fitting .. ... | 10 | 10 | 0 |
| No. 3284. | Travis expanding patch stop ... ... ... | 0 | 12 | 6 |
| No. 3299. | High-power patent focussing dark ground illuminator in centring fitting ... .. | 6 | 2 | 6 |
| No. 3397. | Metal plate for holding thin (.02 in.) slips .. | 0 | 6 | 6 |
| No. 3398. | 1 doz. .02 in. slips of glass, 1.35 by 1.35 in. ... | 0 | 5 | 0 |
| No. 3280. | Sloan objective changer, with 6 fittings, in two cases .. ... ... ... ... ... | 4 | 12 | 6 |
| No. 3275. | Micrometer eyepiece ... ... ... ... | 2 | 2 | 0 |
| No. 3277. | Stage micrometer ... ... ... ... ... | 0 | 12 | 6 |
| No. 3750. | Topley top stage ... ... ... ... ... | 0 | 17 | 6 |
| No. 3751. | Sliding ledge ... ... ... ... ... | 1 | 10 | 0 |
| No. 3752. | Verniers to mechanical stage ... ... . . | 1 | 10 | 0 |
| | | | £146 | 10 0 |

## No. 3741 Pathological microscope with cut-out stage.

(See description and illustration, page 24.)

| | | | | |
|---|---|---|---|---|
| No. 3741. | Pathological microscope with cut out stage, stand only in case ... ... ... ... ... ... ... ... | £25 | 0 | 0 |

Sets of apparatus are supplied as Nos. 3740A—H.



Drawtube of Stand No. 3217




# Standard London Microscope.

Stand No. 3216.

# Standard London Microscope.

Nos. 3214, 3215, 3216, 3217.

This microscope has a large circular rotating stage with two side adjusting screws which may be used to centre the axis of rotation of the stage or for a delicate movement of the object, forming a mechanical stage with a limited amount of motion. The instrument is supplied either with the standard body and drawtube, large 2 in. diameter body and sliding drawtube, or with a 2 in. diameter body with double extension rack and pinion drawtube, giving tube length from 140 to 260 m/m. and capable of taking extra large eyepieces and apparatus of No. 1 R.M.S. Standard 1.41 in. diameter.

| | | No. 3214. | No. 3215. | No. 3216. | No. 3217. |
|---|---|---|---|---|---|
| | Stand with screw focussing substage, standard body, in case | £14 5 0 | — | — | — |
| | Stand as above, but rack and pinion focussing and centring substage ... ... ... ... ... ... | — | £17 0 0 | — | — |
| | Stand as above, with large 2-inch body ... ... ... | — | — | £19 0 0 | — |
| | Stand as above, with double extension rack and pinion drawtube ... ... ... ... ... ... | — | — | — | £23 0 0 |
| | Apparatus Set A— | | | | |
| No. 3260. | 2 Eyepieces, 42 m/m. (× 6), 25 m/m. (× 10) ... | 1 4 0 | 1 4 0 | 1 4 0 | 1 4 0 |
| No. 3231. | ⅔ in. Object glass, 16 m/m. ... ... ... | 1 10 0 | 1 10 0 | 1 10 0 | 1 10 0 |
| No. 3234. | ⅙ in. Object glass, 4 m/m. ... ... ... | 3 15 0 | 3 15 0 | 3 15 0 | 3 15 0 |
| No. 3285. | Abbe condenser ... ... ... ... ... | 1 9 6 | — | — | — |
| No. 3286. | Abbe condenser ... ... ... ... ... | — | 2 10 0 | — | — |
| No. 3288. | Beck achromatic condenser ... ... ... | — | — | 5 15 0 | 5 15 0 |
| No. 3300. | Triple nosepiece ... ... ... ... ... | 1 10 0 | — | — | — |
| No. 3280. | Sloan objective changer and 3 fittings in case ... | — | 2 17 0 | 2 17 0 | 2 17 0 |
| | Apparatus Set B—Set A with addition of | 23 13 6 | 28 16 0 | 34 1 0 | 38 1 0 |
| No. 3235. | 1/12 in. Object glass, oil immersion, 2 m/m. ... | 8 10 0 | 8 10 0 | 8 10 0 | 8 10 0 |
| | Apparatus Set C—Set B with addition of | 32 3 6 | 37 6 0 | 42 11 0 | 46 11 0 |
| No. 3296. | High power dark ground illuminator and stop for 1/12 in. object glass ... ... ... ... | 3 7 6 | 2 12 6 | 2 12 6 | 2 12 6 |
| | Apparatus Set D—Set C with addition of | 35 11 0 | 39 18 6 | 45 3 6 | 49 3 6 |
| No. 3305. | Mechanical stage with scales and verniers ... | 6 0 0 | 6 0 0 | 6 0 0 | 6 0 0 |
| | Apparatus Set E—Set D with addition of | 41 11 0 | 45 18 6 | 51 3 6 | 55 3 6 |
| No. 3306. | Circular mechanical stage, rotating with stage, extra to cost of mechanical stage No. 3305 ... | 6 0 0 | 6 0 0 | 6 0 0 | 6 0 0 |
| | | 47 11 0 | 51 18 6 | 57 3 6 | 61 3 6 |
| | Stand ... ... ... ... ... ... ... ... | 14 5 0 | 17 0 0 | 19 0 0 | 23 0 0 |
| | Apparatus Set J— | | | | |
| No. 3268. | 3 Compensating eyepieces 45 m/m. (× 6), 22 m/m. (× 11), 10 m/m. (× 25) ... ... | 7 2 0 | 7 2 0 | 7 2 0 | 7 2 0 |
| No. 3240. | 1½ in. Apochromatic object glass 40 m/m. ... | 4 10 0 | 4 10 0 | 4 10 0 | 4 10 0 |
| No. 3241. | ⅔ in. Apochromatic object glass 14 m/m. ... | 7 15 0 | 7 15 0 | 7 15 0 | 7 15 0 |
| No. 3242. | ⅓ in, Apochromatic object glass 8 m/m. ... | 9 10 0 | 9 10 0 | 9 10 0 | 9 10 0 |
| No. 3245. | ⅙ in. Apochromatic object glass 4 m/m. ... | 12 0 0 | 12 0 0 | 12 0 0 | 12 0 0 |
| No. 3247. | ⅛ in. Apochromatic object glass, oil immersion, 3 m/m. ... ... ... ... ... ... | 15 0 0 | 15 0 0 | 15 0 0 | 15 0 0 |
| No. 3248. | 1/12 in. Apochromatic object glass, oil immersion, 2 m/m. ... ... ... ... ... ... | 18 0 0 | 18 0 0 | 18 0 0 | 18 0 0 |
| No. 3288. | Beck achromatic condenser, N.A. 1 ... ... | 5 15 0 | — | — | — |
| No. 3291. | Dry and immersion achromatic and aplanatic condenser, N.A. 1.3 ... ... ... ... | — | 9 15 0 | 9 15 0 | 9 15 0 |
| No. 3288P. | Set of patch stops ... ... ... ... ... | 0 7 6 | 0 7 6 | 0 7 6 | 0 7 6 |
| No. 3293. | High power dark ground illuminator with focussing adjustment ... ... ... ... | 6 2 6 | 5 7 6 | 5 7 6 | 5 7 6 |
| No. 3397. | Metal plate to hold .02 in. (½ m/m.) thick slips ... ... ... ... ... ... | 0 6 6 | 0 6 6 | 0 6 6 | 0 6 6 |
| No. 3398. | 12 Thin slips .02 in. (½ m/m.) thick ... ... | 0 5 0 | 0 5 0 | 0 5 0 | 0 5 0 |
| No. 3280. | Sloan objective changer with 6 fittings in cases | 4 12 6 | 4 12 6 | 4 12 6 | 4 12 6 |
| No. 3306. | Complete rotating mechanical stage ... ... | 12 0 0 | 12 0 0 | 12 0 0 | 12 0 0 |
| No. 3275. | Micrometer eyepiece ... ... ... ... | 2 2 0 | 2 2 0 | 2 2 0 | 2 2 0 |
| No. 3277. | Stage micrometer ... ... ... ... ... | 0 12 6 | 0 12 6 | 0 12 6 | 0 12 6 |
| No. 3315. | Large bull's eye condenser ... ... ... | 2 10 0 | 2 10 0 | 2 10 0 | 2 10 0 |
| No. 3320. | Rousellet compressor ... ... ... ... | 1 1 0 | 1 1 0 | 1 1 0 | 1 1 0 |
| | | 123 16 6 | 129 16 6 | 131 16 6 | 135 16 6 |
| No. 3780. | High power binocular, straight model ... ... | ... ... | ... ... | ... ... | £10 10 0 |
| No. 3781. | High power binocular, angular model ... ... | ... ... | ... ... | ... ... | £13 10 0 |
| | Extra eyepieces for binocular at list prices. | | | | |

When the substage apparatus is required for a microscope fitted with the circular mechanical stage the standard substage apparatus requires to be slightly lengthened to allow it to focus through the thicker stage and in ordering this should be mentioned. Any apparatus can be added or omitted at a corresponding increase or reduction in price.



No. 3309.




No. 3201 Massive Microscope.

# No. 3201 Massive Microscope.

This instrument was designed for the National Institute for Medical Research in order to produce a microscope for accurate observations of a more rigid design than has been made hitherto. Its construction is so strong and stiff that no perceptible flexure can take place. The limb consists of a massive brass casting which extends in one piece from the body to the mirror. The tail piece and slow motion slide are planed out in one continuous cut to ensure perfect alignment of the substage and focussing slides. The stage is rigidly fixed to side wings which form an integral portion of the limb. The pillar and base are heavy and free from any flexure. The fine adjustment is exceptionally delicate; each division on the milled head moves the body ·001 m/m. The coarse adjustment milled heads are very large, enabling an accurate setting to be made.

The stage measures $4\frac{1}{2} \times 4\frac{5}{8}$ inches. It is flat with a gap cut out in front to enable substage apparatus to be readily changed without altering the focussing adjustments. The mechanical stage, which fits into dovetails cut in the flat stage, has specially delicate motions actuated by milled heads which project from the right hand side. The cross slide has a travel of 3 inches and the vertical slide has a travel of $1\frac{1}{4}$ inches. Vernier scales are provided to both movements, and a clamp is attached to the vertical motion.

The substage has rack and pinion focussing and centring adjustments and has a tubular fitting of the standard (R.M.S.) size. Its upper surface has an additional dovetailed fitting to receive apparatus. Substage condensers and dark ground illuminators are mounted in dovetailed fittings, held in position by a clamping milled head. They are accurately centred and are of the same height so that they can be rapidly changed while the object is under observation, the gap in the front of the stage permitting this to be done without the focus of the substage being altered. The tubular portion of the substage is free to receive other apparatus which can be used in conjunction with condensers and illuminators.

The back of the foot of the microscope carries a short vertical post to take the weight and form a rigid support when the microscope is in a horizontal position. The body is of the large 2-inch diameter, with a drawtube giving a variation in length from 140 m/m. to 200 m/m. A rack and pinion double extension drawtube, as illustrated on page 30 can be fitted if desired. A high power binocular attachment can be fitted to the instrument.

With these massively made microscopes, the body and apparatus can be relied upon to be always truly in the optic axis, the manipulation of one part of the instrument does not tend to upset the adjustment of the other parts, and when using the very highest power lenses it is a pleasure to work on account of its stability and the delicacy of all its adjustments.

# No. 3201 Massive Microscope.

| | | | | |
|---|---|---|---|---|
| No. 3201. | Stand and 3 substage fittings in case ... ... ... ... ... | | | £55 0 0 |
| No. 3201A. | Stand No. 3201 and 3 substage fittings in case ... ... ... ... | £55 0 0 | | |
| | No. 3291. Beck dry and immersion achromatic and aplanatic condenser 1.3 N.A. ... ... ... ... ... | 9 15 0 | | |
| | No. 3293. Beck patent focussing high power dark ground illuminator | 5 7 6 | | |
| | No. 3397. Metal holder for extra thin slips, .02 in. ... ... ... | 0 6 6 | | |
| | No. 3398. 12 thin slips, .02 in. ... ... ... ... ... ... | 0 5 0 | | |
| | No. 3260. 3 Huyghenian eyepieces, 42 m/m. (×6), 25 m/m. (×10) and 17 m/m., (×15) ... ... ... ... ... | 1 16 0 | | |
| | No. 3231. $\frac{2}{3}$ in. Object glass, 16 m/m. ... ... ... ... ... | 1 10 0 | | |
| | No. 3232. $\frac{1}{3}$ in. Object glass, 8 m/m. ... ... ... ... ... | 3 5 0 | | |
| | No. 3236. $\frac{1}{8}$ in. Object glass 1.2 N.A., oil immersion, 3 m/m. ... | 7 10 0 | | |
| | No. 3280. Sloan objective changer and 3 fittings in case ... ... | 2 17 0 | | |
| | | | | £87 12 0 |
| No. 3201B. | Set as 3201A, but with dust-tight triple nosepiece No. 3300 in place of Sloan changer ... ... ... ... ... ... ... | | | £86 5 0 |
| No. 3201C. | Stand No. 3201 and 3 substage fittings in case ... ... ... ... | £55 0 0 | | |
| | No. 3291. Beck dry and immersion achromatic and aplanatic condenser 1.3 N.A. ... ... ... ... ... | 9 15 0 | | |
| | No. 3292. Beck patent focussing high power dark ground illuminator | 5 7 6 | | |
| | No. 3397. Metal holder for extra thin slips, .02 in. ... ... ... | 0 6 6 | | |
| | No. 3398. 12 thin slips, .02 in. ... ... ... ... ... | 0 5 0 | | |
| | No. 3266. Compensating eyepiece, 45 m/m. (×6) ... ... ... | 2 2 0 | | |
| | No. 3268. Compensating eyepiece, 22 m/m. (×11) ... ... ... | 2 10 0 | | |
| | No. 3270. Compensating eyepiece, 10 m/m. (×25) ... ... ... | 2 10 0 | | |
| | No. 3241. $\frac{2}{3}$ in. Apochromatic object glass, 16 m/m. ... ... ... | 7 15 0 | | |
| | No. 3242. $\frac{1}{3}$ in. Apochromatic object glass, 8 m/m. ... ... ... | 9 10 0 | | |
| | No. 3247. $\frac{1}{8}$ in. Apochromatic object glass 1.2 N.A., oil immersion, 3 m/m. ... ... ... ... ... ... ... | 15 0 0 | | |
| | No. 3280. Sloan objective changer and 3 fittings in case ... ... | 2 17 0 | | |
| | | | | £112 18 0 |
| No. 3201D. | Set as No. 3201C, but with dust-tight triple nosepiece No. 3300 in place of Sloan changers ... ... ... ... ... ... ... | ... | ... | £111 11 0 |
| No. 3780. | High power binocular, straight model ... ... ... ... ... | ... | ... | £10 10 0 |
| No. 3781. | High power binocular, angular model ... ... ... ... ... | ... | ... | £13 10 0 |

Extra eyepieces for binocular at listed prices.

## MASSIVE MICROSCOPE OUTFIT FOR HIGH POWER DARK GROUND ILLUMINATION AS USED BY THE NATIONAL INSTITUTE OF MEDICAL RESEARCH.

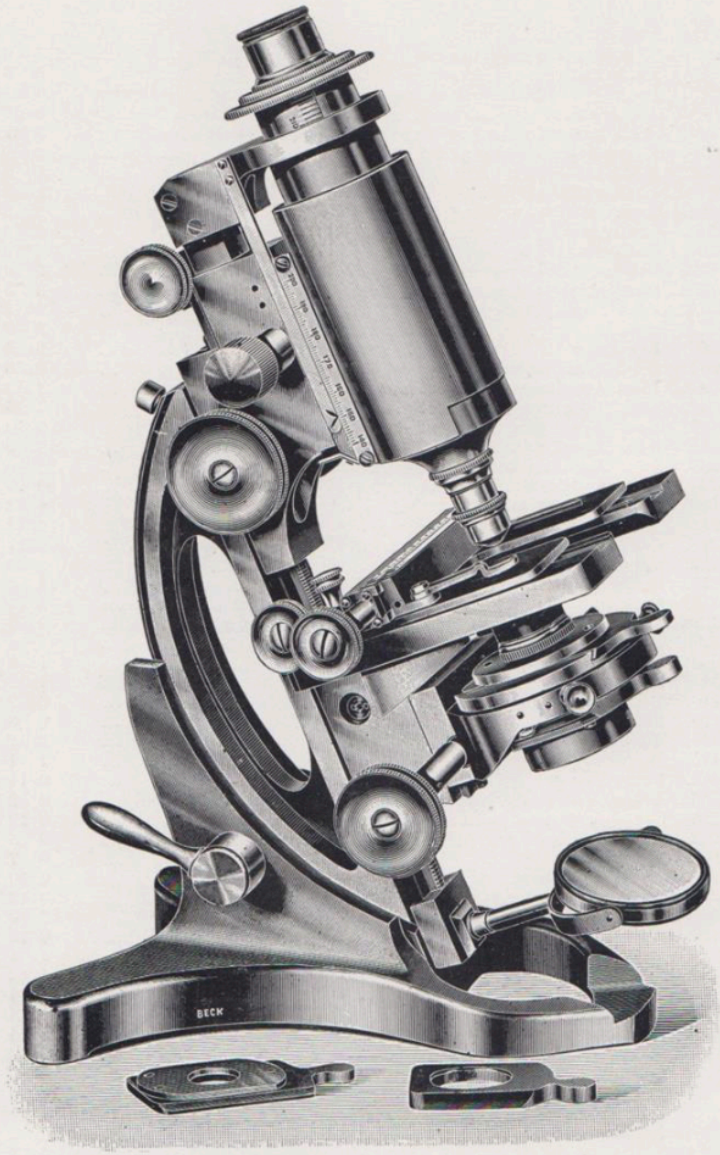
| | | | |
|---|---|---|---|
| No. 3201F. | Stand No. 3201 and 3 substage fittings in case ... ... ... ... | £55 0 0 | |
| | No, 3309. Rack and pinion drawtube ... ... ... ... ... | 5 0 0 | |
| | No. 3288. Achromatic condenser 1 N.A. ... ... ... ... | 5 15 0 | |
| | No. 3293. Beck patent focussing high power dark ground illuminator | 5 7 6 | |
| | No. 3266. Barnard compressor and supply of glasses ... ... | 2 2 6 | |
| | No. 3297. Metal holder for extra thin slips, 0.2 in. ... ... ... | 0 6 6 | |
| | No. 3298. 12 thin slips, 0.2 in. for above ... ... ... ... | 0 5 0 | |
| | No. 3399. $\frac{1}{2}$ gross $\frac{1}{2}$ m/m 3 × 1 slips ... ... ... ... ... | 0 18 0 | |
| | No. 3266. Compensating eyepiece, 45 m/m. (×6) ... ... | 2 2 0 | |
| | No. 3268. Compensating eyepiece, 22 m/m. (×11) ... ... ... | 2 10 0 | |
| | No. 3270. Compensating eyepiece, 10 m/m. (×25) ... ... ... | 2 10 0 | |
| | No. 3241. $\frac{2}{3}$ in. Apochromatic object glass, 16 m/m. ... ... ... | 7 15 0 | |
| | No. 3242. $\frac{1}{3}$ in. Apochromatic object glass, 8 m/m. ... ... ... | 9 10 0 | |
| | No. 3248. $\frac{1}{12}$ in. Apochromatic object glass 1·2 N.A., 2 m/m., oil immersion ... ... ... ... ... ... ... | 18 0 0 | |
| | No. 3280. Sloan objective changer with fittings in case ... ... | 2 17 0 | |
| | No. 3328. Double wedge light moderator ... ... ... ... | 4 17 6 | |
| | No. 3333. Set of Wratten & Wainwright screens ... ... ... | 2 18 6¶ | |
| | No. 3393. Photomicrographic camera ... ... ... ... ... | 15 0 0 | |
| | No. 3615. Mercury vapour lamp ... ... ... ... ... ... | 20 0 0 | |
| | No. 3617. Resistance for high voltages* ... ... ... ... ... | 3 0 0 | |
| | No. 3327. Didymium light filter ... ... ... ... ... ... | 3 10 0¶ | |
| | | | £169 4 6 |

* The resistance listed is for high voltage direct current (D.C. 200—240), resistances for other currents can be quoted for.

# No. 3201 Massive Microscope.

| | | | | |
|---|---|---|---|---|
| No. 3201M. | Stand and 3 substage fittings in case ... ... ... ... ... | £55 | 0 | 0 |
| No. 3309. | Rack and pinion drawtube ... ... ... ... ... | 5 | 0 | 0 |
| No. 3291. | Beck dry and immersion achromatic and aplanatic condenser 1·3 N.A. ... ... ... ... ... ... ... | 9 | 15 | 0 |
| No. 3293. | Beck patent focussing high power dark ground illuminator | 5 | 7 | 6 |
| No. 3326. | Barnard compressor and set of slips ... ... ... ... | 2 | 2 | 6 |
| No. 3397. | Metal holders for extra thin slips, ·02 in. ... ... ... | 0 | 6 | 6 |
| No. 3398. | 12 thin slips, ·02 in. ... ... ... ... ... ... | 0 | 5 | 0 |
| No. 3266. | Compensating eyepiece, 45 m/m. (X 6) ... ... ... ... | 2 | 2 | 0 |
| No. 3268. | Compensating eyepiece, 22 m/m. (X11) ... ... ... ... | 2 | 10 | 0 |
| No. 3269. | Compensating eyepiece, 15 m/m. (X17) ... ... ... ... | 2 | 10 | 0 |
| No 3270. | Compensating eyepiece, 10 m/m. (X25) ... ... ... ... | 2 | 10 | 0 |
| No 3270A. | Compensating eyepiece, 5 m/m. (X50) ... ... ... ... | 3 | 3 | 0 |
| No. 3275. | Beck micrometer eyepiece ... ... ... ... ... | 2 | 2 | 0 |
| No. 3273. | Erecting eyepiece ... ... ... ... ... ... ... | 2 | 0 | 0 |
| No. 3257. | Eyeshade ... ... ... ... ... ... ... ... | 0 | 2 | 0 |
| No. 3011B. | 2-in. Achromatic object glass, 50 m/m. ... ... ... | 0 | 18 | 0 |
| No. 3240. | 1½-in. Apochromatic object glass, 40 m/m. ... ... ... | 4 | 10 | 0 |
| No. 3241. | ⅔-in. Apochromatic object glass, 16 m/m. ... ... ... | 7 | 15 | 0 |
| No. 3242. | ⅓-in. Apochromatic object glass, 8 m/m. ... ... ... | 9 | 10 | 0 |
| No. 3245. | ⅙ in. Apochromatic object glass, 4 m/m. ... ... ... | 12 | 0 | 0 |
| No. 3247. | ⅕-in. Apochromatic object glass 1·2 N.A., 3 m/m. ... ... | 15 | 0 | 0 |
| No. 3249. | 1/12-in. Apochromatic object glass 1·4 N.A., 2 m/m. ... ... | 25 | 0 | 0 |
| No. 3280. | Sloan object glass changer with 6 fittings and 2 cases ... ... | 4 | 12 | 6 |
| No. 3284. | Travis expanding iris stop ... ... ... ... ... | 0 | 12 | 6 |
| No. 3328. | Double wedge light moderator ... ... ... ... ... | 4 | 17 | 6 |
| No. 3333. | Set of 9 colour filters ... ... ... ... ... ... | 2 | 18 | 6 |
| No. 3315. | Bull's eye condenser on stand ... ... ... ... ... | 2 | 10 | 0 |
| No. 3359. | Beck aplanatic ring reflector for ⅔-in. and ⅕-in. object glasses | 2 | 10 | 0 |
| No. 3359A. | Beck aplanatic ring reflector for ⅙-in. object glass ... ... | 2 | 10 | 0 |
| No. 2560. | Beck patent vertical illuminator ... ... ... ... | 4 | 4 | 0 |
| No. 2561. | Iris diaphragm and lens for No. 2560 ... ... ... ... | 1 | 3 | 6 |
| No. 3367. | Dark well ... ... ... ... ... ... ... ... | 1 | 1 | 0 |
| No. 3416. | Beck glass trough ... ... ... ... ... ... ... | 0 | 9 | 0 |
| No. 3420. | Live box ... ... ... ... ... ... ... ... | 0 | 8 | 6 |
| No. 3319. | Akehurst compressorium ... ... ... ... ... ... | 2 | 7 | 6 |
| No. 3421. | Beck compressor ... ... ... ... ... ... ... | 1 | 1 | 0 |
| No. 3422. | Stage forceps ... ... ... ... ... ... ... | 0 | 14 | 0 |
| No. 3325A. | Thoma Hawkesley hæmacytometer ... ... ... ... | 2 | 2 | 0 |
| No. 3325S. | Chessboard glass plate to fit eyepiece ... ... ... ... | 0 | 12 | 6 |
| No. 3322. | Counting chamber to use with 3325S ... ... ... ... | 0 | 5 | 0 |
| No. 3384. | Warm stage ... ... ... ... ... ... ... | 0 | 7 | 6 |
| No. 3276. | Eyepiece micrometer ... ... ... ... ... ... | 0 | 10 | 6 |
| No. 3277. | Stage micrometer 1/10 and 1/100 m/m. ... ... ... | 0 | 12 | 6 |
| No. 3369. | Beck vertical camera lucida ... ... ... ... ... | 2 | 10 | 0 |
| No. 3375. | Drawing table ... ... ... ... ... ... ... | 0 | 15 | 0 |
| No. 3345. | Polarising apparatus ... ... ... ... ... ... | 4 | 4 | 0 |
| No. 3358. | Iris diaphragm in nosepiece adapter ... ... ... ... | 1 | 15 | 0 |
| No. 3276A. | Cobweb micrometer ... ... ... ... ... ... | 9 | 0 | 0 |
| No. 3050. | Tourmaline ... ... ... ... ... ... ... ... | 1 | 15 | 0 |
| No. 3258. | Goniometer eyepiece ... ... ... ... ... ... | 2 | 15 | 0 |
| No. 3349. | Holder for tourmaline or compensating eyepiece over eyepiece | 1 | 15 | 0 |
| No. 3379. | Apertometer ... ... ... ... ... ... ... | 0 | 6 | 0 |
| | Selected apparatus for testing object glasses ... ... ... | 18 | 0 | 0 |
| | Case to hold instruments ... ... ... ... ... ... | 7 | 10 | 0 |
| | Assortment of slips, covers, forceps, scissors, needles, pipettes, etc. ... ... ... ... ... ... ... | 2 | 2 | 0 |
| No. 3781. | High power binocular attachment angular form ... ... | 13 | 10 | 0 |
| Nos. 3266, 3268, 3269. | Extra compensating eyepieces for binocular (3) | 7 | 2 | 0 |
| | | | | £278 17 0 |

The above apparatus forms a complete equipment except for the illuminant, which cannot be recommended without knowledge of the available electric supply. Any of the items can be omitted or replaced by others at the corresponding reduction or alteration in price.




Radial Research Microscope.

Stand No. 3190.

# Radial Research Microscope.

The Radial microscope is an universal instrument for research. The general design is that of a small optical bench, which is swung in a concentric fitting, so arranged that as the instrument is changed from the vertical to the inclined or horizontal position, the centre of rotation is in the optic axis, and the centre of gravity always lies near the centre of the base. This arrangement combined with the focussing stage which the instrument possesses, is of special importance for metallurgical work where a vertical illuminator is used, as the illumination, once having been set, is not altered by the inclination of the instrument or by the focussing.

The instrument has a heavy base with two uprights in which the limb swings in grooves. The limb has a parallel dove-tailed slide provided with a rack along its entire length, and all the parts of the microscope fit this dove-tail and are moved upon it, and with the exception of the mirror slide, are actuated by racks, pinions and milled heads. The upper slide carries the body, fine adjustment and the upper portions of the petrological apparatus. The middle slide carries the stage and substage and the lower portion of the petrological apparatus. The third slide carries the mirror.

The rack and pinion actuating the body slide forms one of the coarse focussing adjustments, and this slide also carries the nosepiece, which, actuated by a double lever action, forms the double speed fine adjustment, which is operated by two side milled heads each giving a different speed. This slow motion slide only carries the object glass and does not support the weight of the body, so that a much more reliable adjustment is obtained. The slow motion also moves the body tube when a plain body only is supplied.

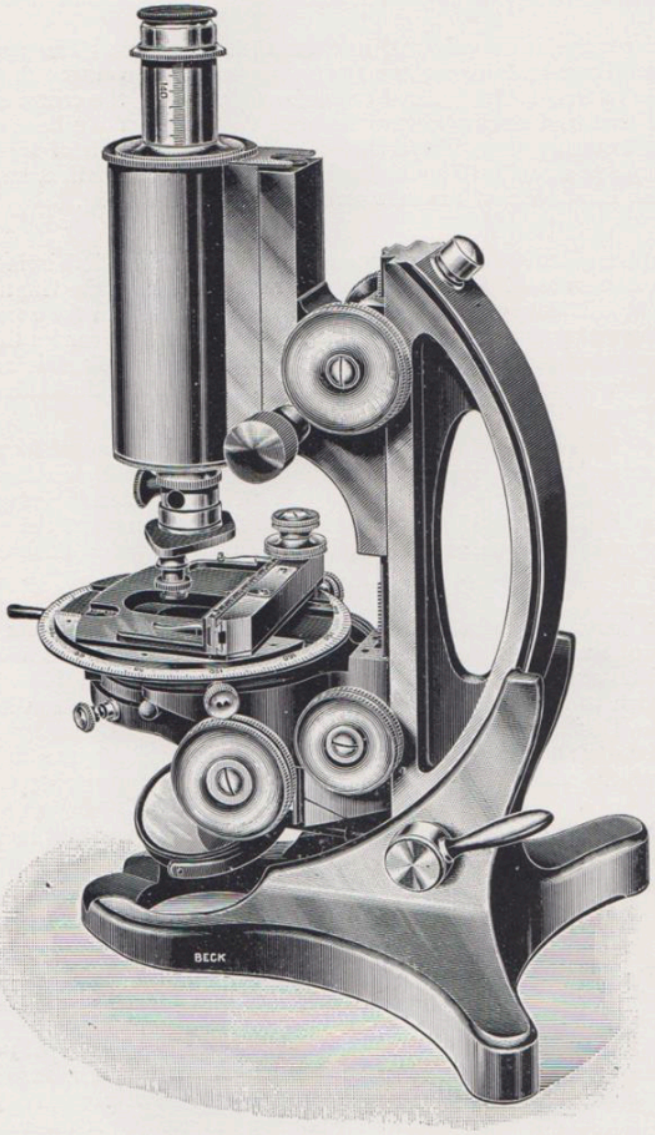
The body slide has a square hole down its entire length, in which fits a bar which can be extended by means of a rack and pinion motion for about $2\frac{1}{2}$ in. To this is fixed a bracket which carries a graduated telescopic draw tube giving any tube length from 140 m/m to 250 m/m. Heavy apparatus such as a spectroscope, photometer or a small camera can be attached to this bar and drawtube. There is no fear of upsetting the fine adjustment by the attachment of these pieces of apparatus, as the fine adjustment mechanism works quite independently, these other pieces of apparatus being separately supported.

A Greenough binocular can be supplied on a separate carriage which fits in the main dove-tail slide of the microscope. The high power binocular is inserted into the drawtube.

The stage slide consists of a focussing carriage, the upper portion of which carries the stage and the lower portion of which carries the substage. Two forms of stage are supplied: one is the square stage as fitted to the Massive microscope, and the other is the complete circular rotating stage with centring motion as described on page 72. The square stage has a gap in the front to enable the substage apparatus to be readily changed. The substage focusses by rack and pinion and has centring adjustment, and consists of a cylindrical fitting of the R.M.S. standard diameter. It also has a dove-tailed slide similar to the system adopted in our Massive microscope, so that an achromatic condenser or a dark ground illuminator can be permanently centred upon its respective slide and can be interchanged without altering the position of the substage.

The petrological apparatus is on the well-known "Dick" principle, by which the polariser and analyser are rotated together, the angular rotation being read on a scale on the analyser. The mechanism has been improved by the substitution of direct acting links for cog-wheels, and also a great improvement has been made in working the fine adjustment independently of this apparatus, which in the older models, owing to its weight, put considerable strain upon the fine adjustment.

For full description of the Radial microscope and its use see "The Microscope: an Advanced Handbook," by Conrad Beck, price 7/6 net.




Radial Research Microscope.

Stand No. 3192.



Greenough binocular body.




Petrological attachment with a synchronized rotating motion to analyser and polarizer by links and independent rotating and swing-out motions.

## Attachments to Radial Research Microscope.

# Radial Research Microscope.

**No. 3190.** **Stand,** coarse and fine focussing adjustments, focussing stage, focussing and centring substage, mirror, in case.
Stage, square, with gap in front, vertical and lateral mechanical motions, vernier scales and clamp to vertical motion.
Substage with three Akehurst slides for condensers and illuminators, two similar slides for stops and colour filters, and including iris diaphragm.
Drawtube bracket on solid extension fitting, with rack and pinion adjustment, extra telescopic sliding tube with divided scales to both adjustments.
High power binocular fitting into drawtube.
Binocular body (Greenough) on separate carriage which focusses by rack and pinion on the main fitting of the limb.
Polarising apparatus with polarising and analysing prisms in fittings with link motions by which they are rotated, together with large divided circle, separate rotations to each prism clicked at 4 positions and with divided circles, independent swing-out adjustments to each prism, eyepiece with cross lines, slot for quartz wedges ... £225 0 0

**No. 3191.** **Regular Model Stand,** coarse and fine adjustments, focussing stage, focussing and centring substage, complete with slides and iris diaphragm, square stage as above, 2 in. body and sliding drawtube and mirror, in case ... ... ... ... ... ... ... 108 0 0

**No. 3192.** **Regular Model Stand** as No. 3191, but with circular rotating mechanical stage with centring adjustments, in case ... ... ... 108 0 0

**No. 3193.** **Regular Model Stand** as No. 3191, but with high power binocular, angular model, in case ... ... ... ... ... 121 10 0

**No. 3194.** **Regular Model Stand** as No. 3191, but without substage, in case ... 91 0 0

No. 3090. Rack and pinion drawtube with additional sliding drawtube to stands Nos. 3191, 3192, 3194 ... ... ... ... ... ... extra 5 0 0

# Sets of Apparatus for use with Radial Research Microscopes.

| | | | | |
|---|---|---|---|---|
| **Set A.** | No. 3291. | Beck dry and immersion achromatic and aplanatic condenser 1.3 N.A. ... ... | £9 15 0 | |
| | No. 3293. | Beck patent focussing high power dark ground illuminator ... ... ... ... ... | 5 7 6 | |
| | No. 3397. | Metal holder for extra thin slips, .02 in. ... | 0 6 6 | |
| | No. 3398. | 12 thin slips, .02 in. ... .. ... ... | 0 5 0 | |
| | No. 3266. | Compensating eyepiece, 45 m/m. (× 6) ... | 2 2 0 | |
| | No. 3268. | Compensating eyepiece, 22 m/m. (× 11) ... | 2 10 0 | |
| | No. 3270. | Compensating eyepiece, 10 m/m. (× 25) ... | 2 10 0 | |
| | No. 3241. | $\frac{2}{3}$ in. Apochromatic object glass, 16 m/m. ... | 7 15 0 | |
| | No. 3242. | $\frac{1}{3}$ in. Apochromatic object glass, 8 m/m. ... | 9 10 0 | |
| | No. 3247. | $\frac{1}{8}$ in. Apochromatic oil immersion object glass, 3 m/m. .. ... ... ... ... ... | 15 0 0 | |
| | No. 3830 | Sloan objective changer and 3 fittings, in case... | 2 17 0 | |
| | | | | £57 18 0 |
| **Set B.** | No. 3291. | Beck dry and immersion achromatic and aplanatic condenser 1.3 N.A. ... ... | 9 15 0 | |
| | No. 3293. | Beck patent focussing high power dark ground illuminator ... ... ... ... ... | 5 7 6 | |
| | No. 3397. | Metal holder for extra thin slips, .02 in.... ... | 0 6 6 | |
| | No. 3398. | 12 thin slips, .02 in. ... ... ... ... | 0 5 0 | |
| | No. 3266. | Compensating eyepiece, 45 m/m. (× 6) ... | 2 2 0 | |
| | No. 3268. | Compensating eyepiece, 22 m/m. (× 11) ... | 2 10 0 | |

Set B—continued

| | | | | |
|---|---|---|---|---|
| No. 3269. | Compensating eyepiece 15 m/m. (×17) ... ... | 2 10 0 | | |
| No. 3270. | Compensating eyepiece 10 m/m. (×25) ... ... | 2 10 0 | | |
| No. 3270A. | Compensating eyepiece 5 m/m. (×50) ... ... | 3 3 0 | | |
| No. 3240. | 1½ in. Apochromatic object glass, 40 m/m. ... | 4 10 0 | | |
| No. 3241. | ⅔ in. Apochromatic object glass, 16 m/m. ... | 7 15 0 | | |
| No. 3242. | ⅓ in. Apochromatic object glass, 8 m/m. ... | 9 10 0 | | |
| No. 3245. | ⅙ in. Apochromatic object glass, 4 m/m. ... | 12 0 0 | | |
| No. 3247. | ⅛ in. Apochromatic object glass, 1.2 N.A., 3 m/m. oil immersion ... ... ... ... | 15 0 0 | | |
| No. 3249. | 1/12 in. Apochromatic object glass, 1.4 N.A., 2 m/m. oil immersion ... ... ... ... | 25 0 0 | | |
| No. 3280. | Sloan objective changer with 6 fittings, in 2 cases | 4 12 6 | | |
| | | | £106 16 | 6 |

**Set E.** Object glasses and eyepieces required for use with Greenough binocular.

| | | | | |
|---|---|---|---|---|
| No. 3266. | Extra compensating eyepiece, 45 m/m. (×6) ... | 2 2 0 | | |
| No. 3268. | Extra compensating eyepiece, 22 m/m. (×11) ... | 2 10 0 | | |
| No. 3010. | Pair object glasses, 55 m/m. ... ... ... | 3 10 0 | | |
| No. 3011. | Pair object glasses, 49 m/m. ... ... ... | 3 10 0 | | |
| No. 3012. | Pair object glasses, 32 m/m. ... ... ... | 4 10 0 | | |
| No. 3013. | Pair object glasses, 16 m/m. ... ... ... | 5 10 0 | | |
| | | | £21 12 | 0 |

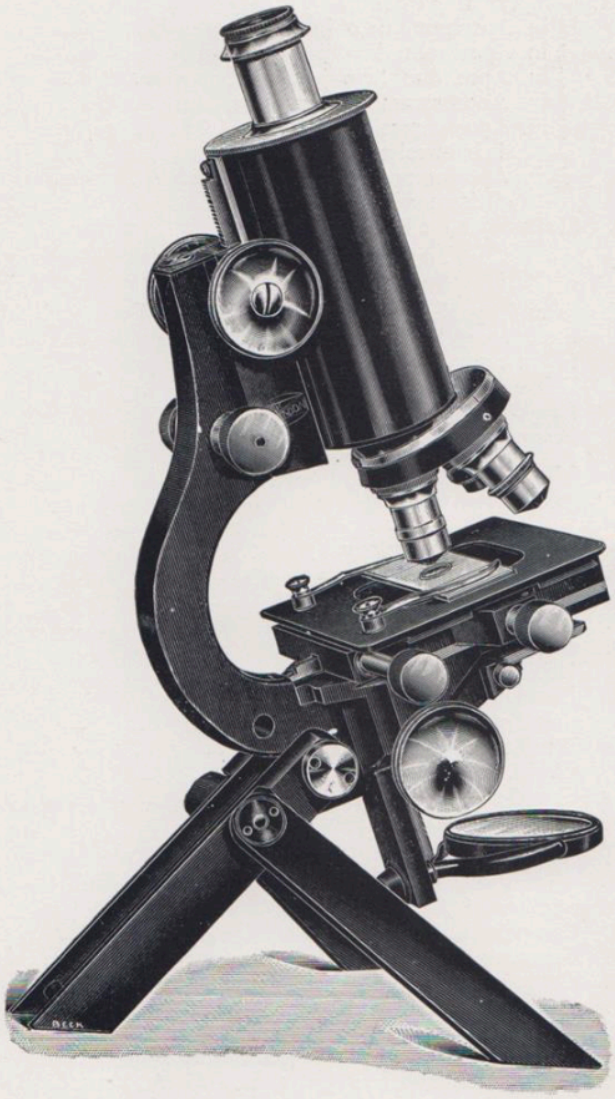
**Set G.** Additional apparatus for petrology.

| | | | | |
|---|---|---|---|---|
| No. 3350. | Quartz and selenite wedge ... ... ... | 4 10 0 | | |
| No. 3056. | ¼ Mica wave plate ... ... ... ... ... | 0 7 6 | | |
| No. 3057. | Unit retardation plate ... ... ... ... | 0 12 0 | | |
| No. 3060. | Bertrand eyepiece ... ... ... ... ... | 3 2 0 | | |
| No. 3058. | Babinet's compensator ... ... ... ... | 15 10 0 | | |
| No. 3066. | Leesons goniometer ... ... ... ... | 5 0 0 | | |
| No. 3073s. | Small stage goniometer ... ... ... ... | 5 5 0 ¶ | | |
| No. 3080s. | Wright's stage refractometer ... ... ... | 1 12 6 ¶ | | |
| No. 3081. | Clarici cell ... ... ... ... ... ... | 1 8 6 | | |
| No. 3085s. | Shand micrometer ... ... ... ... ... | 12 10 0 ¶ | | |
| No 3084s. | Micro spectroscopic eyepiece ... ... ... | 3 17 6 ¶ | | |
| | | | £53 15 | 0 |

**Set D.** For metallurgical work.

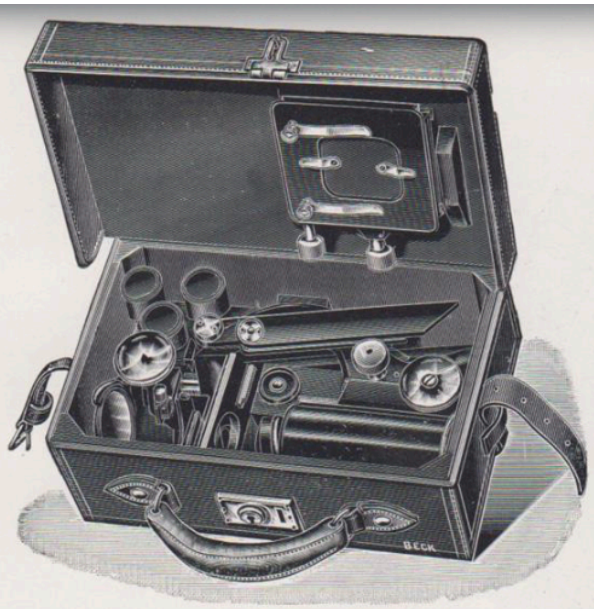
| | | | | |
|---|---|---|---|---|
| No. 3266. | Compensating eyepiece 45 m/m. (×6) ... ... | 2 2 0 | | |
| No. 3268. | Compensating eyepiece 22 m/m. (×11) ... ... | 2 10 0 | | |
| No. 3270. | Compensating eyepiece 10 m/m. (×25) ... ... | 2 10 0 | | |
| No. 3241. | ⅔ in. Apochromatic object glass, 16 m/m. ... | 7 15 0 | | |
| No. 3232. | ⅓ in. Achromatic object glass, 8 m/m. ... ... | 3 5 0 | | |
| No. 3244. | ⅙ in. Apochromatic object glass, 4 m/m. ... | 11 0 0 | | |
| No. 3248. | 1/12 in. Apochromatic object glass, 1·3 N.A., 2 m/m. oil immersion ... ... ... ... | 18 0 0 | | |
| No. 3359. | Aplanatic ring illuminator to fit Nos. 3241 and 3232 ... ... ... ... ... ... | 2 10 0 | | |
| No. 3359A. | Aplanatic ring illuminator to fit No. 3244 ... | 2 10 0 | | |
| No. 3363. | Vertical thin glass illuminator ... ... ... | 1 7 6 | | |
| No. 3315. | Bull's eye condenser on stand ... ... ... | 2 10 0 | | |
| | | | £55 19 | 6 |

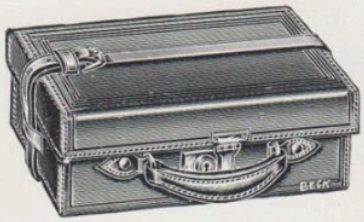
**Set D.A.** The above set D with achromatic instead of apochromatic object glass and Huyghenian eyepieces instead of compensating ... ... ... 27 13 6



No. 3745 Pathological Microscope.

Portable model.



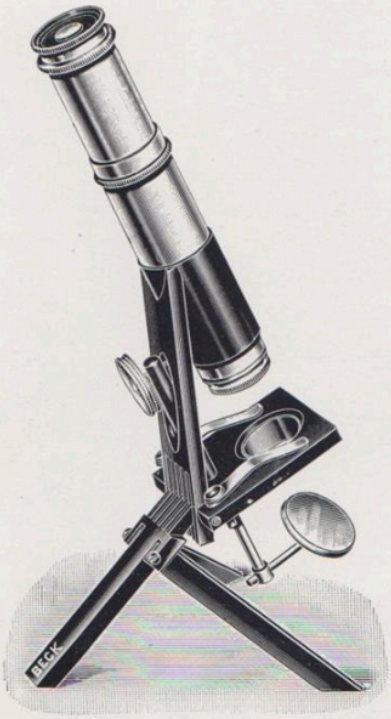

# No. 3745 Portable. Pathological Microscope

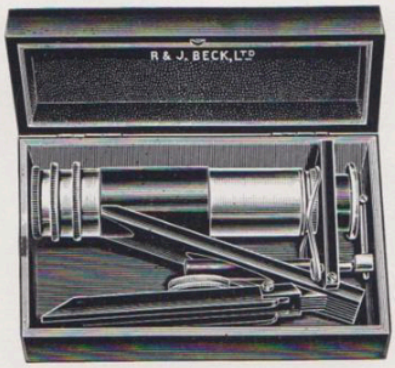
This portable microscope is on the design of our No. 3740 Pathological but the heavy base is replaced by folding legs as will be seen in the illustration on page 40. While the portability has been taken into consideration, the instrument is so designed that when set up it is as rigid as the other models of the Pathological microscope. The outfit No. 3745A packs into a leather case 11 × 7 × 4¼ in., with lock and key, strap and carrying handle. The case for outfit No. 3745B is slightly longer. The only part of the stand which is removed when being packed into the case is the top part of the stage, and the whole outfit forms an extremely efficient microscope for those who are constantly requiring such an instrument while travelling.

| | | | | | |
|---|---|---|---|---|---|
| No. 3745. | Stand only in case ... ... ... ... ... ... | | | | £27 2 6 |
| No. 3745A. | Stand in case ... ... ... ... ... ... ... | £27 | 2 | 6 | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... | 1 | 4 | 0 | |
| | No, 3231. ⅔ in. Object glass 16 m/m. ... ... ... | 1 | 10 | 0 | |
| | No. 3234. ⅙ in. Object glass 4 m/m. ... ... ... | 3 | 15 | 0 | |
| | No. 3235A. 1/12 in. Object glass 2 m/m. oil immersion ... | 5 | 10 | 0 | |
| | No. 3286. Abbe condenser ... ... ... ... ... | 2 | 10 | 0 | |
| | No. 3301. Triple nosepiece ... ... ... ... ... | 1 | 10 | 0 | |
| | | | | | £43 1 6 |
| No. 3745B. | Stand only in case ... ... ... ... ... ... | £27 | 2 | 6 | |
| | No. 3260. 2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... | 1 | 4 | 0 | |
| | No. 3231. ⅔ in. Object glass 16 m/m. ... ... ... | 1 | 10 | 0 | |
| | No. 3232. ⅓ in. Object glass 8 m/m. ... ... ... | 3 | 5 | 0 | |
| | No. 3234. ⅙ in. Object glass 4 m/m. ... ... ... | 3 | 15 | 0 | |
| | No. 3237. ⅛ in. Object glass, oil immersion 3 m/m. N.A. 1.2... ... ... ... ... ... | 7 | 10 | 0 | |
| | No. 3293. High-power focussing dark ground illuminator in centring fitting ... ... ... ... | 6 | 2 | 6 | |
| | No. 3397. Metal holder for extra thin slips, ½ m/m. ... | 0 | 6 | 6 | |
| | No. 3398. 12 ½ m/m. slips ... ... ... ... | 0 | 5 | 0 | |
| | No. 3288. Achromatic condenser N.A.1 in centring fitting | 6 | 10 | 0 | |
| | No. 3301. Triple nosepiece ... ... ... ... ... | 1 | 10 | 0 | |
| | No. 3750. Topley top stage ... ... ... ... ... | 0 | 17 | 6 | |
| | | | | | £59 18 0 |
| No. 3780. | High power binocular attachment, straight model ... ... | | | | 10 10 0 |
| No. 3781. | Ditto angular model ... ... ... ... ... ... | | | | 13 10 0 |
| No. 3260. | Extra eyepieces for binocular ... ... ... ... each | | | | 0 12 0 |

The binocular attachment is supplied in a separate case.

Any apparatus can be added or omitted at a corresponding addition or reduction of price.



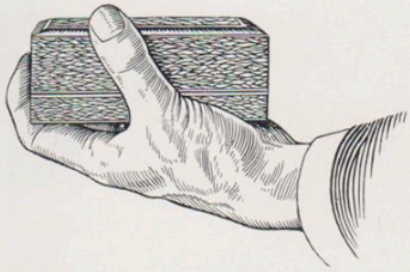

No. 2580 Baby London Microscope.

# No. 2580 Baby London Microscope.

The Baby London microscope is an ideal instrument for those who study nature, pond life, etc. It can readily be carried in the pocket and is so easily set up that examinations can be made with the greatest ease in the field. It is also most useful to medical men for the carrying out of cursory examinations.

It is extremely portable, and yet forms a complete and efficient microscope. It uses standard object glasses and eyepiece of all powers. All the necessary adjustments are provided, including sliding coarse adjustment and fine adjustment. There is a drawtube giving a varying tube length up to 160 mm. The case in which it is contained measures 5¼ in. by 2½ in. by 2 in.

A complete range of accessories including sub-stage condensers is supplied. The mirror usually supplied with the microscope is concave, but when the instrument is fitted with a sub-stage condenser, a flat mirror is provided. This can be supplied in place of the concave or as an extra, the mirrors being interchangeable in the fitting which carries them.



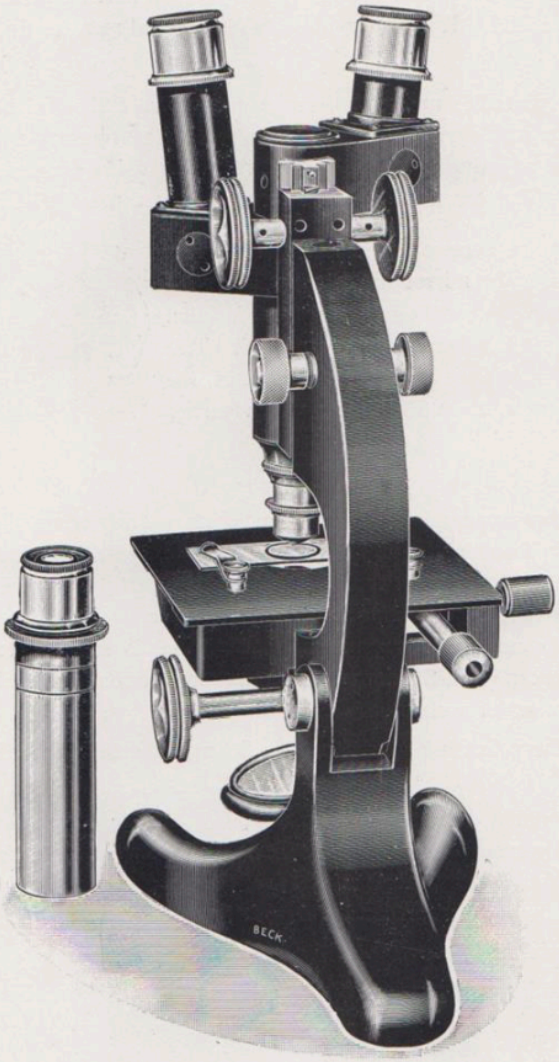
To enable sub-stage apparatus to be used a tubular fitting is supplied which screws into a thread in the stage. Two forms of sub-stage condensers are supplied, the Abbe with iris diaphragm, and a combined condenser and spot lens. The latter is suitable for both transparent and dark ground illumination with low-power object glasses. In order to obtain dark ground illumination with this condenser, a central patch stop which is attached to an arm is swung into position, thus an object can be easily viewed with transparent or dark ground illumination by merely swinging the stop in or out of position.

The polariser of the polarising apparatus also fits into the tubular fitting, the analyser fitting over the eyepiece.

For holding unmounted objects, there are supplied stage forceps and the cork object holder. The latter is suitable for examining fairly large flies, beetles, leaves, etc., the objects being attached to the cork by means of entomological pins. Both of these pieces of apparatus have rotating motions so that the object under examination can be viewed from every aspect.

| | | £ | s | d |
|---|---|---|---|---|
| **No. 2580.** | **Stand** only, in case... ... ... ... ... ... ... ... | 3 | 0 | 0 |
| **No. 2580A.** | Baby London microscope, with 1 eyepiece × 10 and ⅔ in. object glass in case ... ... ... ... ... ... ... ... | 4 | 4 | 0 |
| No. 2583 | Substage tube ... ... ... ... ... ... ... ... | 0 | 2 | 0 |
| No. 2584 | Abbe condenser with iris diaphragm ... ... ... ... ... | 1 | 15 | 0 |
| No. 2585 | Spot lens and condenser ... ... ... ... ... ... ... | 1 | 3 | 0 |
| No. 2586 | Polarising apparatus... ... ... ... ... ... ... ... | 3 | 7 | 6 |
| No. 2587 | Extra flat mirror ... ... ... ... ... ... ... ... | 0 | 5 | 0 |
| No. 2588 | Bull's eye condenser on stand ... ... ... ... ... ... | 0 | 11 | 6 |
| No. 2589 | Stage forceps ... ... ... ... ... ... ... ... ... | 0 | 5 | 6 |
| No. 2590 | Cork object holder with pins ... ... ... ... ... ... | 0 | 3 | 6 |

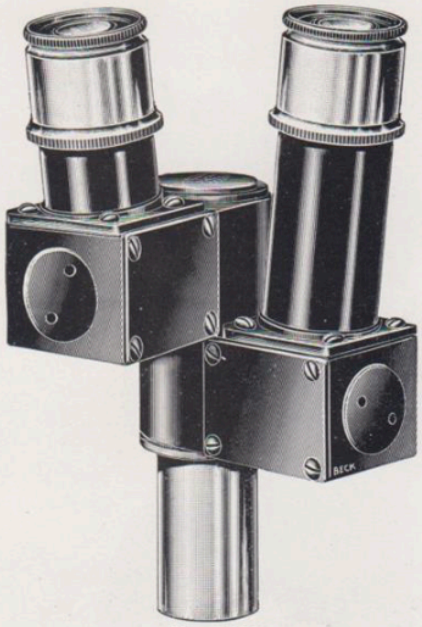
Extra eyepieces, object glasses, etc., at listed prices.




## Beck No. 29 F.B.

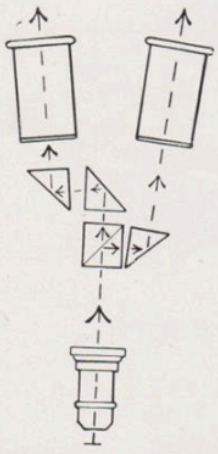
With high power binocular and monocular tube.

# No. 3780 and 3781 High Power Binocular.

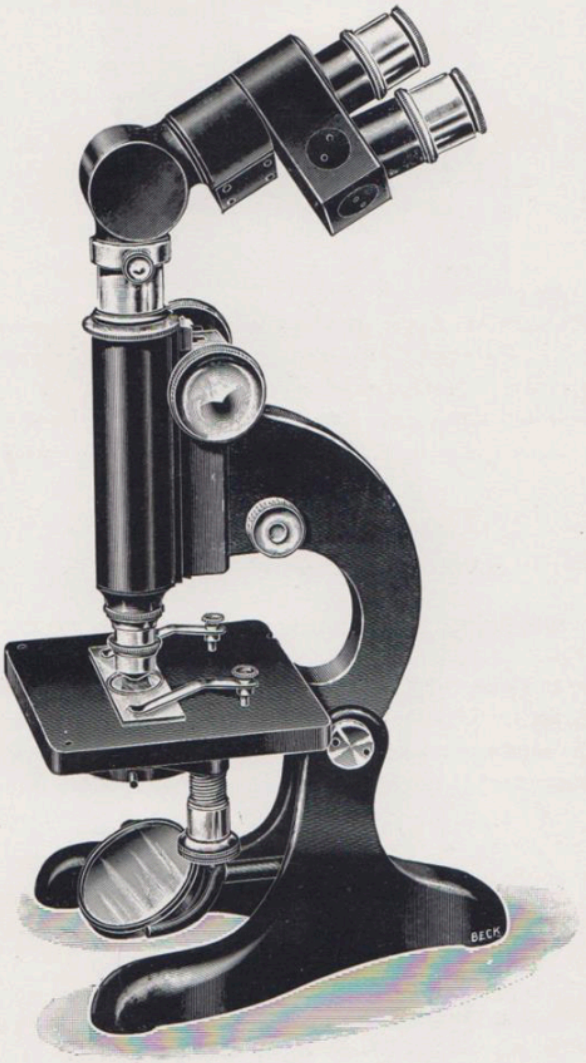



No. 3780

The use of the two eyes for microscopic observation prevents fatigue and improves the quality of vision. With a binocular the perceptive faculties are more constant during prolonged observation than with a monocular, and with the latter, the detection of fine detail is less certain. The earlier form of binocular such as the Wenham had certain disadvantages. It was only suitable for use with low powers and the resolving power was reduced to one half. It was also large and cumbrous. The Beck high power binocular has no such disadvantages. A prism consisting of two right-angled prisms cemented together receives the light from the object glass. The cemented surface has a thin semi-transparent layer of silver which divides the light into two complete bundles, one of which is directed into each eye. As the full aperture of the object glass is used in each eye, the resolution is unimpaired. The illustration shows the optical construction.



The two tubes of the binocular are inclined at the normal convergence for near objects. The principle of having the tubes of an optical instrument parallel is correct in a field glass or binocular telescope where the observer is looking at distant objects. The microscopist, however, who uses his instrument alternately with observing objects on the table upon which the microscope stands, finds it difficult and tiring to constantly change his degree of convergence. Such is the force of habit that the mere action of bending the head downwards induces the eyes to converge for the examination of near objects. To have converging tubes therefore is the only correct system in a binocular microscope. The interocular distance is variable from 47 to 78 millimetres, and is adjusted by turning the two tubes on a common centre, the tubelength remaining unaltered.




## No, 29B London Microscope.

With high power binocular, angular form (No. 3781).

The high-power binocular is made in two forms, No. 3780, the straight model, and No. 3781, angular model.

The straight model increases the working height of the microscope and is therefore more suitable when the instrument is used in an inclined position. It can also be built into a microscope as illustrated on page 44, and be used interchangeably with a monocular drawtube.

The angular model is fitted with a prismatic attachment which inclines the binocular at a convenient angle when the microscope is in a vertical position so that the working height is not increased. This prismatic attachment can be removed if desired and the binocular is then converted into the straight form.

Each binocular has a tubelength corrector, to compensate for the extra optical path.

Any standard object glasses or eyepieces can be used with the binocular and no special form of illumination is required. Either form of binocular is suitable for attachment to any microscopes of our make and to many instruments of other makes. It is advisable for us to have the drawtube of the instrument to ensure that there are no obstructions, which would prevent its complete insertion. If the eyepiece size is not the standard size (·917 in.) a small cost is entailed for adaption.

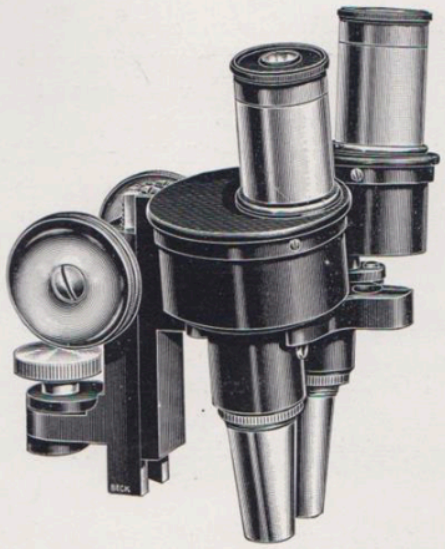
| | | £ s. d. |
|---|---|---|
| **No. 3780.** | High-power binocular straight model ... ... ... ... ... | £10 10 0 |
| **No. 3781.** | High-power binocular angular model ... ... ... ... ... | 13 10 0 |
| **No. 3782.** | Prismatic attachment, to use straight model as angular model ... | 3 10 0 |

The following stands are supplied with the binocular built into the instrument and with an interchangeable monocular body. The apparatus required is given in the price list of the microscopes except that where a binocular is supplied the eyepieces are required in pairs. The cost of the extra eyepieces must be added.

| | | £ s. d. |
|---|---|---|
| **No. 29B.B.** | Stand, with swing out focussing substage in oak case, with lock and key (page 12) ... ... ... ... ... ... ... ... | 18 9 0 |
| **No. 29D.B.** | Stand, with rack and pinion focussing substage, in oak case, with lock and key (page 14) ... ... ... ... ... ... ... | 20 3 6 |
| **No. 29C.B.** | Stand, with rack and pinion focussing and centring substage, in oak case, with lock and key (page 14) ... ... ... ... ... | 21 3 6 |
| **No. 29E.B.** | Stand, with Akehurst substage, in oak case, with lock and key (page 16) ... ... ... ... ... ... ... ... ... | 21 3 6 |
| **No. 29F.B.** | Stand, with built-in mechanical stage and rack and pinion focussing substage, in oak case, with lock and key (page 18) ... ... ... | 23 3 6 |
| **No. 29G.B.** | Stand, with built-in mechanical stage and rack and pinion focussing and centring substage, in oak case, with lock and key (page 18)... | 24 3 6 |

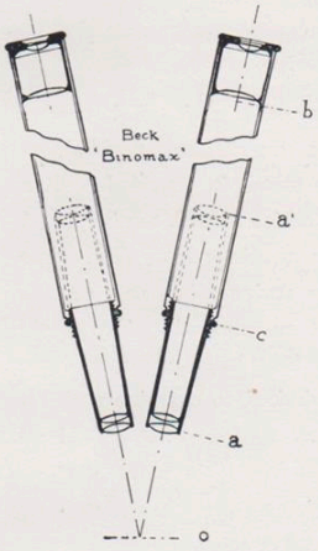
# Binomax Magnifier (Patent).

For a great number of investigations in research and industrial laboratories, a microscope of the ordinary type is not satisfactory. Often a high magnifying power is not required and the objects under examination are not of a suitable shape for placing upon a microscope stage, nor is it convenient to prepare suitable microscopic sections. To fill this requirement we have produced the Binomax. It is a binocular magnifier giving magnifying powers of 4, 8, 16 and 32, and having a very wide field. Binocular vision is of great advantage over monocular, because the view given is natural and is similar to that seen by the eye except that it is on an enlarged scale. Thus the solidity, depth and true perspective are seen, which is invaluable for examining solid bodies and for dissecting. The Binomax is fitted to various stands, which are described and illustrated, and which are adapted for using the magnifier for different purposes. The uses to which this magnifier can be put are too numerous to detail, but a few may be mentioned. In medical work it is an excellent means of examining skin, hair, bone, and makes a good corneal microscope, giving an erect image, and also is invaluable for dissecting work. In a museum a great number of objects in stone, wood, metal, and also specimens in troughs and dishes can readily be examined. The Binomax is without equal for examining parts of large objects, as by means of the stand with universal movement, the magnifier can be brought up to the object without the latter being moved. In other branches of work, dealing with such things as flaws in metal, brushwork in paintings, prints and engravings, fabrics and fibres, this magnifier is of the greatest service. In engineering shops, small machined parts are readily examined, and in many works where very fine precision turning is done, a Binomax with universal movements fitted to the lathe itself will prove of inestimable value. In dealing with small objects or for examining parts of large objects where there are no facilities for making regular microscope specimens, the Binomax is the most convenient and satisfactory form of microscope available.



The Binomax consists of two complete microscope systems inclined to each other at the natural convergence of the eyes. Each system has a prismatic erecting arrangement. The interocular distance is adjusted by revolving the prism boxes. The method of obtaining the four powers with only one pair of object glasses is a new one. The object glasses are held in tubular mounts with

the lenses at one end. Each object glass is so threaded that it can be placed in the microscope body in two ways, one way having the tubular mount projecting out of the body and the other with the tubular mount inside the body. By this means the distance between object glass and eyepiece is made to differ very considerably and widely different powers are therefore obtained. The optical performance is not interfered with as the object glass by this process is reversed. By the use of two pairs of eyepieces, also of different powers, four powers are therefore obtained with the same object glasses.



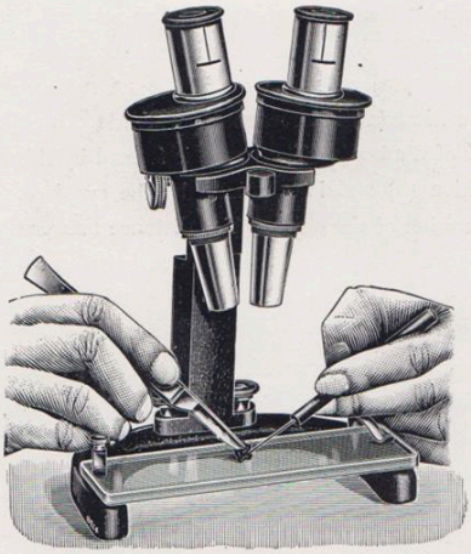

The accompanying diagram illustrates the principle upon which the Binomax is made. The object glass (a) is shown screwed on to the body with its lenses projecting in front of the microscope. In dotted lines the position (a′) is shown into which it can be screwed in the interior of the body. The image is formed by this object glass at a position (b) and is examined by the eyepiece. The point (o) is the position of the object. The distance between the object (o) and the position (a) and the distance between (o) and the position (a′) are so arranged that (oa) is equal to (a′b) and (oa′) is equal to (ab). The image is therefore in focus at (b) whichever way the object glass is screwed on to the body, but different powers are obtained. If the object glass is corrected to work in the position (a), it will also work in the position (a′) and provided that the lenses are reversed, which is done by reversing the whole mount, the optical corrections are in each case equally perfect. In a binocular instrument the object must lie at the intersection of the two optic axes of the microscopes and the change in power is therefore made without altering the distance between the object and the bodies of the microscope.

In order to obtain an extra large field of view with the higher power eyepieces, we supply also the orthoscopic form of eyepiece. The size of field of view will be seen in the following table:—

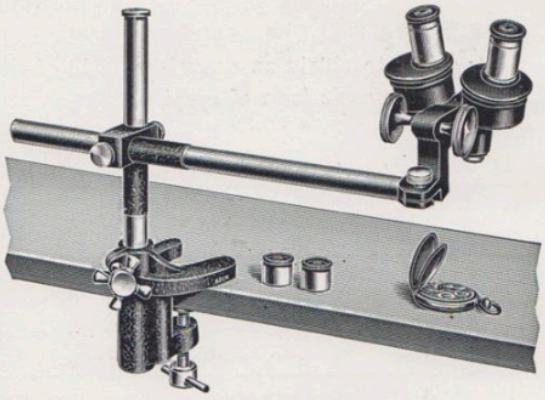
| Magnifying powers. | Working distance. | Diameter of field of view with Huyghenian eyepieces | Diameter of field of view with orthoscopic eyepieces |
|---|---|---|---|
| ×4 | 110 m.m. | 33 m.m. | — |
| ×8 | 110 m.m. | 22 m.m. | 35 m.m. |
| ×16 | 75 m.m. | 9 m.m. | — |
| ×32 | 75 m.m. | 5 m.m. | 9 m.m. |

The Binomax is so arranged that the body can be used interchangeably on any form of the stands listed, thus if desired one Binomax body can be purchased and several of the stands employed. Prices for outfits of this description will be furnished on application.

An attachment is made for illuminating objects under examination It consists of a small 12-volt lamp which can be run off an accumulator or off current with a suitable resistance, together with a condensing lens to throw a brilliant light upon the object. The attachment is fixed to the Binomax, moving with it during focussing by the rack and pinion.

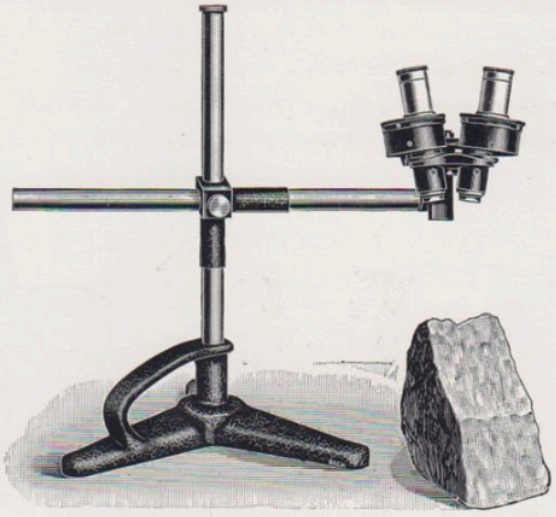


**No. 3760. Binomax** with rack and pinion focussing motion on horseshoe stand, as illustrated. This stand is provided with a glass plate upon which objects can be placed for examination or dissection. The glass is held down by spring clips, and can be easily removed if not desired. The whole stand can then be placed upon a large surface if it is desired to examine such an object ... ... ... ... £16 11 6



**No. 3761. Binomax** with rack and pinion focussing motion on table clamp stand. In this stand a substantial table clamp holds a rod adjustable in height, and which can be clamped at any required position. Running up and down this is a fitting, which can also be clamped, and which carries a cross bar to which the Binomax is attached. The cross-bar can be adjusted horizontally and clamped By means of the various adjustments a practically universal motion can be obtained. The maximum height from the table is 11 in., and the length of the cross-bar is 13 in. £19 10 0

**No. 3762. Binomax** with rack and pinion focussing motions on heavy table stand. This stand possesses the same adjustments as the table clamp. The maximum height from table is 15½ in., and the length of cross-bar, 10 in. ... £19 10 0





**No. 3763. Binomax,** mounted on heavy horse-shoe base provided with large square stage, joint for inclination, double mirror for illuminating transparent objects. This illustration shows the lighting attachment (No. 3766) for illuminating opaque objects. The instrument is contained in a cabinet ... ... ... £19 7 6

**No. 3764. Hand rests** for No. 3763 ... 0 13 0

**No. 3766. Illuminating attachment** for illuminating opaque specimens, as illustrated on No 3763. This employs a small low voltage electric lamp, which can be run off accumulators, or direct from the current by means of a resistance ... ... ... ... ... ... ... £3 0 0

**No 3767. Resistance** for No. 3766, suitable for voltages from 100—240 ... ... 2 5 0

**No. 3768. Resistance flex** for No. 3766, suitable for one voltage only. Voltage must be specified in ordering ... ... ... ... ... ... 1 17 6¶

**No. 3770. Lamp resistance** for No. 3766, suitable for one voltage only. Voltage must be specified in ordering ... ... ... ... ... ... 0 13 6¶

**No. 3769. Spare lamps** for No. 3766 ... ... ... ... ... ... ... 0 2 0¶

**No. 3775. Orthoscopic eyepiece** giving extra large field of view per pair 3 10 0




No. 3205 Greenough Binocular Microscope.

# Greenough Binocular Microscope.

This binocular is suitable for use with low and medium powers up to approximately 200 magnifications. Four powers of object glasses are made which are mounted upon slides fitting the nosepiece of the instrument. It gives a striking stereoscopic effect and the image is erect. The interocular distance can be varied by the rotation of the prism boxes. It is focussed by rack and pinion. The magnifications and working distances are shown in the following table :—

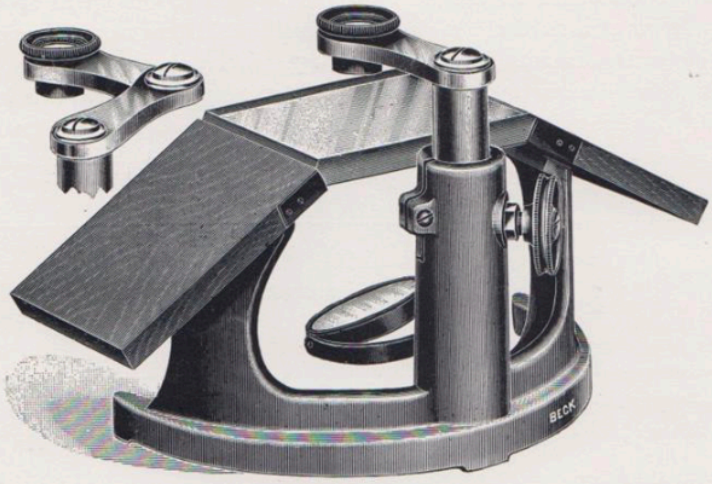
| No. | Focal Length. | Working distance. | ×6 eyepiece 45 m/m. | ×10 eyepiece 25 m/m. | ×15 eyepiece 17 m/m. | Price, per pair on slide. |
|---|---|---|---|---|---|---|
| | | | | | | £ s. d. |
| No. 3010 ... | 59 m/m. | 80 m/m. | 10 | 16 | 28 | 3 10 0 |
| No. 3011 ... | 49 m/m. | 50 m/m. | 20 | 32 | 56 | 3 10 0 |
| No. 3012 ... | 32 m/m. | 30 m/m. | 35 | 60 | 100 | 4 10 0 |
| No. 3013 ... | 16 m/m. | 17 m/m. | 70 | 120 | 200 | 5 10 0 |

The Greenough binocular can be supplied on an ordinary microscope base and stage (No. 3205) as illustrated, or on the stands listed with the Binomax Nos. 3760, 3761, 3762.

| | | | |
|---|---|---|---|
| **No. 3205A.** | Stand in case ... ... ... ... ... ... | £15 15 0 | |
| | No. 3010. Pair of object glasses, 59 m/m. ... ... | 3 10 0 | |
| | No. 3012. Pair of object glasses, 32 m/m. ... ... | 4 10 0 | |
| | No. 3260. 1 Pair of eyepieces, 42 m/m. (×6) ... ... | 1 4 0 | |
| | | | £24 19 0 |
| **No. 3205B.** | Stand in case ... ... ... ... ... ... | £15 15 0 | |
| | No. 3010. Pair of object glasses, 59 m/m. ... ... | 3 10 0 | |
| | No. 3011. Pair of object glasses, 49 m/m. ... ... | 3 10 0 | |
| | No. 3012. Pair of object glasses, 32 m/m. ... ... | 4 10 0 | |
| | No. 3013. Pair of object glasses, 16 m/m. ... ... | 5 10 0 | |
| | No. 3260. 2 Pairs of eyepieces, 42 m/m. (×6) and 25 m/m. (×10) ... ... ... ... | 2 8 0 | |
| | No. 3775. Pair of orthoscopic eyepieces 17 m/m. (×15) | 3 10 0 | |
| | No. 3357. Spot lens for dark ground illumination ... | 1 0 0 | |
| | No. 3422. Stage forceps for holding objects ... ... | 0 14 0 | |
| | No. 3316. Small bulls eye condenser on stand ... | 1 5 0 | |
| | No. 3413. Trough on 3×1 slip ... ... ... ... | 0 2 0 | |
| | No. 3205h. Hand rests attached to stage ... ... | 0 13 0 | |
| | | | £42 7 0 |
| **No. 3206.** | Grcenough binocular mounted on stand as in Binomax No. 3760 ... | | 12 16 6 |
| **No. 3028.** | Greenough binocular mounted on stand as in Binomax No. 3761 ... | | 15 15 0 |
| **No. 3029.** | Greenough binocular mounted on stand as in Binomax No. 3762 ... | | 15 15 0 |

Nos. 3206, 3028 and 3029 do not include object glasses and eyepieces.

# Crescent Dissecting Microscope.



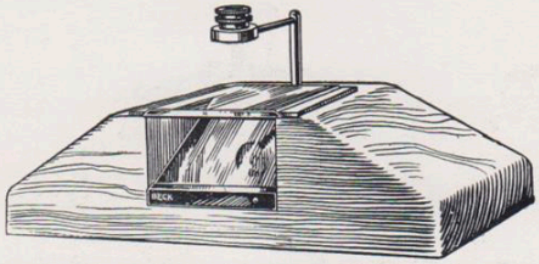

No. 3020.

The design and construction of this instrument have been specially considered with a view to perfect rigidity. The ordinary dissecting microscope has followed the lines of a compound microscope stand to which side hand rests have been added. Such a construction is unsuitable for dissecting as the weight of the hands upon the hand rests has a tendency to upset the instrument. In the Crescent dissecting microscope the supports are immediately under the hand rests. The hand rests are of hard wood and the stage is a thick plate of glass. The base is a heavy casting on three projecting feet and with two uprights to support the hand rests and stage. A pillar is provided at the back within which fits a solid rod which carries a swinging arm for the lenses. This rod is focussed up and down by a rack and pinion actuated by a milled head, which is placed at a convenient angle for the hand. The amount of motion is over 3 in. so that very thick specimens can be examined. A mirror is provided below the stage, silvered on one side and opal white glass on the other.

The instrument is supplied with a single swinging arm for holding the lenses or with a double arm if it is desired to move the magnifier over the specimen rather than to move the specimen.

| | | |
|---|---|---|
| **No. 3020.** | Stand only ... ... ... ... ... ... ... ... ... | £2 17 6 |
| **No. 3020A.** | Stand, with single arm, with 2 single lenses × 5 and × 10 ... ... | 3 6 6 |
| **No. 3020B.** | Stand, with 1 single lens × 5, and 2 achromatic lenses × 12 and × 20 | 5 1 6 |
| **No. 3020C.** | Stand with 3 achromatic lenses, × 5, × 12 and × 20 ... ... | 5 15 6 |
| **No. 3021.** | Double-jointed arm fitted to any of the above ... ... ... extra | 0 12 6 |
| **No. 3022.** | Case for above ... ... ... ... ... ... ... ... | 0 17 6 |

# Cornex Dissecting Microscope.



This dissecting microscope is constructed from a solid block of wood and in use will be found very rigid. The sides of the block are cut away at a convenient angle so as to form rests for the hands. A glass stage is provided upon which to place the objects, which are illuminated by a mirror set at an angle of 45°.

The lenses are carried in an arm which is attached to a rod, the rod being held in a tubular fitting which allows it to be slid up and down for focussing purposes and also to be swung over the stage plate so that objects at different positions can be examined.

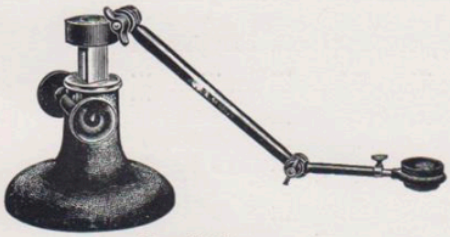
With the lenses supplied, magnifications of 7 and 14 are obtained. These lenses are so arranged that they combine together, the higher power being obtained with the two lenses combined, the lower power when separated.

Holes are provided in the top of the microscope into which the lenses can be placed for storage purposes when the instrument is not in use.

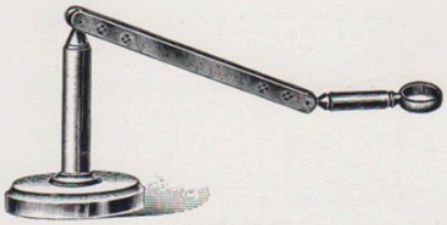
For class use this dissecting microscope will be found most satisfactory, as although it is of the simplest construction, it is very rigid and strong, and the magnification given is all that is required for ordinary botanical and entomological dissection. For naturalists' work and for such purposes as the recognition of diseases in bees and other insects it will be found equally useful.

**No. 33B. Cornex dissecting microscope** complete with two magnifiers ... £0 15 6

# Dissecting Arms.



No. 3019.



No. 3018.

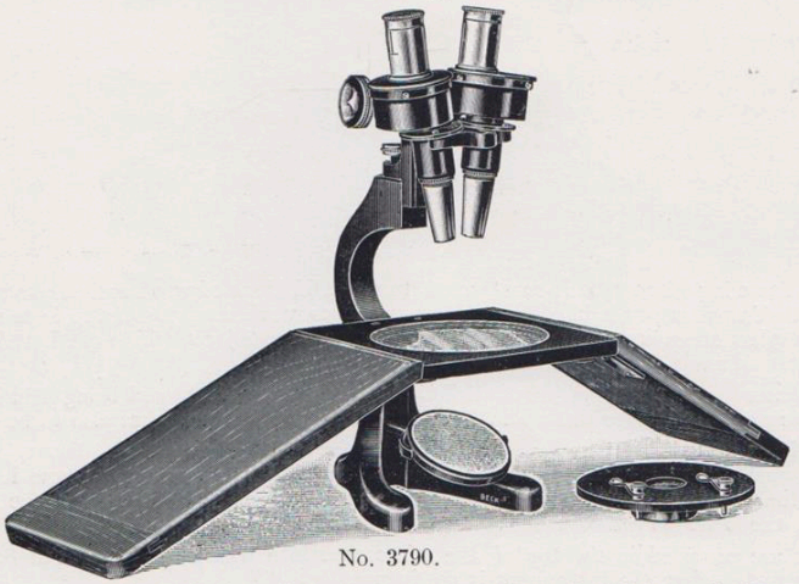
**No. 3019. Jointed dissecting arm,** mounted on heavy base, rack and pinion focussing adjustment, clamp nuts to joints ... ... ... ... £2 2 0¶

**No. 3018. Jointed dissecting arm,** simple pattern, mounted on circular base 0 16 6

# Magnifiers for Dissecting Microscopes.

| | | | |
|---|---|---|---|
| **No. 3171D.** | **Achromatic magnifier** | × 5 ... ... ... ... ... ... | £0 18 6 |
| **No. 3172D.** | „ „ | ×12 ... ... ... ... ... ... | 0 18 6 |
| **No. 3173D.** | „ „ | ×20 ... ... ... ... ... ... | 1 1 0 |
| **No. 3170D.** | **Single lens magnifier** | × 5 ... ... ... ... ... ... | 0 4 6 |
| **No. 3168D.** | „ „ | ×10 ... ... ... ... ... ... | 0 4 6 |

# Platen Dissecting Microscope.



No. 3790.

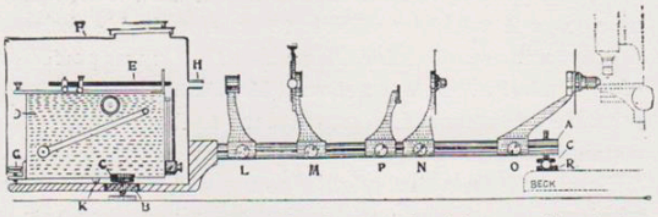
The general design of this dissecting microscope may be gathered from the illustration. It possesses features which render it a most convenient instrument for prolonged work, the arm-rests being of a large size, so that the arms are in a comfortable position. The stage is 6″ square and is recessed to receive either a glass plate or a brass plate with stage clips. The mirror is of extra large size, opal glass on one side, and silvered on the other.

Either the Binomax magnifier or the Greenough binocular can be used on this microscope (see descriptions, pages 48 to 53).

The addition of orthoscopic eyepieces, as listed, is of great advantage, giving a very large field for dissecting. For example, with the Binomax magnifier, at eight magnifications, the field of view is 35 m/m.

| | | | | |
|---|---|---|---|---|
| No. 3790. | Stand with Binomax magnifier, with object glasses and Huyghenian eyepieces ... ... ... ... ... ... ... ... ... | | | £22 5 0 |
| No. 3791. | Stand with Greenough binocular, without object glasses or eyepieces ... | | | 18 10 0 |
| No. 3791A. | Stand ... ... ... ... ... ... ... ... | £18 10 0 | | |
| | No. 3011. Pair of object glasses, 59 m/m. ... ... | 3 10 0 | | |
| | No. 3012. ,, ,, 32 m/m.... ... ... | 3 10 0 | | |
| | No. 3260. 2 pairs of Huyghenian eyepieces, 45 m/m. (×6) and 25 m/m. (×10) ... ... ... ... | 2 8 0 | | |
| | | | | £27 18 0 |
| No. 3791C. | Stand ... ... ... ... ... ... ... ... | £18 10 0 | | |
| | No. 3010. Pair of object glasses, 59 m/m.... ... ... | 3 10 0 | | |
| | No. 3011. ,, ,, 49 m/m.... ... ... | 3 10 0 | | |
| | No. 3012. ,, ,, 32 m/m.... ... ... | 4 10 0 | | |
| | No. 3013. ,, ,, 16 m/m.... ... ... | 5 10 0 | | |
| | No. 3260. 2 pairs of Huyghenian eyepieces 45 m/m. (×6) and 25 m/m. (×10) ... ... ... ... | 2 8 0 | | |
| | No. 3775. Pair of orthoscopic eyepieces 17 m/m. (×15)... | 3 10 0 | | |
| | | | | £41 8 0 |
| No. 3792. | Brass stage interchangeable with glass stage ... ... ... ... | | | 0 15 0 |
| No. 3310. | Tubular substage ... ... ... ... ... ... ... ... | | | 0 5 0 |
| No. 3357. | Spot lens for dark field illumination ... ... ... ... ... ... | | | 1 0 0 |
| No. 3775. | Orthoscopic eyepieces 17 m/m. (×15) ... ... ... | | per pair | 3 10 0 |

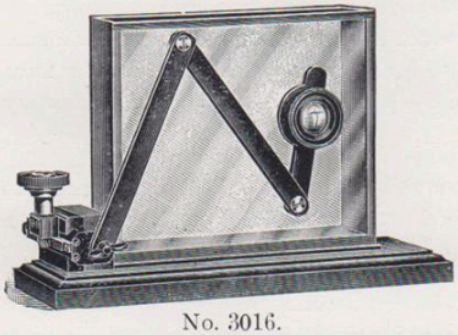
# Outfit for Ultra-Microscopy.




This is mounted complete on an optical bench consisting of a strong steel bar (A) 24 in. long, carried on 2 cross bars (B), supported on 2 levelling screws (C). Projecting over one end of the bar is fixed an automatic arc lamp (D) 5 to 10 amps, which has the positive carbon (E) horizontal and the negative carbon vertical. The crater of the arc is thus directly facing the optic axis of the bench. The arc lamp is enclosed in a lamp house (F) with side doors and with a small tubular aperture (H) in the front to allow the light to emerge. The lamp is also provided with raising and lowering motions (G) and a small lateral movement swinging on the pivot (K). A series of fittings slide along the steel bar. The first (L) carries an achromatic lens system for focussing an image of the crater of the arc upon the fitting (M) carrying an adjustable slit which is provided with a rotating movement and side cheeks for limiting the length of the slit. A fitting (N) carries a 32 m/m achromatic lens system by which an image of the slit is projected along the optic axis 5 times smaller than the slit. At a distance of about 280 m/m from this lens system a special microscope object glass, 25 m/m focus, .28 N.A., is carried upon another fitting (O). This object glass has a working distance of 9 m/m and allows of the use of the highest power lenses without touching the mount of the observing lens. Between the slit and the projecting lens an adjustable chisel edge is carried on the fitting (P) by which the beam of light can be restricted in height. The adjustments having been made on the optical bench to ensure proper centring the whole bench can be adjusted vertically by the front levelling screw (C) and laterally by moving the whole bench. The levelling screws stand on 3 smooth metal plates, the front one (R) of which is provided with a lateral screw adjustment. The size of the final ribbon of light can be varied by arranging the optical elements in different positions.

No. 3380. **Ultra-Microscopic outfit** ... ... ... Price on application ¶

No. 3381. Holder for fluids ... ... ... ... Price according to model. ¶



No. 3016.

**No. 3016. Aquarium microscope** on wood platform. This instrument consists of a jointed arm moving parallel to the side of an aquarium and carrying an aplanatic lens. The arm is focussed by means of rack and pinion which is fixed to a wooden stand on which the aquarium is placed. Without aquarium, with 1 achromatic magnifier ×5 or ×12 ... £4 8 0

No. 3016A. As above but with a single lens magnifier instead of achromatic ... ... 3 15 0

No. 3017. **Aquarium,** $6\frac{1}{8} \times 5 \times 1\frac{1}{2}$ in. ... ... ... ... ... ... ... 0 5 6¶

# The Beck Ultra-Violet Microscope made for J. E. Barnard, Esq., F.R.S.

Many years ago it was realised that if ultra-violet light could be used in connection with the microscope it would be possible to at least double the resolving power of the instrument. An attempt was made to solve the problem, but it was practically abandoned owing to the difficulties of manipulation. It was not until Mr. Barnard worked out a completely new technique that the principle was brought into practical use so that photographs could be taken with almost the same certainty and regularity as with ordinary light. Special apparatus was required of a totally different type from that originally suggested, and the following is a description of the apparatus which we manufactured to Mr. Barnard's instructions for this work.

There are but few substances that are transparent to ultra-violet light of a reasonably short wavelength. At present there is no such glass, and most of the natural materials which allow ultra-violet light to pass are crystalline. The only substance which is available at present for manufacturing lenses for this apparatus is fused quartz. An achromatic lens cannot be made composed of only one material. The lens must therefore be monochromatic and will only give a clear image when light of one wavelength is used. The other aberrations can be corrected by means of a number of lenses used in combination, the shapes of which are specially calculated, but it can only be corrected for one specified wavelength of light.

The monochromatic lens made by us has been designed and computed by the British Scientific Instrument Research Association. It is corrected for ultra-violet light of 2,753 A.U. It will work well for light slightly different from this if a suitable change in the tubelength is made. The spectrum of cadmium contains a number of lines in the ultra-violet of different wavelengths. One of these has the above wavelength for which the object glass is corrected. This must be isolated by means of a train of prisms or some other suitable apparatus.

The focus of a monochromatic lens is in a different position for every wavelength of light. If it were possible to obtain a clear image when using light of some particular wavelength in the visible spectrum it would be possible to alter the focus of the microscope by a specified amount to obtain the correct position for the ultra-violet light for which it is corrected. The image produced by any visible light is, however, not sufficiently clear to enable an accurate setting of the focus to be made. This difficulty has hitherto formed one of the great obstacles to getting satisfactory photographs.

A fluorescent eyepiece has been used whereby the invisible ultra-violet light was turned into visible light by means of a fluorescent screen. Experience has shown that the image on a fluorescent screen is not sufficiently clear to make it possible to set the focus with any precision.

The technique devised by Mr. Barnard consists of having a quartz monochromatic lens, for use with the ultra-violet light, and an apochromatic lens, for use with visual light, of the same focal lengths. Both are carried in mounts so adjusted that the distance from the object to the back of the mount when using ultra-violet light is almost the same as that with the apochromatic when using visual light.

After having focussed with visual light with the apochromatic lens and having changed to the monochromatic lens in order to use ultra-violet light, only a small adjustment has to be made, which is in the nature of one-fiftieth of what would otherwise be the case if the lenses were not so mounted. For carrying this out extraordinary rigidity in the whole of the apparatus is necessary combined with a means of interchanging the lenses with great certainty. A fine adjustment of far greater delicacy than has previously been supplied on a microscope is required. It may safely be said that even the best microscopes hitherto made are quite unsuitable owing to lack of rigidity and uncertainty in the focussing adjustments. With this special microscope a fine adjustment is provided in which there is no perceptible backlash, and in which every division on the milled head moves the instrument 1/10,000 of a millimetre.

Searching a specimen for the portions to be photographed or finding any particular organism by means of this invisible light obviously cannot be done by photography. The difficulty is overcome by making the monochromatic and apochromatic lenses so exactly concentric and so certain in their interchangeable mounts, that each has the same field of view. The condenser with which the object is illuminated is duplex. The central portion is of quartz transmitting ultra-violet light, the outer portion is a glass dark ground illuminator transmitting visual light. The dark ground illuminator has an independent focussing adjustment so that the visual and the ultra-violet light may be set to the same focus and the whole condenser then focussed by means of the substage focussing adjustment. The visual light from the dark ground illuminator and the apochromatic lens is used for the visual examination of the specimen for finding the objects to be photographed, for placing them in the correct position and for determining their general characteristics, after which all that has to be done in order to take the photograph is to change the object glass, alter the slow motion by a small pre-determined number of divisions, attach the camera and take the photograph.

If it is considered to be undesirable to use the ultra-violet illumination during the process of preliminary examination in order that it should not kill the organisms being examined, the ultra-violet light may be turned on only for the actual purpose of making the exposure. The fluorescent eyepiece although it is not used for focussing is of use for the arrangement of the illumination.

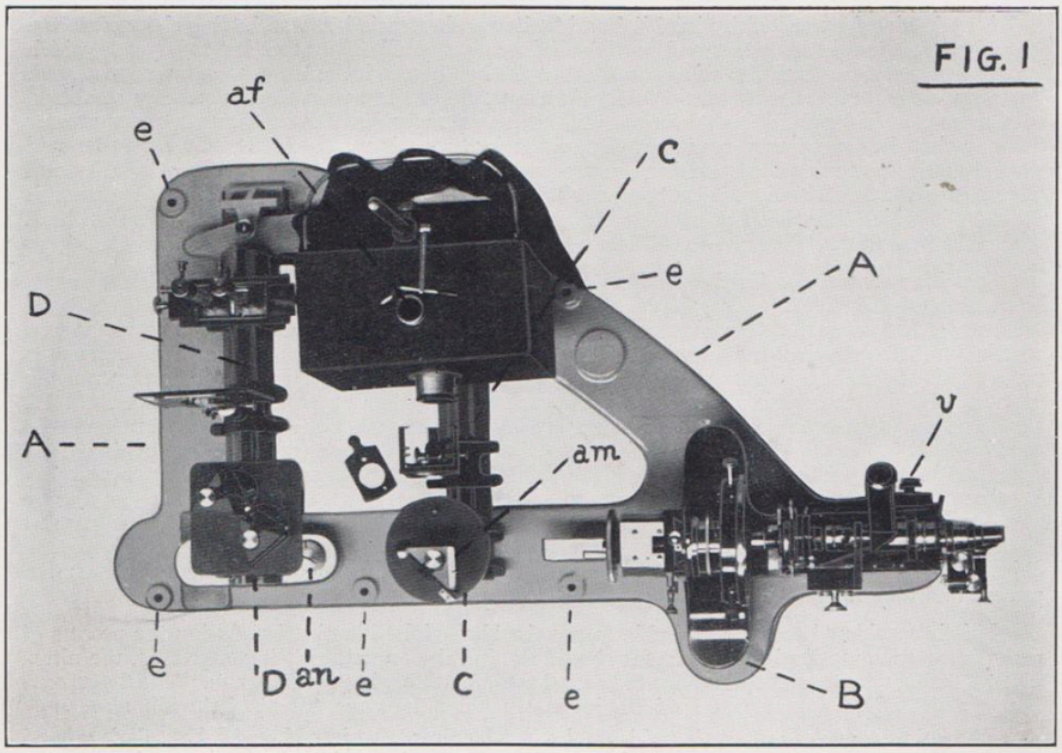
The instrument is so made that this duplex condenser can be interchanged for a dark ground illuminator by means of a dovetailed slide in the substage into which both pieces of apparatus drop interchangeably. This ultra-violet dark ground illuminator is a reflecting apparatus made from a metal which has a specially high reflecting power for short wavelength light. Silver and most metallic reflectors have so little reflecting power for these radiations that they are useless.

The camera is made to attach to the bed-plate which carries the whole apparatus. It is not connected with any portion of the microscope, and consequently can be fitted on without any fear of interfering with the adjustments.

There are certain other factors in the use of ultra-violet light that do not arise in ordinary photography. For instance, if the object, the mounting material, the slip, the cover slip or any of the optical elements are fluorescent, they may render the object invisible. In one case a very small percentage of carbolic acid placed in the mounting medium for preservative purposes was rendered fluorescent by the ultra-violet light and caused the background to be so bright that the object was entirely obscured. There must be no grease present on any of the surfaces as most forms of grease are fluorescent. The immersion fluid of the immersion lenses cannot be the usual cedar wood oil, and no cement at present known can be used on any of the lenses or slides as they are opaque to the light used.

The immersion fluid used is a definite proportion of glycerine and distilled water, and precautions must be taken to ensure that the evaporation of the water or the hygroscopic quality of the glycerine do not alter the refractive index of the immersion fluid, which must remain exactly the same as that of fused quartz for the 2,753 A.U. line. If dark ground illumination is employed, the immersion fluid must be filtered to remove fine particles which otherwise by scattering light destroy the blackness of the background.

For dark ground illumination the exact centration of the illuminator is of the utmost importance, and the final adjustment should be made by observing the concentricity of the diffraction rings caused by a brilliant illumination on a small piece of dust in the object, or better still of a minute mercury globule.




Beck Barnard ultra-violet microscope. Complete outfit.
Approx. $\frac{1}{8}$ size.

Fig. 1 shows a bird's-eye view of the apparatus with its screens and camera removed. It consists essentially of four parts :—

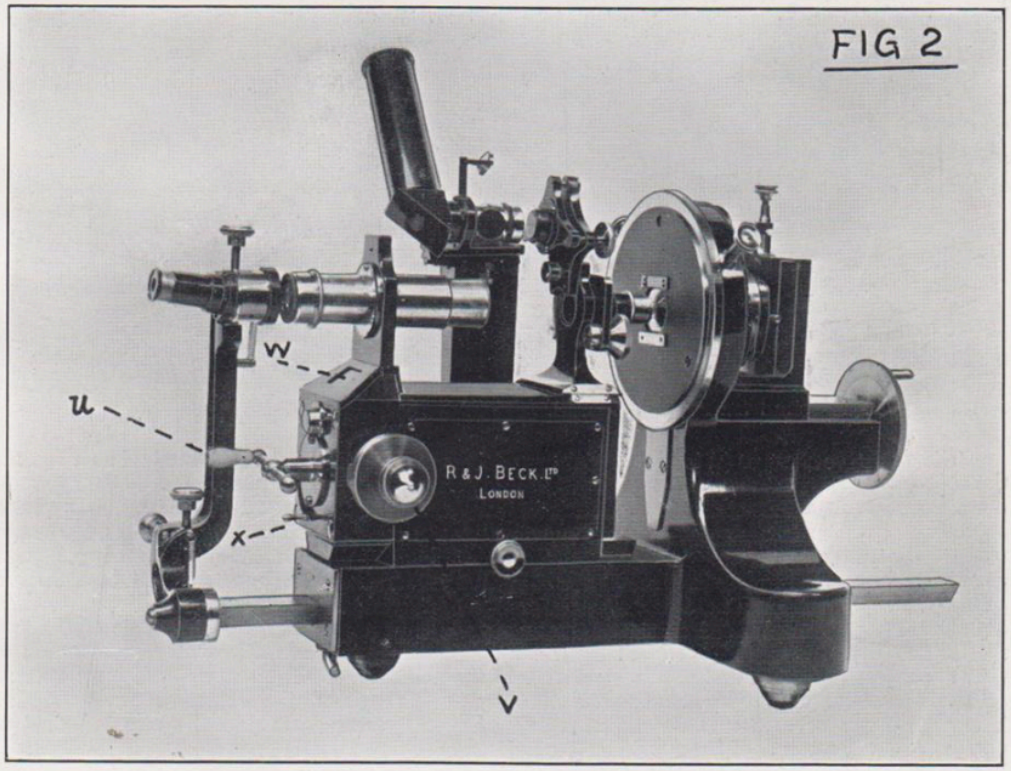
(A) A massive iron bedplate (A, Fig. 1).
(B) The microscope (Figs. 2 and 3 and B, Fig. 1).
(C) The optical bench for illumination with visible light (C, Fig. 1).
(D) The optical bench for ultra-violet illumination (D, Fig. 1).

(A) The main bedplate is a heavily ribbed iron casting of great strength and rigidity. The microscope is placed at its narrow end fitting into three slots, which accurately locate the three toes of the microscope (B, Fig. 1) and thus its accurate alignment with the rest of the apparatus is ensured. The two optical benches (C and D) are fixed to the main bedplate. This bedplate is supported on three feet. A series of tapped holes (*e*, Fig. 1) are provided, into which pillars are screwed, to support screens to enclose the illuminating apparatus.

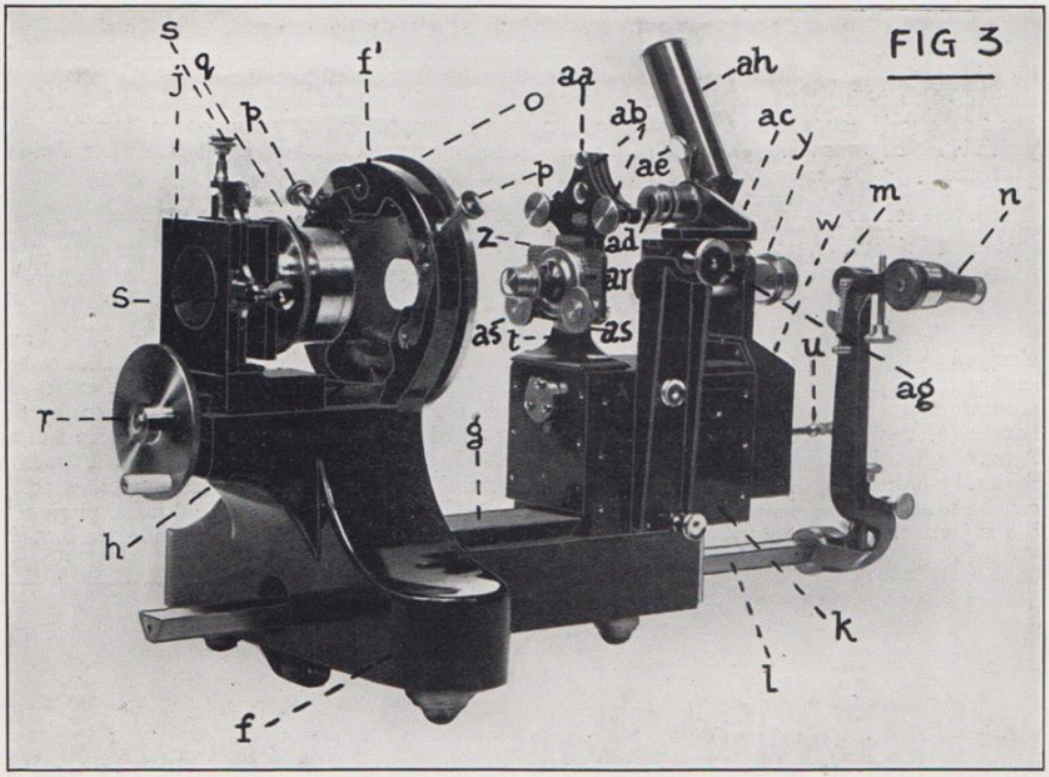
(B) The microscope is illustrated in Figs. 2 and 3. It consists of an iron casting (*f*, Fig. 3) of great rigidity which stands on three toes. Upon it are two dovetail slides (*g* and *h*). The slide (*g*) carries the focussing unit (*k*) and the slide (*h*) carries the substage (*j*). Running in a slide in the casting and below the slide (*g*) is a long bar (*l*). It carries an adjustable bracket (*m*) to support the fluorescent eyepiece (*n*) with provision for accurately aligning it with the main eyepiece. The bar is provided with a clamp. The stage (*o*) is supported on a massive bracket (*f'*) which is part of the main casting. It is held down upon an accurately flat surface fitting on three small raised areas by three springs. A very accurate lateral motion of about 1 cm. in each direction is imparted to the stage by means of the adjusting screws (*p*). The slide holding the object consists of a quartz slip ·5 m/m. thick, and a fused quartz cover glass is used. The slide is held on the

stage by two strips which are undercut at 45° so as to overlap the top surface of the slide. The upper strip is capable of a small vertical movement, but is held against the surface of the stage by shoulder screws. The upper strip is raised, the slide is inserted and the strip then falls by its own weight and holds the slide down on to the lower strip and against the surface of the stage. The substage (*j*) is made on very massive lines as it is required to carry the double illuminator (*q*) which is of large size. It is focussed by means of the micrometer screw (*r*) which carries a divided circle reading to ·01 m/m. The substage centring adjustments are actuated by the screws (*s*). The adjustments are by means of dovetail slides instead of the more usual arrangement which is not sufficiently rigid. The duplex substage illuminator is shown in Fig. 4, the central optical system is of quartz, the outer combination is of glass and forms the dark ground visual illuminator ; it is provided with an independent focussing adjustment.

The focussing unit (*k*) consists of a box-shaped block which can be slid along the slide (*g*) and clamped in a suitable position. Inside this block is a very accurately made floating slide which carries the object glass bracket (*t*). The slide can be moved 1 c/m. by means of an extremely accurate micrometer screw with jewelled contact plates. The screw can be rotated direct by the handle (*u*, Figs. 2 and 3) in which case one rotation of the handle moves the objective 1 m/m. A scale is fitted alongside the objective carrier (*t*) divided in millimetres for coarse measurements. A small window is provided at (*w*) through which a dial fixed to the end of the micrometer screw can be seen. This is divided into 100 divisions, each division being equal to ·01 m/m. motion of the objective. On moving the small lever (*x*, Fig. 2), an extremely accurate gearing is brought




Beck Barnard ultra-violet microscope.
Approx. $\frac{1}{4}$ size.




Beck Barnard ultra-violet microscope.
Approx. $\frac{1}{4}$ size.

into play, and by rotating the milled head (*v*, Fig. 2), a motion 100 times as fine is obtained. The milled head carries a drum with 100 divisions so that one division on the drum represents a motion of the objective of ·0001 m/m. (1/250,000 inch). A drawtube (*y*) ground parallel to an exact cylinder and sliding in a ground fitting, is provided.

The objective changer (*z*) is of a special type. It is an essential part of the method as it locates the objectives with such extreme accuracy that it is possible to focus the image seen by dark ground illumination with a first-class apochromatic objective, and then to replace this with the quartz objective, alter the focussing adjustment by the required amount and obtain a sharp photograph with certainty and regularity. The essential feature of the changer is that the only force which retains the objective and its fitting in place is that of gravity. The objective is screwed into a circular collar (*ar*, Fig. 3) and is placed in contact with the back plate of (*z*). It is then allowed to slide downwards until the rounded corner of the collar comes into contact with the inside of the two steel cones (*as*). These hold the circular collar (*ar*) against the back plate and also locate it so that the objective is accurately in the optic axis of the microscope. The two cones (*as*) are capable of rotation about an eccentric axis, and thus by rotating them, the objective can be moved laterally. In order to accurately adjust a pair of objectives so as to give the identical field of view, the rounded corner of the circular collar (*ar*) is rubbed down until the desired result is obtained. Provision is made to prevent the rotation of these collars when in position. The faces of the back plate and of the rings are optically flat and they are provided with recessed grooves into which dust is removed from their surfaces as the object glass carrier slides into position.

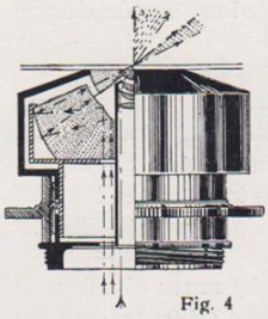


Fig. 4
Duplex dark ground (visual) and Transmitted and U.V. Condenser.

The illuminator (Fig. 4) consists of a large size concentric focussing dark ground illuminator in which the optical parts have a central aperture into which is fitted a quartz condenser. Both these systems can be simultaneously focussed upon the object, and by blocking out the appropriate apertures at the back of the condenser, either dark ground illumination with visible light, or ultra-violet illumination is employed, according to which source of illumination is being used.

An interferometer is supplied to measure the movement of the objectives in terms of wavelengths of light. A mirror fitting (*aa*, Fig. 3) is provided which can be fitted to the objective bracket (*t*). This carries a flat mirror which can be tipped by two adjusting screws (*ab*). Another fitting (*ac*) is fixed to the body of the focussing unit (*k*). This includes a plane plate of glass (*ad*), a thin glass reflector and an observing microscope (*ah*). A small mirror (*ae*) receives light from the mirror (*af*, Fig. 1) of the mercury lamp and reflects this down on to the thin glass reflector, which in turn reflects it upon the interferometer plates. These are moved close together by means of the rack and pinion (*ag*) and the first interferometer mirror is adjusted parallel to the second by means of the two screws (*ab*). The observing microscope (*ah*) is then swung round to a convenient position and the shift of the interference bands can be observed when the fine adjustment is actuated.

(C) The optical bench (C, Fig. 1) consists of a triangular section bar rigidly fixed to the main frame (A) at right angles to the axis of the microscope (B). Three fittings slide along this bar. The first carries a vertical rod, upon which is fitted the quartz mercury lamp. The second carries a condensing lens and a rack to carry any standard size colour filters. The third carries a table upon which is the swinging reflecting prism. All these fittings have vertical adjustments so that the apparatus which they carry can be accurately adjusted with the axis of the microscope (B). The swinging prism is so adjusted that when it is swung against one stop it reflects the light from the mercury lamp along the optic axis of the microscope (see Fig. 1) and when it is swung against the other stop, the prism is entirely removed, thus allowing an unobstructed path for the ultra-violet light from the optical bench (D). Full adjustments in all directions are provided.

(D) The optical bench (D, Fig. 1) has a triangular bar similar to (C) but it is mounted so as to swing on a vertical axis (*an*, Fig. 1) which is in the same vertical plane as the optic axis of the microscope (B). It carries an adjustable spark gap, a fitting with a quartz collimating lens and a prism table. This table carries two quartz 60° prisms, one left-handed and the other right-handed in adjustable mounts arranged in such a way that the last surface through which the ultra-violet light passes is exactly over the swinging axis (*an*). These prisms are first adjusted for minimum deviation and then the whole optical bench is rotated round the axis (*an*) until the required line in the ultra-violet spectrum has been selected and directed along the optic axis of the microscope (B). If required, the bench (D) can be swung on a horizontal axis by unscrewing the lock nut and rotating the axis screw (*an*) which tips the bench in the required manner. As in the case of bench (C) the fittings are capable of vertical adjustment and can be slid along the triangular bar and clamped in position. This bench has been designed for use with a line in the spark spectrum

of cadmium, wavelength = 2,753 A.U. but sufficient adjustment is provided to allow for changes in wavelength.

The spark is produced by a 500 watt transformer working from a source of alternating current. This is stepped up to a potential of 10,000—20,000 volts, which in conjunction with a suitable high tension condenser connected in parallel with the spark gap and secondary winding of the transformer, gives a very powerful spark, rich in ultra-violet radiations. At present no improvement has been found from increasing the power, as it gives a larger spark, but no increase in intrinsic brilliancy.

For photography, a camera of special design is provided. It slides by means of a dovetail and clamp on to the bedplate of the apparatus. It is designed to take two photographs on one plate by means of a simple repeating back.

## The Beck Barnard Ultra-Violet Microscope Outfit.

The outfit consists of :—

The microscope stand, the bedplate, the optical bench for illumination by visible light, including mercury vapour lamp and resistance, collimating lens, 1½ in. glass prism, the optical bench for ultra-violet illumination, with spark gap, pinhole camera, quartz collimating lens, 2 quartz prisms, shields for surrounding illuminating apparatus, interferometer, fluorescent eyepiece, Barnard interchangeable object glass holder, and the following optical equipment :—

2 Quartz microscope eyepieces.

1 Monochromatic 3 m/m. quartz immersion object glass.

1 Apochromatic 3 m/m. oil immersion object glass.

Duplex dark ground illuminator and quartz substage condenser.

Plates of uranium glass.

Didymium screen.

Glass trough for filter.

Detachable camera and plate holder.

Patent ultra-violet and high-power dark ground illuminator.

The following lenses are to be recommended in addition for use with the above apparatus :—

1 Apochromatic 8 m/m. object glass.
1 Apochromatic 16 m/m. object glass.
1 Compensating eyepiece, ×8.
1 Compensating eyepiece, ×25.

Prices upon application.

The apparatus as quoted does not include the provision of the necessary transformer, etc., required to produce the spark. This portion of the apparatus can be supplied to special order, according to the current available, which should be stated when ordering, or when quotations are asked for.

# Beck Object Glasses.

The manufacture of object glasses has advanced in recent years. By the invention of new formulae and by improved methods of testing we may claim to be producing object glasses which are somewhat in advance of anything hitherto made in this or any other country.

Two series are made, achromatic and apochromatic. The achromatic series fill the requirements for most purposes, and are in more general use on account of the fact that they are made to a simpler formula and of less expensive materials and are consequently able to be sold at a lower price. The resolution is of a high order and is in all lenses as nearly up to the theoretical resolving power for the respective apertures as has yet been reached. The chief feature of the apochromatic series is that different glass is employed and other materials substituted and this combined with a different formula involving the use of a larger number of component lenses produces an object glass in which there is a more perfect correction for chromatic and zonal aberrations. In achromatic object glasses the correction is made for two colours of the spectrum but in apochromatic lenses the correction is made for three colours. For very fine structure undoubtedly apochromatic lenses give superior results; the perfection of the colour correction enables certain objects to be seen with greater crispness than is possible with achromatic lenses and higher power eyepieces can be used without breaking down the image. For photography the apochromatics have a decided advantage.

All object glasses, unless otherwise ordered, are corrected for a tube length of 160 m/m., and the drawtube should be extended to the 160 mark. The Sloan objective changer measures 10 m/m., and if this is used the tube should be extended to the 150 m/m. mark. Similarly if a revolving nosepiece is used which measures 10 m/m., the drawtube should only be extended to the 150 m/m. mark.

Dry object glasses, unless otherwise ordered, are adjusted for use with a cover glass ·006 inch (·15 m/m.) thick, and a small thickness of mounting fluid, and coverglass of approximately this thickness should be used for all high-power work. The exact thickness of coverglass to be employed for a dry object should be ·007 inch (·18 m/m.) with the tube length of 160 m/m. or ·006 inch (·15 m/m) with tube length of 180 m/m. Object glasses specially ordered for use with uncovered objects such as metallurgical specimens are supplied at the same prices.

All achromatic object glasses, except the lowest powers, 32 m/m. to 60 m/m. focus, have the same optical lengths, so that when used on a Sloan objective changer or a revolving nosepiece, they are in focus without more than a small movement of the fine adjustment.

For dark ground illumination it is often the practice to place a removable stop in the back of the object glass to reduce its aperture to the requisite amount to exclude direct light. This method has the disadvantage that the stop, not being in the most effective position for its purpose, it is necessary to cut down the aperture to a greater extent than is actually required, thus sacrificing the resolving power of the object glass. The $\frac{1}{12}$ inch (2 m/m.) and $\frac{1}{8}$ inch (3 m/m.) 1.2 N.A. apochromatic and achromatic object glasses are specially made for use with our high power focussing dark ground illuminator with $\frac{1}{2}$ m/m. slips, the full aperture being employed. For thicker slips up to $1\frac{1}{2}$ m.m. thick a stop is provided to reduce the aperture to ·95 N.A. The $\frac{1}{8}$ inch (3 m/m.) N.A. ·95, and the $\frac{1}{12}$ inch (2m/m.) N.A.1, achromatic object glasses are suitable for use with any type of high power dark ground illuminator with a slip of approximately 1 m/m. thick, their full aperture being employed. All these object glasses are also suitable for use with direct illumination.

Object glasses to be used with the Beck aplanatic ring illuminator are supplied without extra cost specially mounted to allow of the full illuminating angle being utilised but lower powers than 16 m/m. require a special adapter.

For hints on the use and selection of object glasses see " The Microscope, a simple handbook," and for further details of illumination and technique see "The Microscope, an advanced handbook."

# Object Glasses and Eyepieces.

## ACHROMATIC OBJECT GLASSES.

| No. | English designation. inches. | Focal length. m/m. | Numerical aperture. | Approximate magnifying power. With eyepiece. ×6. 42 m/m. | ×10. 25 m/m. | ×15. 17 m/m. | Add for each 20 m/m. extension of drawtube. ×6. 42 m/m. | ×10. 25 m/m. | ×15. 17 m/m. | £ s. d |
|---|---|---|---|---|---|---|---|---|---|---|
| **3010** b | 2½ | 60 | ·07 | 7 | 13 | 20 | 3 | 5 | 7 | 0 18 0 |
| **3011** b | 2 | 50 | ·08 | 10 | 20 | 27 | 3 | 6 | 8 | 0 18 0 |
| **3230** a | 1½ | 32 | ·12 | 25 | 45 | 65 | 4 | 6 | 8 | 1 7 6 |
| **3230** | 1½ | 32 | ·15 | 25 | 45 | 65 | 4 | 6 | 8 | 2 5 0 |
| **3238** | 1 | 25 | ·12 | 38 | 63 | 95 | 7 | 10 | 13 | 1 7 6 |
| **3231** a | ⅔ | 16 | .17 | 62 | 110 | 155 | 8 | 12 | 18 | 0 16 6 |
| **3231** | ⅔ | 16 | ·28 | 62 | 110 | 155 | 8 | 12 | 18 | 1 10 0 |
| **3232** | ⅓ | 8 | ·54 | 115 | 200 | 285 | 20 | 30 | 40 | 3 5 0 |
| **3239** | ¼ | 6 | ·85 | 180 | 300 | 450 | 30 | 45 | 70 | 4 0 0 |
| **3234** | ⅛ | 4 | ·85 | 285 | 490 | 690 | 40 | 60 | 80 | 3 15 0 |
| **3234** a | ⅛ | 4 | ·65 | 285 | 490 | 690 | 40 | 60 | 80 | 2 17 6 |
| ***3236** | ⅛ | 3 | ·95 | 380 | 650 | 950 | 50 | 85 | 120 | 6 17 6 |
| ***†3237** | ⅛ | 3 | 1·2 | 380 | 650 | 950 | 50 | 85 | 120 | 7 10 0 |
| ***3235** a | 1/12 | 2 | 1·0 | 530 | 900 | 1275 | 60 | 100 | 150 | 5 10 0 |
| ***3235** | 1/12 | 2 | 1.2 or 1·3 | 530 | 900 | 1275 | 60 | 100 | 150 | 8 10 0 |

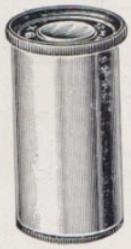
## APOCHROMATIC OBJECT GLASSES.

| No. | English designation. inches. | Focal length. m/m. | Numer. aperture. | Approximate magnifying power. With eyepiece. ×6. 42 m/m. | ×8. 30 m/m. | ×11. 22 m/m. | ×17. 15 m/m. | ×25. 10 m/m. | Add for each 20 m/m. extension of drawtube. ×6. 42 m/m. | ×8. 30 m/m. | ×11. 22 m/m. | ×17. 15 m/m. | ×25. 10 m/m. | £ s. d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **3240** | 1½ | 40 | ·16 | 20 | 27 | 37 | 56 | 83 | 3 | 4 | 5 | 8 | 12 | 4 10 0 |
| **3241** | ⅔ | 16 | ·35 | 62 | 90 | 120 | 175 | 270 | 8 | 11 | 15 | 23 | 30 | 7 15 0 |
| **3241** a | ⅔ | 14 | ·35 | 84 | 120 | 160 | 215 | 365 | 12 | 16 | 22 | 34 | 50 | 7 15 0 |
| **3242** | ⅓ | 8 | ·65 | 115 | 155 | 220 | 325 | 500 | 20 | 26 | 35 | 60 | 75 | 9 10 0 |
| **3244** | ⅛ | 4 | ·95 | 285 | 380 | 540 | 805 | 1225 | 40 | 53 | 76 | 110 | 150 | 11 0 0 |
| §**3245** | ⅛ | 4 | ·95 | 285 | 380 | 540 | 805 | 1225 | 40 | 53 | 76 | 110 | 150 | 12 0 0 |
| ***†3247** | ⅛ | 3 | 1·2 | 380 | 500 | 725 | 1100 | 1500 | 50 | 75 | 90 | 140 | 200 | 15 0 0 |
| †**3250** | 1/12 | 2 | 1·2 | 530 | 705 | 1000 | 1505 | 2250 | 60 | 80 | 110 | 170 | 250 | 18 0 0 |
| ***3248** | 1/12 | 2 | 1·3 | 530 | 705 | 1000 | 1505 | 2250 | 60 | 80 | 110 | 170 | 250 | 18 0 0 |
| ***3249** | 1/12 | 2 | 1·4 | 530 | 705 | 1000 | 1505 | 2250 | 60 | 80 | 110 | 170 | 250 | 25 0 0 |

*Oil immersion.
†Including stop to reduce aperture to ·95 N.A.
§Provided with collar correction for using cover glasses of different thicknesses.

## HUYGHENIAN EYEPIECES.

Eyepieces Nos. 3260 to 3264 and No. 3798 are made to fit easily into the Royal Microscopical Society's No. 1 Standard, ·917 inch diameter. They are designated by their focal length, and their magnifying power is given for the distance of distinct vision 250 m/m., and is engraved on each eyepiece. Eyepieces Nos. 3253-5 are of the large size to fit the 1.41 inch R.M.S. gauge and give large field of view.



| | Focal length. | Magnifying power. | |
|---|---|---|---|
| No. 3260 ... | 42 m/m. ... | ... × 6 ... ... ... | £0 12 0 |
| No. 3261 ... | 25 ,, ... | ... ×10 ... ... ... | 0 12 0 |
| No. 3262 ... | 17 ,, ... | ... ×15 ... ... ... | 0 12 0 |
| No. 3798 ... | 10 ,, ... | ... ×25 ... ... ... | 0 18 0 |
| No. 3253 ... | 42 ,, ... | ... × 6 ... ... ... | 2 5 0 |
| No. 3254 ... | 25 ,, ... | ... ×10 ... ... ... | 2 5 0 |
| No. 3255 ... | 17 ,, ... | ... ×15 ... ... ... | 2 5 0 |
| No. 3263 ... | 25 ,, with indicator | ×10 ... ... ... | 0 17 0 |
| No. 3264 | Eyepieces Nos. 3260 to 3262 with cross lines | ... ... | 0 17 0 |

**Compensating Eyepieces.** These eyepieces are specially corrected for use with apochromatic object glasses and should always be used with them to obtain full advantage of the corrections of these object glasses.

| | Focal length. | Magnifying power. | £ s. d. |
|---|---|---|---|
| No. 3266 ... ... | 45 m/m. ... ... | × 6 ... ... ... ... | 2 2 0 |
| No. 3267 ... ... | 30 ,, ... ... | × 8 ... ... ... ... | 2 2 0 |
| No. 3268 ... ... | 22 ,, ... ... | ×11 ... ... ... ... | 2 10 0 |
| No. 3269 ... ... | 15 ,, ... ... | ×17 ... ... ... ... | 2 10 0 |
| No. 3270 ... ... | 10 ,, ... ... | ×25 ... ... ... ... | 2 10 0 |
| No 3270B ... | 7 ,, ... ... | ×37 ... ... ... ... | 3 3 0 |
| No. 3270A ... | 5 ,, ... ... | ×50 ... ... ... ... | 3 3 0 |
| No. 3270C ... | 2½ ,, ... ... | ×100 ... ... ... ... | 4 4 0 |

**Projection eyepieces.** The best eyepieces for projection and photography are compensating eyepieces Nos. 3266, 3267 and 3268. No advantage is gained by making special eyepieces for the purposes.

No. 3273. **Erecting eyepiece** ... ... ... ... ... ... ... ... ... £2 0 0

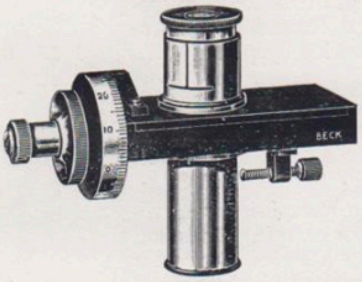
This is a compound eyepiece for use with a 16 m/m. (⅔ inch) object glass. With this object glass it gives a magnifying power 10 to 40 diameters by extending the drawtube and a very large field of view. It gives an erect instead of an inverted image and is particularly useful for dissecting.

No. 3775. **Orthoscopic eyepiece.** 17 m/m. focus (× 15) ... ... ... ... £1 15 0

This eyepiece gives an extra large field of view and is especially suited for use with binocular microscopes for dissecting.

No. 3778. **Double demonstration eyepiece** ... ... ... ... ... ... £8 15 0

This eyepiece enables two observers to examine an object simultaneously. It is of great use in instructional work, as the instrument can be set up in the usual way by the operator and the image viewed also by a second person. An adjustable pointer visible in both fields is provided.




No. 3276A



**No. 3276A. Cobweb eyepiece micrometer** ... ... ... £9 0 0

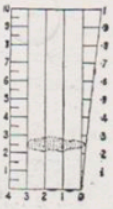
This eyepiece has two cobwebs, one of which is fixed and the other is movable by a micrometer screw. The screw has a millimetre pitch and a drum divided into 100 parts, each division reading 1/100 millimetre. The saw-shaped scale of teeth is so arranged that each tooth is equal to one turn of the screw.



No. 3257

**No. 3275. Beck micrometer eyepiece** ... ... ... £2 2 0

This consists of a complete eyepiece with a magnifying power × 8, and a special vernier millimetre scale placed in its focus.



It is provided with a collar which fits over the drawtube and can be clamped in position by a milled head. The eyepiece has an adjustment for focussing the scale.

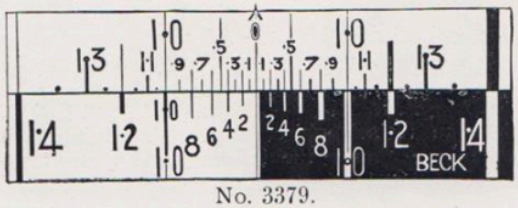
The scale (see diagram) is in millimetres with a vernier reading to 1/10th of a m/m. On the left is a vertical series of divisions divided in half millimetres for rough measurement. For fine measurement the object to be measured is placed in a horizontal position, and the length is measured to 1/10th m/m. by use of the slanting line on the right. The image of an object as shown in the diagram measures 3·25 m/m., because it covers three large divisions and extends to the oblique line at a point halfway between the ·2 and ·3 of tenth millimetre vernier divisions.

To obtain the actual size of the object itself this result has merely to be divided by the initial magnifying power of the object glass.

No. 3256. **Ehrlich eyepiece** ... ... ... ... ... ... ... ... £3 10 0
This is a Huyghenian eyepiece of standard size and power ×6 and provided with a square aperture, the size of which can be varied from 1 to 8 mm. It is useful for measurement of areas or for blood counting,

No. 3404. **Slide with silver film,** with fine pinholes under cover glasses of 3 different thicknesses ... ... ... ... ... ... ... 0 12 6

No. 3404A. **Simple form** with only 1 thickness of cover glass ... ... ... 0 3 0



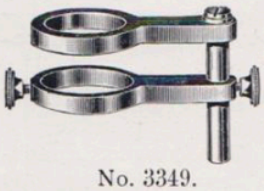
No. 3379.

No. 3379. **Apertometer** ... ... 0 6 0
Brass diaphragm for use in eyepiece with above ... ... 0 1 6

No. 3358. **Iris diaphragm** to screw into nosepiece of microscope to reduce aperture of object glass ... ... 1 15 0



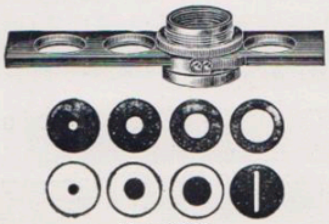
No. 3356. **Nosepiece** to screw into microscope body so that object glass can be rotated on its axis ... ... ... 2 2 0


No. 3349.

No. 3349. **Swing-out adapter** to fit drawtube of microscope which will carry Ramsden eyepiece for observing and measuring eyepoint ... 1 15 0

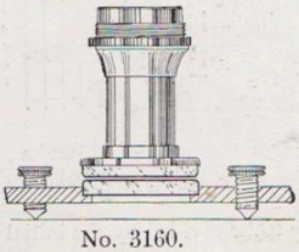
No. 3349A. **Ramsden eyepiece** ×8 to fit above ... 0 15 0

No. 3349B. **Micrometer** to fit on front of Ramsden eyepiece No. 3349A ... ... ... ... 0 15 0


No. 3355.

No. 3355. **Adapter** to fit into nosepiece of microscope with slide for carrying stops and patches, including a series of circular patches and stops, and diaphragms of various shapes ... ... ... 5 10 0

No. 3355A. **Adapter** to fit into nosepiece of microscope with slide carrying a series of low power lenses for altering the tube length correction of object glasses ... 3 10 0


No. 3160.

No. 3160. **Barnard interferometer plates** for testing mechanical defects; one plate is mounted to screw into the body of the microscope like an object glass; the other is on a levelling plate to stand on the stage ... ... ... 6 10 0

No. 4481. **Cube of Uranium glass,** side .5 ins. ... 0 8 6

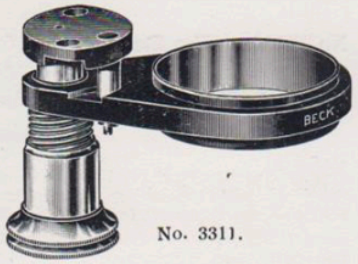


No. 3285.

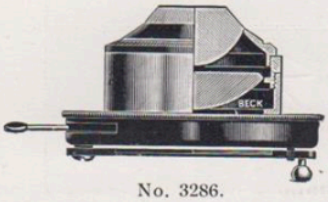
No. 3311. **Substage,** with focussing adjustment by special screw and swing-out movement £1 5 0

No. 3285. **Small Abbe condenser.** A system of lenses mounted with an iris diaphragm, to fit the standard substage £1 9 6

No. 3285P. Set of 3 patch stops for above ... ... £0 7 6



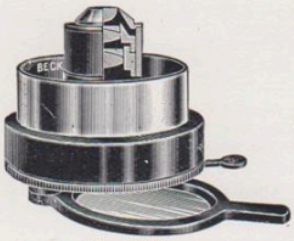
No. 3311.



No. 3286.

No. 3286. **Large Abbe condenser.** A system of larger lenses in a fitting with a large iris diaphragm and a swing-out tray for colour screens or patch stops, with green and and ground glass screens ... ... ... £2 10 0

No. 3286P. Set of 3 patch stops for above ... ... ... 0 7 6

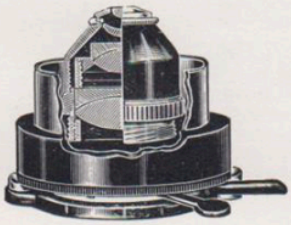


No. 3288.

No. 3287. **Beck dry achromatic condenser.** 1 N.A., with standard object glass screw ... ... 4 5 0

No. 3288. **Beck dry achromatic condenser.** 1 N.A., in fitting with iris diaphragm and swing-out tray, green and ground glass screens ... 5 15 0

No. 3291. **Beck dry and immersion achromatic and aplanatic condenser.** 1·3 N.A. in mount with iris diaphragm and swing-out tray with green and ground glass screens ... 9 15 0



No. 2391.

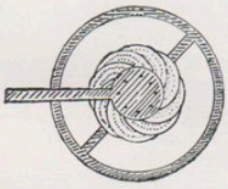
No. 3288P. Set of 3 patch stops for Nos. 3288 or 3291 ... 0 7 6

No. 3284. **Travis expanding iris patch stop** ... ... 0 12 6

No. 3357. **Spot lens** for dark field illumination ... 1 0 0

No. 3296. **High power dark ground immersion illuminator,** in plain substage fitting ... 2 10 0

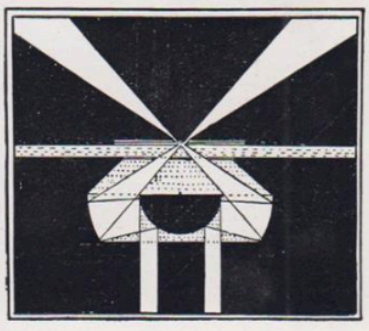
No. 3297. **Ditto,** in centring substage fitting ... ... 3 5 0

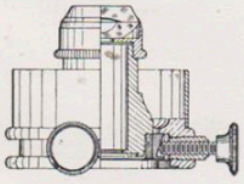


No. 3284.

This illuminator throws upon the object a hollow cone of light between 1 and 1.3 N.A. It must be used in immersion contact with the slide and the slide must be 1 m/m. thick or the light will not be in focus.

It is specially intended for use with object glasses of high power, as it gives a very small but brilliantly illuminated spot of light. Oil immersion object glasses such as the 3 m/m. with an aperture of .95 can be used with it, but lenses with a greater aperture require to be stopped down by the insertion of a diaphragm behind their back lens.





No. 3297.

No. 3293. **The Beck patent focussing dark ground immersion illuminator,** in plain substage fitting ... ... ... ... ... ... ... £5 7 6

No. 3294. **Ditto,** in centring substage fitting ... ... ... ... ... ... 6 2 6

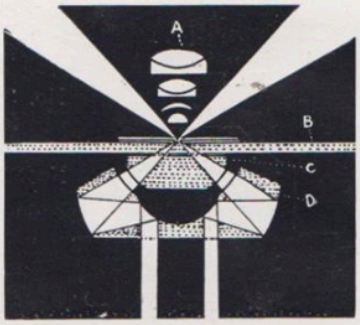


Fig. 1.

This illuminator can be accurately focussed for a slip of any thickness from ½ m/m. to 1½ m/m. This has a great advantage over the usual type. The slips used need not be selected, and mounted objects can be examined which is, owing to their incorrect thickness, often impossible with the non-focussing form.

The peculiarity of dark ground illumination is that if the light is not so focussed that the point to which the light is converged falls upon the object, the latter will not be illuminated at all. As the illuminator must be in immersion contact with the lower surface of the slide, it cannot be moved up and down to alter its focus. For this reason a fixed focus dark ground illuminator can only be used with slips of a given thickness for which the illuminator has been made.

In the Beck focussing dark ground illuminator the optical portion consists of two lenses, C and D (Fig. 1), and the lower lens, D, can be moved up and down while the upper lens, C, remains in immersion contact with the slide B. By means of the lever projecting from the mount at the lower end (C, Fig. 2) the focus of the illuminator is adjusted for a slip of any thickness between ½ m/m. and 1½ m/m. The mount is provided with a ring (A, Fig. 2) which varies in its distance from a projecting ring (B, Fig. 2) as the illuminator is focussed. If the slide to be used is placed on the ring B, and the lever C moved until the ring A just clamps the slide against the ring B, the illuminator will be approximately in focus for this slide, the final adjustment being made by direct observation in the microscope.

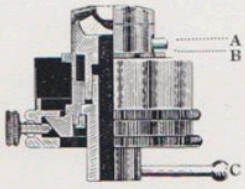


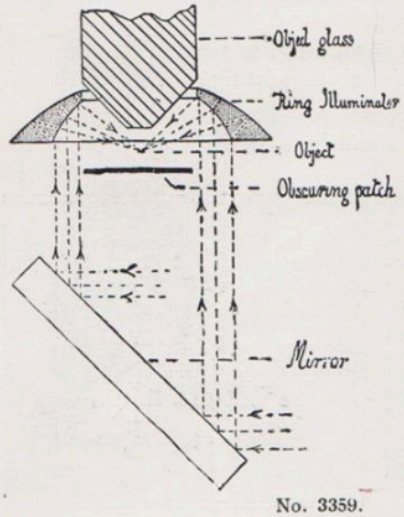
Fig. 2

When this illuminator is used on slips varying from ·1 m/m. to 1½ m/m. the cone of light which it transmits to the object is between 1 N.A. and 1·4 N.A., which enables any object glass with an aperture not higher than ·95 N.A. to be employed with it. If, however, a slip is used that is not thicker than ½ m/m., when the illuminator is focussed for this thickness the angle of the cone of light is altered so that its angle is between 1·25 N.A. and 1·4 N.A., and an object glass with an aperture of 1·2 N.A. can then be employed. We make a 2 m/m. and 3m/m. both in the achromatic and apochromatic series, which while being equally useful for ordinary work is specially made for dark ground illumination.

The front lens of the illuminator can be unscrewed and then forms an excellent dark ground illuminator for low powers, which can be used dry and not in immersion contact with the slide. Lenses whose angle is below ·7 N.A. can be used with it.

The substage fitting regularly supplied is made to the standard size 1·52 in. but special fittings can be supplied to suit other sizes at a small extra cost. In ordering for microscopes not of our manufacture this size should be given and also the distance from the bottom of the substage fitting when it is focussed as far up as possible to the top of the stage, so that the illuminator may be supplied of the correct height.

No. 3482. **Pinhole diaphragm** for centring, in mount with standard R.M.S. object glass thread ... ... ... ... ... ... ... ... ... £0 10 6



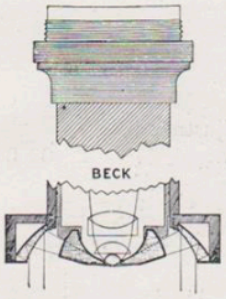
No. 3359.

For particulars of special slip holders for dark ground illumination see page 87.

No. 3359. **Beck aplanatic ring illuminator** for the illumination of opaque objects with powers of 1½ in., ⅔ in. and ⅓ in. The mounts of the object glasses must be specially arranged to take the illuminator. The illuminator consists of a silvered glass ring of such curves that light thrown upwards from the flat mirror is condensed to a very perfect aplanatic focus. The illumination is exceedingly brilliant and is directed upon the object from all sides. ... £2 10 0

No. 3359A. **Beck aplanatic ring illuminator** for ⅙ in. object glass ... ... ... ... 2 10 0

No. 3373. **Beck achromatic and aplanatic ring illuminator** (Price on application).



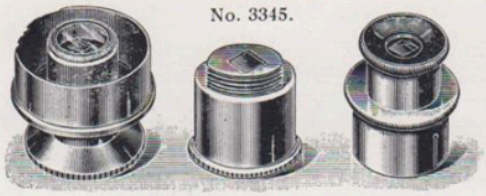

No. 3365.

No. 3365.—**Immersion ring illuminator** for oil immersion object glasses with apertures up to 1.3 N.A. For this purpose a special immersion object glass is made in which the whole front mounting is made of glass instead of metal. The glass mounting has an outer surface which is spherical in shape and concentric with the focus of the object glass so that the light from the aplanatic ring illuminator passes through without refraction. The glass front mount has a small aperture in its centre and into this aperture the front lens of the object glass is cemented, so that the portion of the front lens usually employed for mounting it into a metal cell is used for transmitting light to the object. The front surface of the front lens of the object glass is level with the front surface of the glass mount and the whole of this surface is in immersion contact with the object when in use.

No. 3365. Immersion ring illuminator with 3 m/m. apochromatic object glass 1.3 N.A. ... ... ... ... ... ... ... ... ... £20 0 0

No. 3365A. Ditto but with 3 m/m achromatic object glass 1.3 N.A. ... ... 12 2 6

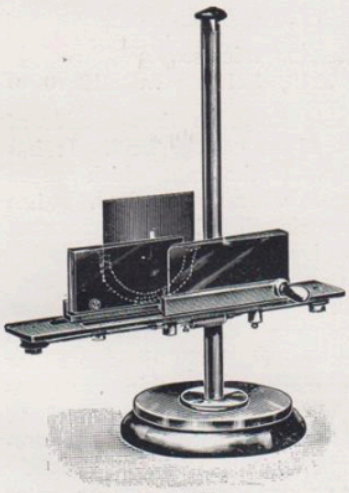
No. 3367 **Dark well for use with ring illuminators.** This is mounted in a ring of the standard substage size and the well has an adjustment up and down and thus provides a suitable stop for obscuring the central beam of light from the mirror ... ... ... ... ... 1 1 0



No. 3345.

No. 3345. **Polarising apparatus,** comprising polariser in revolving fitting to fit to substage, analyser in revolving fitting to fit nosepiece or fit over eye-piece. Selenite plate is provided with polariser .. ... ... ... ... 4 4 0

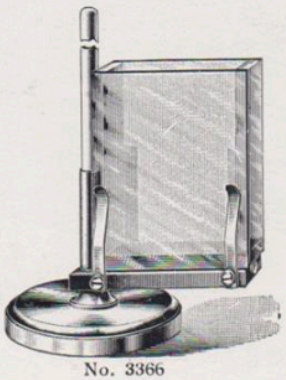
No. 3367. **Polarising apparatus** with lens system to correct astigmatism ... 5 5 0



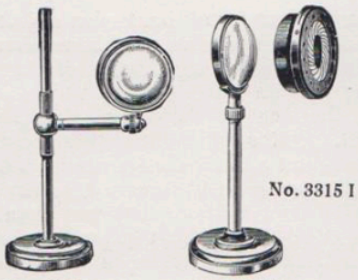
No. 3328.

No. 3328. **Double wedge light moderator** on stand. This consists of a frame which carries two neutral tint glasses which slide in fittings so connected that they move together in opposite directions to vary the density of neutral glass interposed between the source of light and the microscope. The frame carrying the glasses has fittings for the reception of colour filters or diaphragms. The moderator can be adjusted to any height above the table between 2 and 8 in. ... 4 17 6

No. 3366. **Colour trough on adjustable stand.** By dissolving acetate of copper in water an excellent blue-green filter for ordinary visual observation is obtained which is more transparent than a gelatine filter. Other solutions give different colours ... £2 10 0



No. 3366



No. 3315 I

No. 3315 No. 3315A

No. 3315. **Bulls' eye condenser,** 2¼ in. diam. lens with complete adjustments ... ... ... ... £2 10 0

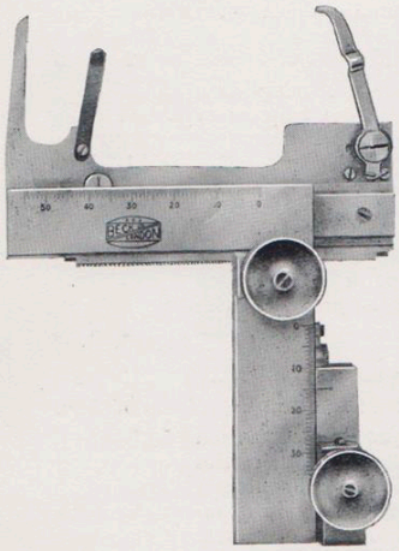
No. 3315A. **Bulls' eye condenser,** 2¼ in. diam. lens with vertical adjustment only ... ... ... ... 2 0 0

No. 3315I. **Iris diaphragm** to fit either of the two above condensers, Nos. 3315 and 3315A ... ... ... 1 0 0

No. 3316. **Bulls' eye condenser,** 1½ in. diam. lens, with complete adjustments ... ... ... ... 1 5 0

No. 3316A. **Bulls' eye condenser, achromatic and aplanatic,** 1·2 in. diam. on adjustable stand, as No. 3316 ... ... ... ... 2 0 0

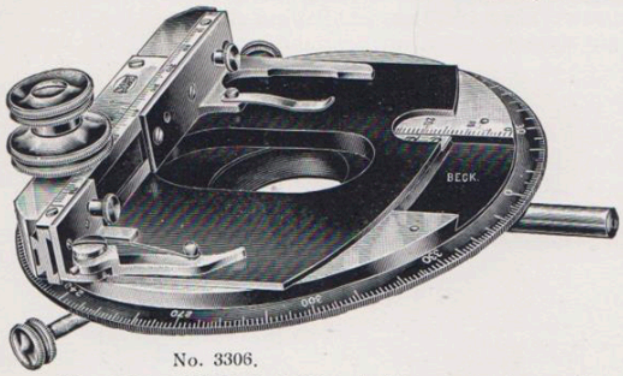
No. 3305. **Mechanical stage**... ... ... 6 0 0



No. 3305

This stage has both horizontal and vertical motions actuated by milled heads. The rack employed is very finely cut, which gives an exceedingly delicate and smooth motion. In the horizontal direction, the travel is 2½ in. and in the vertical 1 in. This type of stage is the one supplied with the Nos. 22 and 29 London microscopes. It can be fitted to other instruments but in some instances a small charge for fitting is entailed.

No. 3306. **Concentric rotating mechanical stage,** suitable for microscopes 3214, 3215, 3216, 3217 ... £12 0 0

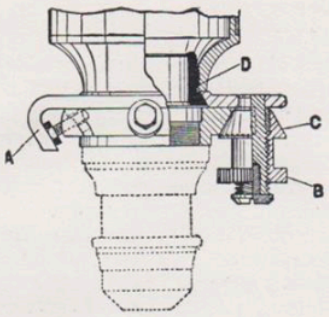


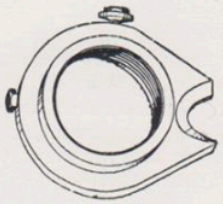

No. 3306.

This stage has adjustable stops, so that a slide of any length from 4 in. to 1½ in. can be held. It has a spring to hold the slide down to the stage, which can be turned aside when not required. It has two concentric milled heads, so mounted that there is no tendency for the motion of one to affect the other. The horizontal range is 3 in., the vertical motion 1 in. The stage is supplied with scales and verniers in both directions for finding specimens or making measurements. When this stage is fitted to existing instruments the standard substage apparatus must be made slightly longer to accommodate further extra thickness.

No. 3307. **Sliding ledge** to fit square stage microscopes ... ... ... ... £0 14 0

This slides up and down the edges of the stage and the object can be pushed laterally along the ledge.



No. 3280.

No. 3280. **Sloan objective changer,** including adapter, spanner and 2 fittings ... £1 17 6

No. 3281. Extra **fittings** ... ... ... ... 0 8 0

No. 3282. **Case** to hold 3 fittings with object glasses attached in dust-tight spring holders ... ... ... ... ... 0 11 6

This takes the place of the revolving nosepiece and has certain advantages.

It consists of an adapter which screws on to the nose of the microscope. This adapter has on one side a sloping projection (A), and on the other a screw clamp (B) with a bevelled nut (C). The adapter is clamped to the nosepiece of the microscope by a screwed ring (D), which is provided with slots, into which a halfpenny will fit, for tightening it up.

Loose fittings are supplied, one of which is screwed on to each object glass.

Each fitting has a bevelled gap which fits loosely over the bevelled nut (C) of the adapter and swings round into position when a turn of the milled head (B) forces the fitting against the sloping projection (A) and holds it firmly in position. An object glass can be changed almost as rapidly as with a revolving nosepiece, and it allows of the use of any number of object glasses. Each adapter has screwed studs with clamping screws, which form the stops in both directions when the object glass is in the correct position. These can be adjusted by means of a spanner supplied for the purpose, so that each lens can be centred with an accuracy that is never possible with a revolving nosepiece, because the error of each individual object glass cannot be compensated for.




No. 3301.

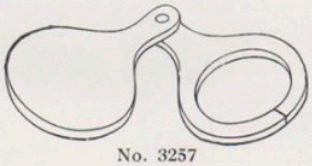
No. 3300. **Dust-tight double nosepiece** ... ... ... £1 1 0

No. 3301. **Dust-tight triple nosepiece** ... ... ... 1 10 0

No. 3302. **Dust-tight quadruple nosepiece** ... ... 1 15 0

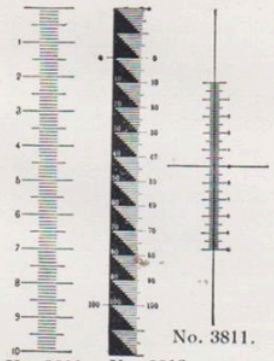
No. 3418. **Diamond object marker** ... ... ... ... 2 10 0

This fits into the microscope like an object glass and has a diamond set into it, so that a circle can be scribed upon the cover glass around any portion of the object which it is desired to mark. The diameter of the circle is adjustable.



No. 3257

No. 3257. **Eyeshade,** to shield the unemployed eye from light and enable it to remain open during observation ... ... ... £0 2 0



No. 3810. No. 3812. No. 3811.

No. 3277. **Stage micrometer** on 3×1 slip, engraved 1/10 and 1/100 m/m. ... ... ... ... 0 12 6

No. 3278. **Stage micrometer** on 3×1 slip, engraved 1/100 and 1/1000 inch ... ... ... 0 12 6

No. 3276. **Eyepiece micrometer,** scale 5 m/m., divided into 50 parts ... ... ... ... ... 0 10 6

No. 3810. **Eyepiece micrometer,** scale 10 m/m., divided into 100 parts ... ... ... 0 10 6

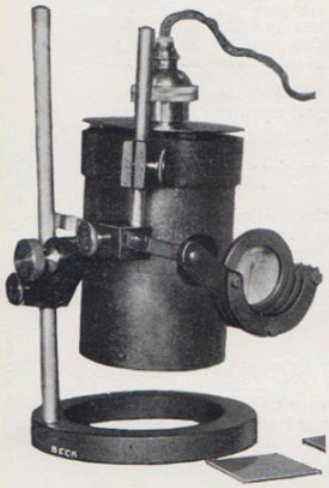
No. 3811. **Eyepiece micrometer,** scale 10 m/m., divided into 100 parts and cross lines ... 0 12 6

No. 3812. **Step eyepiece micrometer** ... ... ... 0 12 6

No. 3265. **Glass plate,** ruled with cross lines ... ... 0 5 0

No. 3279. **Glass plate** ruled in squares, $\frac{1}{4}$ m/m., $\frac{1}{2}$ m/m., or 1 m/m. .. ... ... ... ... 0 10 6

## BECK ELECTRIC LAMP.



No. 3332

This lamp has been designed so as to provide a completely adjustable light source for all classes of microscopic illumination. It consists of a heavy circular base with an upright upon which the lamphouse moves in a vertical direction and upon which it also tips so as to alter the horizontal axis of the light. Both adjustments are provided with clamps. By means of the raising and lowering adjustment, the lamp can be placed in any position between 3 in. and 9 in. above the table. An adjustment is provided for the accurate alignment of the light source in the optic axis. The condenser can be focussed and clamped in the required position. Provision is made for the accommodation of an iris diaphragm and colour screens, 2 in. square. The complete adjustments render the lamp suitable for use with all methods of microscopic illumination. An ordinary 60 watt incandescent or Pointolite lamp can be employed as the illuminating source. The latter is strongly recommended for high power work, and especially for dark ground illumination. It is a very satisfactory illuminant, the source of light being a sphere of tungsten about 1/10 in. diameter, which when incandescent, has extreme intensity. This lamp is supplied of 100 c.p. for direct current, or 150 c.p. for alternating current, and is used in conjunction with a fixed resistance so that it is necessary to specify the voltage of the electric supply when ordering.

| | | |
|---|---|---|
| No. 3330. | **Beck electric lamp,** with condenser, ground and green glasses and 60 watt Fullolite lamp ... ... ... ... | £6 10 0 |
| No. 3332. | **Beck electric lamp,** with condenser, ground and green glasses, 100 c.p Pointolite lamp, and fixed resistance | 10 17 6 |
| No. 3330A. | **Beck electric lamp** as No. 3332, but with Pointolite 150 c.p. lamp and fixed resistance ... ... ... | 12 2 6 |
| No. 3680. | Iris diaphragm ... ... ... ... | 0 12 6 |
| No. 3681. | Achromatic and aplanatic condenser in place of ordinary condenser, ... extra | 0 10 6 |



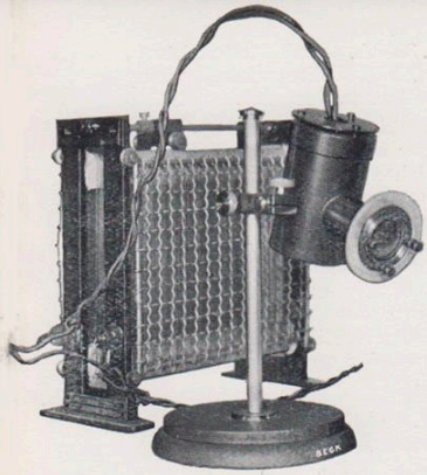
No. 3330a.

## BECK MINOR ELECTRIC LAMP.

This lamp can be adjusted vertically, enabling it to be placed at any height from 2½ in. to 7½ in. It can be inclined to any angle. The lamp has fitted to it two bars which can be swung aside separately and each of which carries two fittings for colour screens, iris diaphragm and condenser. Thus one piece of apparatus can be swung out of the axis independently of the others when not required.

The illuminant used in this lamp is the 30 c.p. Pointolite. This has a smaller tungsten ball than in the 100 c.p. lamp, but it is of the same intrinsic brilliancy. It is worked with a fixed resistance for direct currents only of voltages from 100 to 240. The current should be stated in ordering. The whole lamp is of very convenient design, and suitable for all classes of microscopic illumination, including dark ground illumination with high powers.

| | | |
|---|---|---|
| No. 3330A. | **Beck Minor electric lamp,** with 30 c.p. Pointolite lamp, fixed resistance, bull's eye condenser, iris diaphragm, ground and green glasses ... ... ... ... ... ... ... ... ... | £9 9 0 |



No. 3344

## BECK INTENSITY MICROSCOPE LAMP.

The illuminant is a gas-filled lamp of great intrinsic brilliancy. It does not possess the intrinsic brilliancy of a Pointolite lamp, but is a good substitute, being quite sufficiently intense for use with dark ground illumination with high powers, unless deep colour screens are used. For transparent illumination it is most satisfactory and for metallurgical and photomicrographic work it is of special advantage, as it possesses great intensity in the actinic region of the spectrum and exposures are therefore reduced.

The lamp housing consists of a tube 2 in. diameter and to it is fitted a condensing lens with sliding focussing adjustment. The lamp housing is fitted to a rod, and has adjustments for regulating the height and angle, each being provided with a clamp. The upright rod is fitted to a heavy metal base. A ground and green glass screen and also a length of flex for attachment to the electric supply are supplied.

| | | £ | s | d |
|---|---|---|---|---|
| No. 3344. | **Beck Intensity lamp,** with condenser, ground and green glasses and resistance to work on any current from 100—250 volts, direct or alternating | 4 | 15 | 0 |
| No. 3344A. | Ditto, but with iris diaphragm ... ... | 6 | 0 | 0 |
| No. 3344B. | **Beck Intensity lamp,** without resistance to work from accumulators on 12 volt current ... ... ... | 3 | 7 | 6 |
| No. 3344C. | Ditto, but with iris diaphragm ... ... | 4 | 12 | 6 |
| No. 3344D. | Spare bulbs ... ... ... each | 0 | 5 | 0 |
| No. 3682. | Achromatic and aplanatic condenser in place of ordinary condenser ... extra | 0 | 7 | 6 |



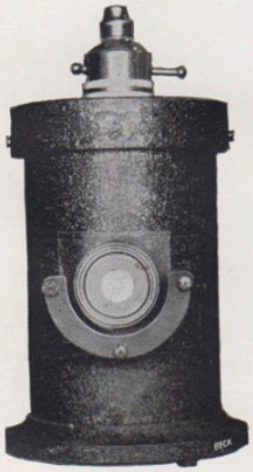
No. 3625

## BECK SIMPLEX MICROSCOPE LAMP.

This lamp is suitable for general microscopic work, excepting dark-ground illumination. The casing is strongly made and well ventilated, finished in crsytalline enamel. The light source is a 60-watt Fullolite globe and the screen a special blue glass, giving an illumination equivalent to day-light. Other coloured screens, as listed, can be supplied.

The lamp is supplied complete with flexible wire and bayonet or pin adapter. In ordering, the voltage of the electric supply should be specified, also whether bayonet or pin adapter is required.

| | | £ | s | d |
|---|---|---|---|---|
| **No. 3625.** | **Beck Simplex microscope lamp** ... | 0 | 18 | 6 |
| **No. 3626.** | **Spare screens,** ruby, red, orange, green, blue-green, blue ... ... ... ... each | 0 | 2 | 0 |



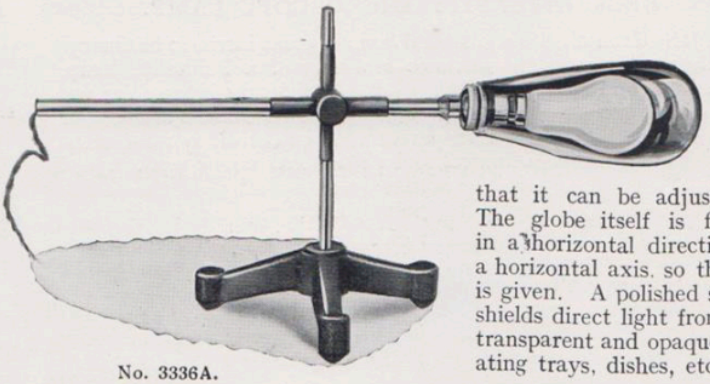
No. 3086

## BECK CANISTER LAMP.

This is a very simple lamp containing a Fullolite globe, the general design being seen from the illustration. It is solidly made and has an iris diaphragm fitted together with a cell in which a colour filter can be placed.

It is a useful lamp for general work, as the light can be readily controlled by the iris diaphragm, but it is not sufficiently powerful for high power dark ground illumination, and cannot be used for top lighting or work with a vertical illuminator, as it has no raising motion.

| | | £ | s | d |
|---|---|---|---|---|
| No. 3086. | **Beck Canister lamp,** with Fullolite globe, iris diaphragm and green glass | 2 | 2 | 0 |



No. 3336A.

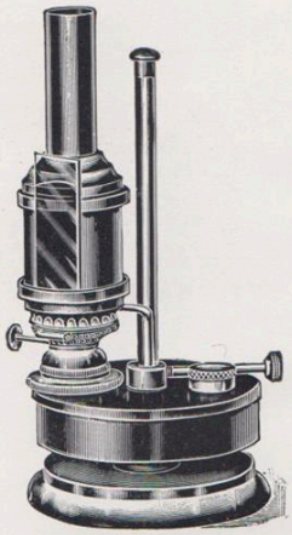
No. 3336A. **Beck Reflex lamp,** with Fullolite globe, wiring and connector ... £1 7 6

This lamp consists of a heavy iron tripod stand with an upright, up and down which the arm carrying the globe slides, so that it can be adjusted for height and can be rotated. The globe itself is fitted on to an arm which slides in a horizontal direction and can also be rotated about a horizontal axis, so that practically universal adjustment is given. A polished shade increases the illumination and shields direct light from the eyes. It is suitable for both transparent and opaque illumination and also for illuminating trays, dishes, etc., during dissection.

No. 3335. **Beck paraffin lamp.** The burner can be clamped at any convenient position above the table and has a revolving motion so that the edge or flat side of the flame can be used. ... ... ... ... £2 15 0

No. 3334. **Beck paraffin lamp,** as above, but with rack and pinion raising and lowering adjustment, bull's-eye on adjustable arm and screen holder. Ground and green glasses are supplied. ... ... ... ... ... £8 17 6

No. 3337. **Incandescent gas lamp,** with inverted mantle, on stand, with movements and metal hood shade. £2 5 0



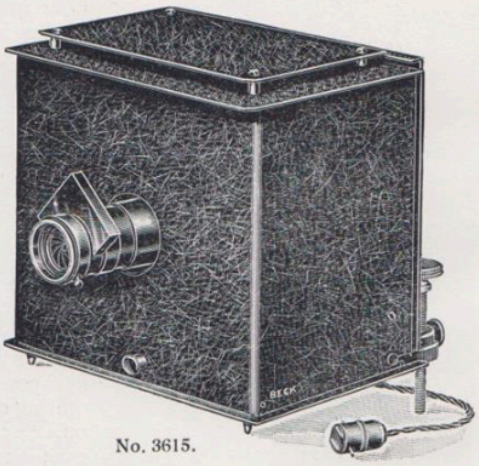
No. 3335.

## QUARTZ MERCURY VAPOUR LAMP.

The quartz mercury vapour burner, now being used to a greater extent for microscopy, has led us to produce a suitable housing provided with all necessary adjustments for the accommodation of this burner.

The design of this housing can be seen by the illustration. It consists of an iron baseplate on which are fitted two uprights to support the burner. There is also an upright which carries in a tube, a focussing condenser and iris diaphragm. The tube is slotted to take screens of varying thicknesses. The housing is capable of being tilted to an angle of 20 degrees by means of screws. Clamping screws are also provided so that when the lamp has been set at the required angle the screws operating the tilting motion can be definitely clamped in the required position. The backplate of the housing is easily removable so that the burner is readily accessible should any adjustment be required or so that the same burner can be used for other purposes, such as sterilizing. The housing is well ventilated and so arranged to prevent extraneous light escaping. This latter is an important feature with the mercury vapour burner, as unless the eyes are protected, ultra-violet light causes serious damage. The whole of the housing is finished in crystalline enamel. The condenser supplied in the ordinary way is glass, but for those who are requiring to use light in the ultra-violet region, a condenser of quartz can be fitted.

The quartz mercury vapour burner which we supply is the K.B.B. atmospheric type. No mechanical devices are required for starting the arc, which renders the lamp free from defects inseparable from such mechanisms. The lamp can be operated from a



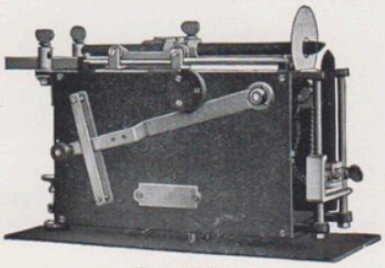
No. 3615.

direct current house supply provided the series resistance is adjusted to suit the particular voltage For operating from alternating current a rectifier or motor generator is required.

The quartz mercury vapour burner gives an illumination with a small number of monochromatic spectrum lines, and by the use of filters any one of these lines can be used giving a monochromatic source of light of great intensity. In addition to the advantages offered in the visible spectrum the burner is also one of the richest sources of ultra-violet radiation, and since fused quartz is transparent to rays of very short wavelength, the burner is particularly valuable to research workers requiring light in the ultra-violet and extreme ultra-violet region of the spectrum, in which case the condenser must be of quartz.

The housing can be supplied for existing burners. For this purpose it is necessary for the burner to be sent to us, and a small charge is made for the necessary fitting.

| | | |
|---|---|---|
| No. 3615. | **Quartz mercury vapour lamp**, housing complete with K.B.B. atmospheric burner ... ... ... ... ... ... ... | £20 0 0 |
| No. 3616. | **Resistance for low voltages.** ... ... ... ... ... ... | 2 2 0 |
| No. 3617. | **Resistance for high voltages.** ... ... ... ... ... ... | 3 0 0 |
| No. 3618. | **Housing only** ... ... ... ... ... ... ... ... ... | 8 10 0 |
| No. 3619 | **Hewittic rectifier**, for operating burner on alternating current. ... | 19 19 0 |
| No. 3620 | **Quartz condenser**, in place of ordinary type. ... ... ... ... | 1 10 0 |
| No. 3327. | **Didymium glass screen.** ... ... ... ... ... ... ... | 3 10 0 |



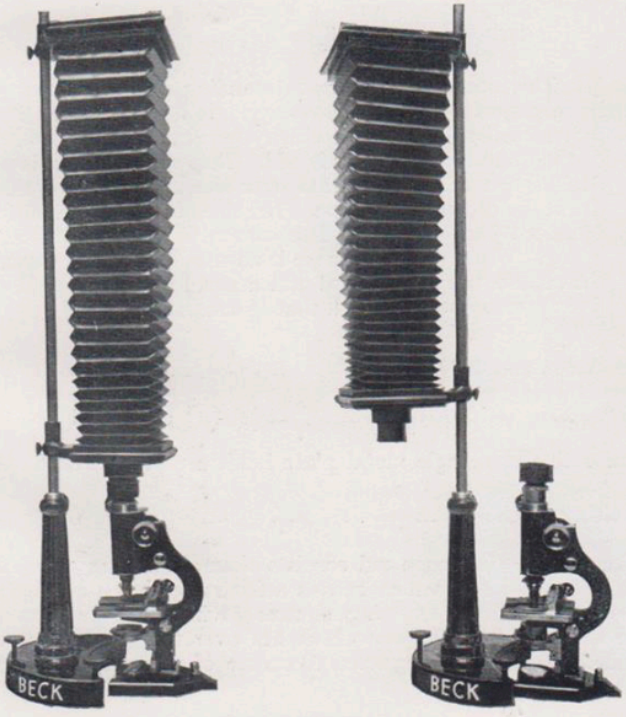
No. 3329

No. 3329. **Automatic arc lamp,** 6 amperes, for direct current. This forms a very satisfactory illuminant for micro-photography, projection, dark ground illumination, etc. etc. The automatic mechanism relieves the operator of all trouble except that of switching on and off.

No. 3329A. **Adjustable resistance**

Prices on application.

## BECK PHOTOMICROGRAPHIC CAMERAS.



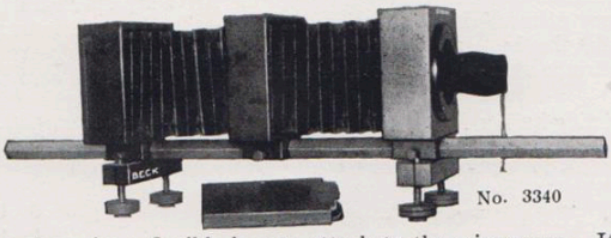

No. 3650

This apparatus is of exceptionally rigid construction, and is intended for photomicrography with high powers. The base is very massive and is supported on levelling screws. Cast solid with this base is an upright pillar in which rotates the vertical rod carrying the camera and which can be clamped in any position of its rotation. By this rotation of the vertical rod the whole camera can be turned aside out of the optical axis when not required. The camera has extension of 80 centimetres, and slides on the upright bar which is graduated in centimetres. It is half plate size, carriers being provided in the dark slide to take ¼-plate. The front of the camera carries an exposing shutter and also has a light tight joint for attachment to the microscope.

No. 3650. **Vertical photomicrographic camera,** complete with one double book form slide ... £25 0 0

No. 3651. Extra double book form slides with carriers for ¼-plate £1 4 0

No. 3340. **Beck photomicrographic camera,** complete with one double dark slide, ¼-plate, 3¼ in. × 4¼ in. size ... ... ... ... ... ... ... £6 6 0

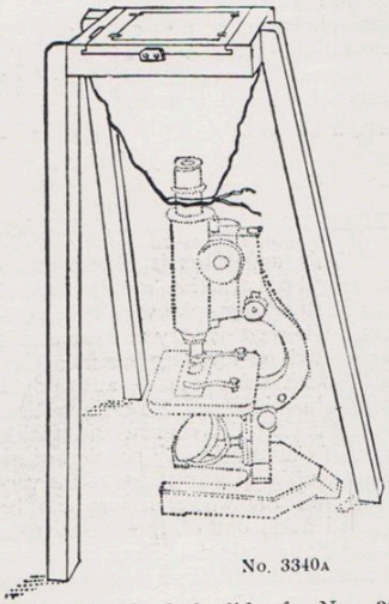


No. 3340

The camera has an extension of 30 in. It consists of a steel hexagonal bar supported on four levelling screws. Along this bar slide three frames with connecting bellows, each frame being provided with a clamp screw. The frame at one end holds the ground glass and double plate holder, the frame at the other end carries a flexible bag to attach to the microscope. It can be adjusted up and down so that its centre is at any distance from the ground between 5¾ in. and 7¼ in.

No. 3340B. As No. 3340 but with reversing back to camera and exposing shutter ... £7 19 6

No. 3339. **Beck photomicrographic camera,** complete with one double dark slide, ½ plate, 6½×4¾ in. size ... ... ... ... ... ... 15 0 0


No. 3340A

This camera is in the main features similar to the No. 3340. It, however, has a total extension of 36 ins. and is provided with a reversing back and exposing shutter. An extra front panel is also provided to which can be attached a short focus lens when it is desired to take low power photomicrographs. Four sockets are supplied to screw on to bench.

No. 3340A. **Beck vertical photomicrographic camera,** with one double dark slide, ¼ plate, 3¼in.×4¼in. ... £4 4 0

This consists of a frame standing on three strong legs splayed out to give stability. It has a slide on its upper surface into which either the ground glass screen or the double plate holder is slid. Below this frame is a flexible connection which fits over the upper end of the drawtube of the microscope. The size of the plate used is 4¼ in. × 3¼ in. (¼ plate). This camera is very convenient in use. When the microscope is adjusted for visual work, the camera can be attached and a small alteration to the fine focussing motion is all that is necessary.

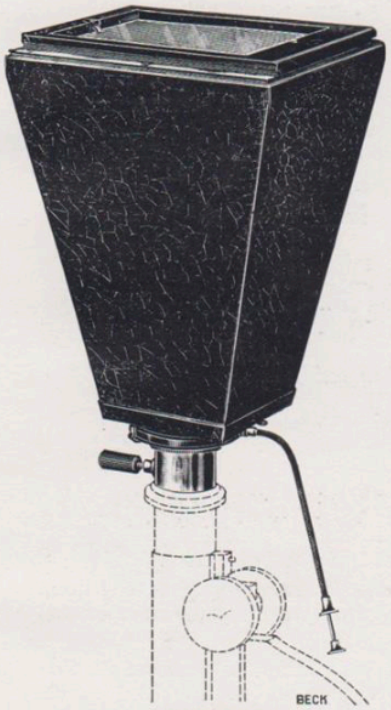
Extra double dark slides for Nos. 3340, 3340A and 3340B ... ... ... each £0 16 6

Extra double dark slides for No. 3339 ... ... ... ... ... ... each 1 0 0

No. 3654. **Eyepiece camera**, complete with three single metal plate holders ... 3 3 0

No. 3655. Extra single metal plate holders, each ... ... ... ... ... 0 3 6

This camera is for use over the eyepiece of the microscope and consists of an aluminium tapered box, 6¾ in. long. The upper end is fitted with a frame which carries a focussing screen or single metal plate holder. The lower end is fitted with an exposing shutter giving time bulb and instantaneous speeds. Into this shutter is screwed an adapter which fits over the draw-tube of the microscope. The adapter is provided with a clamping screw to ensure of the camera being




No. 3654.

rigidly held in position. The shutter is actuated by an antinous release. The size of the plate which the single metal plate holders carry is ¼-plate ($4\frac{1}{4} \times 3\frac{1}{4}$ in.). The camera is extremely light in weight, the total weight including a single metal slide being 15 oz.

No. 3333. **Wratten and Wainwright's colour filters,** "M" visual or photomicrographic, set of 9, gelatine, between glass plates 2 in. square, in cardboard case ... ... £2 18 6¶

No. 3333A. **Ditto,** circles $1\frac{3}{8}$ diam. ... ... 2 5 0¶

**Single filters** as above, 2 in. square ... 0 6 6¶

**Single filters** in circles $1\frac{3}{16}$ in. diam. ... 0 4 6¶

**Neutral tint filters** transmitting 75%, 50%, 25%, 10%, or 5% respectively each 0 17 6¶

No. 3346. **Beck colour filters,** set of 6, gelatine, between glass plates 2 in. square, comprising blue-green, green, blue, red, orange and purple ... ... ... ... 1 5 0

No. 3347. **Single filters,** 2 in. square ... 0 4 6

No. 3786 **Stand** to hold filters 2 in. square ... 1 10 6

## MICROSTIGMAR LENSES.

This series of lenses have been specially designed and corrected for photomicrography. They are found extremely useful when it is desired to take photographs of large objects at low magnifications. The working aperture is f/4·5, and the mounts have the standard R.M.S. gauge of screw.

No. 2994. 40 m/m focal length ... ... ... £6 15 0

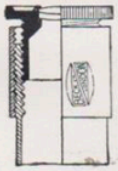
No. 2995. 50 „ „ „ ... ... ... 6 15 0

No. 2996. 75 „ „ „ ... ... ... 6 15 0




No. 3333.

No. 3343. **Achromatic focussing glass** ... ... ... ... £0 15 0



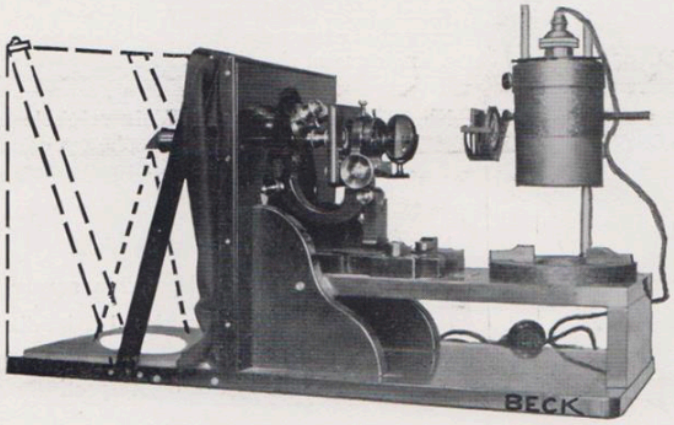
No. 3343

This consists of a high-power lens mounted in an adjustable tube, which can be set so that when it is stood upon the ground glass the latter is sharply focussed. A small portion in the centre of the ground glass screen of our cameras is left clear so that the image can be viewed with the focussing glass without being partially obscured by the ground glass.

The method of setting the focussing glass is as follows: Loosen the top cell which holds the lens combination by slightly unscrewing it, then screw the outer one of the tubes downwards away from the cell, leaving the screw of the top cell exposed. Now hold the inner tube and screw the top cell backwards and forwards until a pencil mark on the lower side of the ground glass is sharply defined, while the focussing glass is held against the upper side. Then screw up the outer tube, which will form a lock nut and fix the top cell in the correct position.

No. 3343A. **Focussing glass,** of simpler type, and without clamp ring ... ... ... £0 4 6

## BECK DRAWING APPARATUS.




No. 3660

The method of drawing objects, as seen through the microscope, by means of projecting an image on to the paper, is perhaps the most simple of any method. It requires no artistic skill, and it is simply the outlining of a picture which is actually projected on to the drawing paper.

The difficulty generally arises in obtaining a sufficiently visible picture giving good contrast, and thus making the process of drawing easy and certain. The arrangement of the microscope, lamp, etc., also present some difficulties.

We have, therefore, produced a self-contained apparatus with lamp, a platform for the microscope, right-angle prism and drawing board. The apparatus is provided with adjustable curtains which exclude all extraneous light from the drawing board. These curtains are so arranged that they can be folded back, while the adjustments of the microscope are operated and let back in position while the drawing is being carried out. It will be found that with either of the illuminants which we list this apparatus can be used with any powers up to and including a 1/12th, and that even with the latter power when all light is shut off by means of the curtains, an image is projected which is quite sufficiently brilliant to enable drawings to be made with ease.

In ordering, the pattern of microscope should be specified, also the diameter of the eye end of the draw-tube over which the prism has to fit.

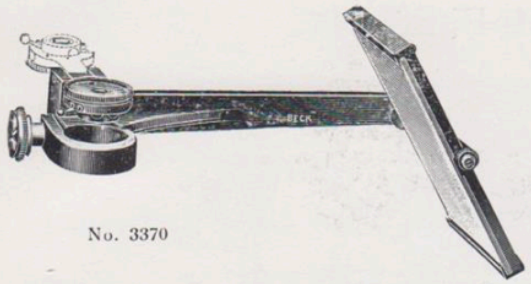
| | | |
|---|---|---|
| No. 3660. | **Drawing apparatus,** complete with Intensity lamp and resistance to work off any current from 100 to 250 volt. ... ... ... ... | £16 0 0 |
| No 3661. | Extra for 100 c.p. Pointolite lamp and resistance to work off direct current 100 to 240 volt. ... ... ... ... ... ... ... | 9 0 0 |
| No. 3661A. | Extra for 150 c.p. Pointolite lamp and resistance to work off alternating current 100 to 240 volt. ... ... ... ... ... ... ... | 10 0 0 |
| No. 3662. | Right angle prism only ... ... ... ... ... ... ... ... | 1 10 0 |

The prices do not include microscope, but include the cost of fitting customer's microscope to the apparatus.

### SUGGESTED COMPLETE OUTFIT.

| | | | |
|---|---|---|---|
| No. 3660. | Drawing apparatus ... ... ... ... ... ... | £16 0 0 | |
| No. 29C, | London microscope with rack and pinion focussing and centring substage (without case) ... ... ... ... | 9 16 0 | |
| No. 3260. | 2 Eyepieces, 42 m/m. and 25 m/m. (×6 and ×10) ... ... | 1 4 0 | |
| No. 3231A. | $\frac{2}{3}$ in. Object glass, 16 m/m. ... ... ... ... ... | 0 16 6 | |
| No. 3234A. | $\frac{1}{6}$ in. Object glass, 4 m/m. ... ... ... ... ... | 2 17 6 | |
| No. 3235A. | $\frac{1}{12}$ in. Object glass, 2 m/m., oil immersion ... ... ... | 5 10 0 | |
| No. 3285. | Abbe condenser and iris diaphragm ... ... ... ... | 2 10 0 | |
| No. 3301 | Triple nosepiece ... ... ... ... ... ... ... | 1 10 0 | |
| | | | £40 4 0 |

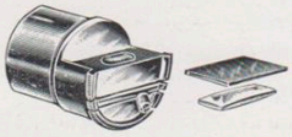
## CAMERA LUCIDAS.



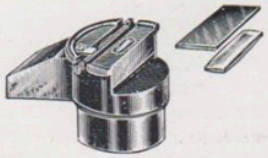
No. 3370

No. 3370. **Abbe camera lucida** ... £4 5 0

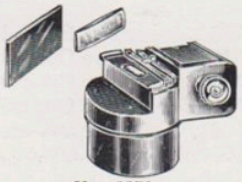
This apparatus is made for the production of correct drawings of images seen through the microscope. It consists of a prism mounted to fit over the eyepiece of the microscope and a large mirror placed a few inches from it. The prism is silvered but has a small clear aperture in its centre. The paper upon which the drawing is made is reflected by the mirror into the prism and in turn by the silvered surface of the prism into the eye. At the same time the object is seen through the clear aperture in the prism. Thus the object is seen superimposed upon the paper and can be readily drawn. This Abbe camera lucida is of rigid design and is made of a light metal, so that the total weight is 7 oz. The fitting carrying the prism is hinged and can therefore be readily turned aside when not desired for use, or for changing eyepieces. A series of neutral tint glasses for equalising the light in the two fields are mounted in a revolving fitting. The microscope should preferably be used vertical, but if inclined, the drawing paper must be set in the same plane as the stage.



No. 3368.



No. 3369.



No. 3371.

No. 3371. **Simple form of Abbe camera lucida** ... ... ... ... ... £3 3 0

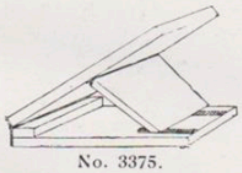
The large mirror is replaced by an adjustable prism. With this form, a lens is supplied to bring the pencil and paper into focus at a distance of about 10 ins., which in this case is the approximate distance between the eyepiece and paper. A neutral glass is also supplied.

No. 3368. **Beck horizontal camera lucida** ... ... ... ... ... ... £1 17 6

This again gives an image of the paper by means of a prism, but it is constructed for use with the microscope placed in a horizontal position. The image of the paper is reflected into the eye by a half-silvered surface on the prism and the object is at the same time viewed through this half-silvered surface. The compensating lens and neutral glass are supplied.

No. 3369. **Beck vertical camera lucida** ... ... ... ... ... ... £2 10 0

This is constructed on similar lines to the horizontal pattern but is made for use with the microscope in either an upright position or at 60° inclination.



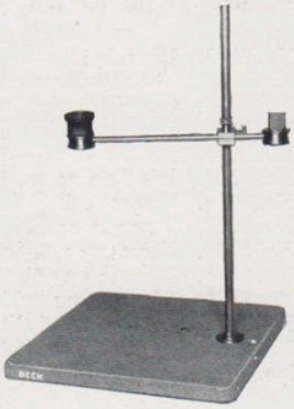
No. 3375.

No. 3375. **Drawing table,** adjustable for angle, for use with camera lucidas ... ... ... £0 15 0

No. 3376. **Table camera lucida,** with two prisms and lenses ... £7 10 0

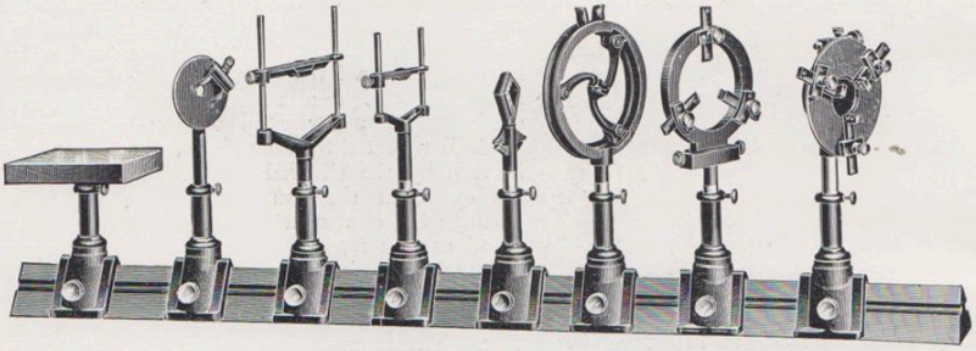
This apparatus has been designed for making accurate drawings without artistic skill. The general design of the apparatus may be seen from the illustration It has two prisms, one for sketching near, and one for distant objects.

For portability, the upright rod is so made that it can be easily unscrewed from the board thus allowing of the whole to be fitted into a small space.



No. 3376.

# Optical Benches and Fittings. ¶

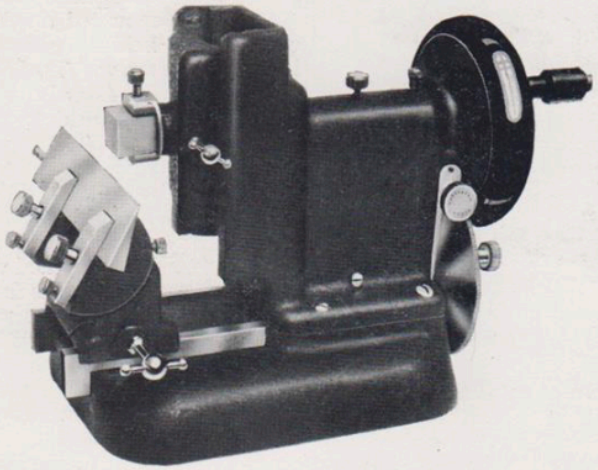


No. 3916. No. 3917. No. 3918. No. 3919. No. 3920. No. 3921. No. 3922. No. 3923.

| | | | | | |
|---|---|---|---|---|---|
| No. 3900. | ½ metre Optical bench ... ... ... ... ... ... ... ... | | | £1 | 2 0 |
| No. 3901. | 1 metre Optical bench ... ... ... ... ... ... ... ... | | | 1 | 18 0 |
| No. 3902. | 1½ metre Optical bench ... ... ... ... ... ... ... ... | | | 5 | 0 0 |
| No. 3903. | 2 metre Optical bench ... ... ... ... ... ... ... ... | | | 6 | 0 0 |
| No. 3904. | Saddle stand with base 30mm. long, with stem 30mm. high ... ... ... | | | 0 | 11 0 |
| No. 3905. | Saddle stand with base 30mm. long, with stem 60mm. high ... ... ... | | | 0 | 12 0 |
| No. 3906. | Saddle stand with base 30mm. long, with stem 90mm. high ... ... ... | | | 0 | 14 0 |
| No. 3907. | Saddle stand with base 60mm. long, with stem 30mm. high ... ... ... | | | 0 | 13 0 |
| No. 3908. | Saddle stand with base 60mm. long, with stem 60mm. high ... ... ... | | | 0 | 14 0 |
| No. 3909. | Saddle stand with base 60mm. long, with stem 90mm. high ... ... ... | | | 0 | 16 0 |
| No. 3910. | Saddle stand with base 90mm. long, with stem 30mm. high ... ... ... | | | 0 | 18 0 |
| No. 3911. | Saddle stand with base 90mm. long, with stem 60mm. high ... ... ... | | | 0 | 19 0 |
| No. 3912. | Saddle stand with base 90mm. long, with stem 90mm. high ... ... ... | | | 1 | 0 0 |
| No. 3913. | Saddle pins, 170mm. long ... ... ... ... ... ... ... | | | 0 | 2 0 |
| No. 3914. | Table stand ... ... ... ... ... ... ... ... ... ... | | | 0 | 10 0 |
| No. 3915. | Wood blocks to steady bench for table use (9″ × 2″ × 2″) ... ... | | pair | 0 | 4 6 |
| No. 3916. | Table ... ... ... ... ... ... ... ... ... ... | | | 0 | 8 6 |
| No. 3917. | Stage plate with rotary movement ... ... ... ... ... ... | | | 1 | 0 0 |
| No. 3918. | Lens holder, sliding grip maximum 10cm. ... ... ... ... ... | | | 0 | 15 0 |
| No. 3919. | Lens holder, sliding grip maximum 5cm. ... ... ... ... ... | | | 0 | 12 6 |
| No. 3920. | Lens holder, spring grip maximum 5cm. ... ... ... ... ... | | | 1 | 0 0 |
| No. 3921. | Lens holder, spring grip maximum 7·5 cm. ... ... ... ... ... | | | 1 | 5 0 |
| No. 3922. | Lens holder with independent centring adjustment and cross traverse movement, maximum 7cm. ... ... ... ... ... ... ... | | | 2 | 12 6 |
| No. 3923. | Lens holder with independent centring adjustment and rotary vertical movement, maximum 7cm. ... ... ... ... ... ... ... | | | 3 | 0 0 |
| No. 3924. | Centring point ... ... ... ... ... ... ... ... ... | | | 0 | 2 6 |
| No. 3925. | Metal cross line diaphragm ... ... ... ... ... ... ... | | | 0 | 12 6 |
| No. 3926. | Rotary stops—$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{15}{16}$ ... ... ... ... ... ... | | | 1 | 0 0 |
| No. 3927. | Iris diaphragm, 4cm. approx. ... ... ... ... ... ... ... | | | 1 | 10 0 |
| No. 3928. | Water tank ... ... ... ... ... ... ... ... ... ... | | | 1 | 10 0 |
| No. 3929. | V support ... ... ... ... ... ... ... ... ... ... | | | 0 | 17 0 |
| No. 3930. | Microscope objective screwed flange ... ... ... ... ... ... | | | 0 | 12 6 |
| No. 3931. | Microscope objective screwed flange with screw adjustment for centring ... | | | 2 | 0 0 |
| No. 3932. | Glass screen holder ... ... ... ... ... ... ... ... | | | 0 | 15 0 |
| No. 3933. | Single optical slit ... ... ... ... ... ... ... ... ... | | | 2 | 5 0 |
| No. 3934. | Electric lamp holder ... ... ... ... ... ... ... ... | | | 0 | 12 6 |
| No. 3935. | Projection lamp in metal body (100 watt) ... ... ... ... ... | | | 2 | 0 0 |

# Microtomes.

## No. 3880 Automatic Rotary Microtome.



No. 3880.

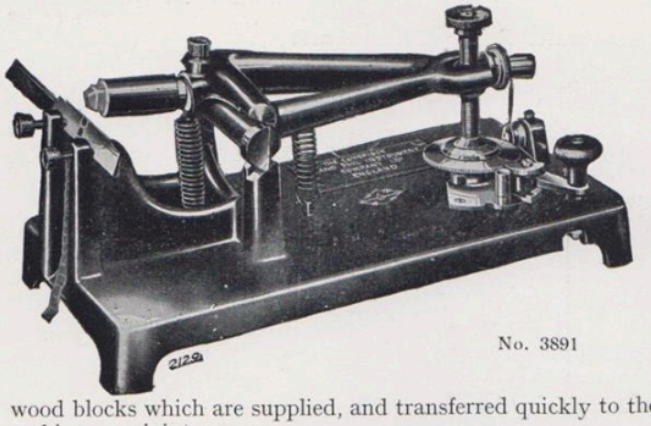
This instrument is of very rigid design; it can be very quickly set up to cut a perfectly uniform series of sections at the highest possible speed. The object holder consists of a clamp adapted to take a block 16mm. in height, while the width may be anything up to 25mm. This clamp has a universal adjustment for the angle of face around a point coincident with the surface of a block of material of the average thickness, so that there is no lateral displacement when orientating. The clamp is adapted to take standard wood blocks 19mm. × 19mm. × 12mm., but a roughened metal plate can be supplied 19mm. × 25mm. at a small cost. The knife holder is provided with an adjustment for position with respect to the block surface. It is fitted with screws permitting the angle of the knife to be precisely adjusted. The micrometer slide for the feed is extremely heavy and is carried in channels in the base of the instrument. The micrometer screw is direct acting and the feed, consisting of one lever and pawl only, is cam operated and enclosed. Section thickness is arranged in steps, 2·5$\mu$, 5$\mu$, 7·5$\mu$, 10$\mu$, 12·5$\mu$, and 15$\mu$. The adjustment is made by a knurled head on the front of the frame, and, if necessary, without stopping the machine. The finish of the frame of the instrument, knife holder, object holder, is of crystalline enamel, the other parts being nickel-plated.

| | | | | |
|---|---|---|---|---|
| No. 3880. | Automatic Rotary microtome ... ... ... ... ... ... ... | £17 | 10 | 0¶ |
| No. 3881. | Knife 12cm. blade ... ... ... ... ... ... ... ... | 1 | 12 | 6¶ |
| No. 3883. | Knife handle ... ... ... ... ... ... ... ... ... | 0 | 12 | 6¶ |
| No. 3884. | Wood blocks ... ... ... ... ... ... ... per dozen | 0 | 2 | 0¶ |

## No. 3891 Cambridge Rocking Microtome.

The Cambridge Rocking microtome is a model which is well known. It is of rigid construction, simple in use; the sections it gives are accurate and uniform, also long ribbons of sections can be obtained very speedily. The present model has been improved in design, the chief improvement consisting of the fitting of double knife edges on the rocking arms, ensuring a definite and correct alignment without friction or backlash. A simple device, which gives a clearance between the knife and the specimen on the backward or non-cutting stroke, has been added.

The scale of the instrument which indicates the thickness of the section is divided into 12 divisions, the value of each division being ·002mm., the total being ·024mm. It will cut uniform sections of any size required within these limits, and objects up to 12mm. × 20mm. in cross section can be dealt with.



No. 3891

Four types of object holders are made, all of which are interchangeable and can be quickly mounted on the microtome, being held in position by a single clamping screw. The simple object holder consists of a brass tube with a partition inside it about 1cm. from one end. This end is filled with paraffin wax, which projects about 1cm., permitting objects to be attached. The object holder for wood blocks consists of a brass tube with clamping screw and wood block, to which the object is fixed. A large variety of specimens can be kept on the wood blocks which are supplied, and transferred quickly to the microtome without the necessity of making wax joints.

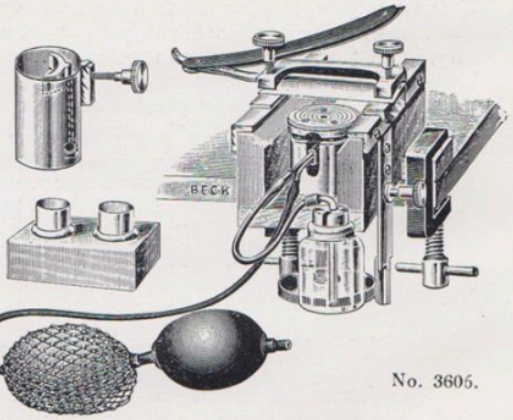
The simple pattern orientating object holder consists of a brass tube with a cup-shaped end. A brass hemisphere fits in this end and can be clamped in any position. The hemisphere is filled with paraffin wax on which the object is stuck.

The orientating object holder with adjustments is very similar to the simple pattern, except that screws are provided for adjusting the position of the object. There are two adjusting screws, one of which actuates the object about a horizontal axis, the other about a vertical axis.

| | | | | | | |
|---|---|---|---|---|---|---|
| No. 3890. | Cambridge Rocking microtome complete with simple object holder, simple orientating object holder and knife ... ... ... ... ... | £6 | 18 | 0¶ |
| No. 3891. | Orientating object holder with adjustments ... ... ... ... ... | 1 | 10 | 0¶ |
| No. 3892. | Orientating object holder, simple pattern ... ... ... ... ... | 0 | 7 | 0¶ |
| No. 3893. | Object holder for wood blocks ... ... ... ... ... ... ... | 0 | 15 | 0¶ |
| No. 3894. | Simple object holder ... ... ... ... ... ... ... ... | 0 | 2 | 6¶ |
| No. 3895. | Spare hard wood blocks, 22mm. square ... ... ... ... per dozen | 0 | 2 | 0¶ |
| No. 3896. | Spare hard wood blocks, 16mm. × 22mm. ... ... ... per dozen | 0 | 2 | 0¶ |
| No. 3897. | Knife, Sheffield make ... ... ... ... ... ... ... ... | 0 | 3 | 6¶ |

**Cathcart microtome.** This consists of a central fitting which carries either an ether freezing chamber or embedding cell which is raised by a fine screw. On either side of the fitting are two metal rails and the section is cut by sliding a frame containing razor along these rails. It is clamped to the table by two clamps.

| | | | | |
|---|---|---|---|---|
| No. 3605. | For embedding only ... | £2 | 15 | 6 |
| No. 3606. | For embedding and freezing ... ... | 3 | 15 | 6 |
| No. 3607. | Thickness register ... | 0 | 7 | 6 |



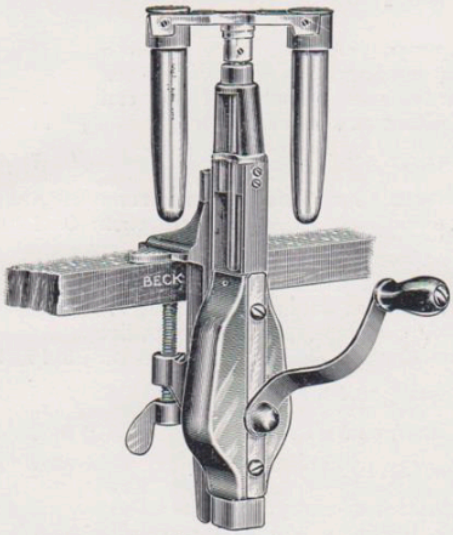

No. 3605.




No. 3602.

No. 3602. **Hand microtome**, constructed of solid brass 1½ in. diameter with well ⅜in. diameter. Though simple in design, being solidly made, considerable accuracy can be obtained. The raising screw has approximately 40 threads to the inch ... ... £0 15 6

No. 3432. **Razor**, flat one side, for use with above ... ... 0 2 9




No. 3610.

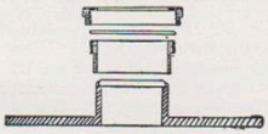
No. 3610. **Hand centrifuge,** with head carrying two buckets, two graduated tubes, clamp for fixing to table. This machine is strongly made, and can attain a speed of 2,500 r.p.m. ... ... £2 10 0

No. 3611. **As above,** but with four buckets and tubes ... ... ... 2 17 6

Extra tubes, graduated ... ... each 0 2 0

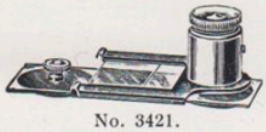
Extra tubes, plain ... ... per doz. 0 5 0

Quotations for motor-driven and water-power machines given on application.



No. 3420.

No. 3420. **Live box.** This consists of a 3 × 1 ebonite slip with a raised portion, the top of which contains a thick glass plate. Over this fits a cell with a thin cover glass so that the material being examined is held between the two glasses 0 8 6

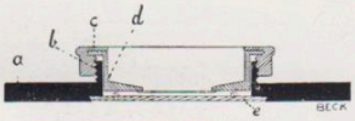


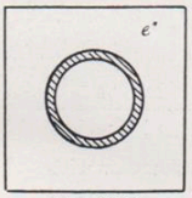
No. 3421.

No. 3421. **Beck compressor.** The Beck compressor is a 3×1 in. plate of glass at one end of which a circular pillar is fixed. This pillar carries an arm which holds a cover glass. The arm is raised or lowered by a screw at the top of the pillar, which mechanically varies the space for holding the specimen. The arm carrying the thin glass can be swung to one side for placing the specimen in position and then lowered to the required amount ... ... .. 1 1 0

No. 3320. **Rousellet's compressor.** This is somewhat similar to the Beck compressor but the 3 × 1 plate is brass with a circular glass plate in the centre, and the upper glass is cemented to the brass arm ... 1 1 0

No. 3321. **Rousellet's live box.** In this live box the thick glass plate is level with the stage and is therefore suitable for use with substage apparatus ... ... 0 17 6




No. 3319

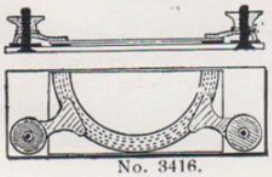
No. 3319. **Akehurst's compressorium.**

This compressor is suitable for the examination with low and moderate powers of zoological and aquatic specimens and also with high powers for the smallest specimens, such as bacteria.

It consists of a brass plate (a) which has a raised screw ring (b), upon which a cap (c) screws up and down. By this means a cell (d) is raised and lowered as it is prevented from turning in the plate (a), while the cap (c) revolves. A cover glass is cemented to the lower surface of the cell (d).

In the lower surface of the plate (a) a dove-tailed groove is cut so that a plain glass plate or glass plates with cells or cavities (e) can be inserted. The brass plate (a) is cut away at the front to allow of a glass plate with a cell or other projection being slid in. Eight glass plates are supplied with each compressor. Four are ½ m/m. thick, four are 1 m/m. thick. One of each is plain. One has a circular glass cell about 1 m/m. thick. Two have square glass cells about ¼ m/m. thick and three have thin rings of cement forming very shallow cells.

This compressor has several advantages. The movement of the cover glass is such that it is always parallel with the glass underplate (e). The underplate (e) being flush with the lower surface of the brass plate (a) renders this compressor particularly suitable for examination with condensers and high power dark ground illuminators. The ease of changing the plain glass underplate for one with any described form of cell, renders it more adaptable than ordinary compressors and it forms a good live trap for entomological objects. All parts can be readily cleaned. In case with 8 glass underplates ... ... ... ... ... ... ... ... £2 7 6

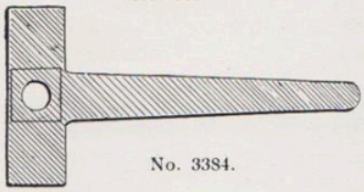


No. 3416.

No. 3416. **Beck glass trough,** consisting of a 3×1 glass slide which has two screwed studs and rivets ; by means of these thick or thin cover-plates are held on to the 3×1 slide with a separating band formed by cutting an ordinary rubber band in half. Various thicknesses of separating bands may be used .. .. £0 9 0



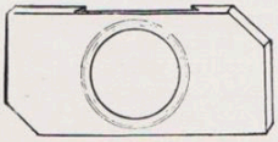
No. 3422.



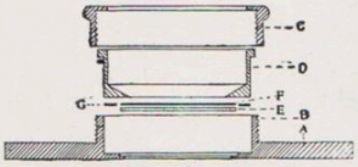
No. 3384.




No. 3413.



No. 3397




No. 3326

No. 3422. **Stage forceps.** A 3×1 plate carries a metal fitting holding a short revolving rod with a pair of spring forceps at one end and a tube with cork at the other .. .. £0 14 0

No. 3384. **Simple warm stage** .. .. .. 0 7 6

No. 3479. **S.I.R.A. wax**. For holding specimens on slides .. .. .. .. per stick 0 1 6

No. 3425. Case of apparatus for holding objects, including 3 slides, 2 slides with hollow, slide with ledge, trough on 3×1 slide, Beck's glass trough, Beck's compressor, stage forceps, live box and thin glass .. .. .. .. 3 15 0

No. 3412. **Trough,** small, on 3×1 slide .. .. 0 1 0

No. 3413. **Trough,** large, on 3×1 slide .. .. 0 2 0

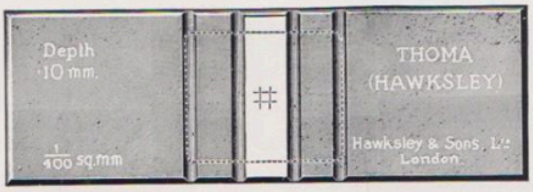
No. 3414. **Trough,** on 3×1½ slide .. .. .. 0 2 6

No. 3397. **Metal holder for carrying glass slides** ½ m/m. thick, 1·35 in. × 1·35 in., for use with high power dark ground illuminators .. 0 6 6

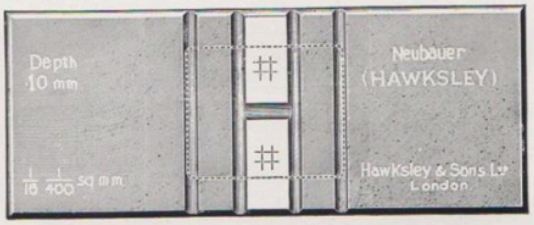
The holder is a metal plate of a suitable size to go into the plain or mechanical stages, which has a bevelled aperture in the centre and at the back has a dovetailed recess into which the thin glass plate slides and is fixed by a minute piece of wax at each side. The object to be examined is placed in the centre and covered with a cover glass in the usual manner.

No. 3398. **Glass slides,** 1.35 in. × 1.35 in., approx. ½ m/m thick .. .. .. per doz. £0 5 0

No. 3326 **Barnard compressor** for use with high power illuminators. This compressor holds the cover glass and a circular slip either ½ m/m or 1 m/m firmly in contact .. .. .. 1 17 6




No. 3325a.




No. 3325c.

No. 3325a **Haemacytometer,** consisting of open or closed cell, counting chamber with Thoma ruling, two pipettes and covers in case .. .. .. .. £2 2 0¶

No. 3325c. **Haemacytometer**, complete, but with double cell Bürker counting chamber in case .. .. .. .. .. .. .. .. .. .. 2 12 6¶

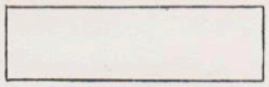
The above may be supplied with any of the following rulings :—Thoma, Türck, Neubauer, improved Neubauer, Fuchs-Rosenthal, Gower, Zappert and Breuer.

No. 3325s. **Haemacytometer,** chess-board pattern squared glass plate to drop into eyepiece, 25 squares of 1 m/m., 9 squares of 2 m/m., or squares over entire field either ¼ m/m., ½ m/m., 1 m/m., or 2 m/m. .. .. .. each 0 12 6

No. 3322. **Counting chamber** for use with chessboard .. .. .. .. .. 0 5 0

No. 3323. **Pipette** for red corpuscles .. .. .. .. .. .. .. 0 5 6

No. 3324. **Pipette** for white corpuscles .. .. .. .. .. .. .. 0 5 6



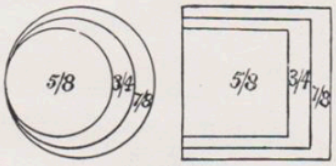
No. 3828.



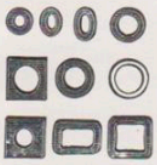
No. 3405.



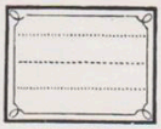
No. 3406.




No. 3390/5



No. 3410.



No. 525.

No. 3399. **Glass slides,** 3×1, ½ m/m thick, for dark ground illumination ... ... ... ... ... £0 3 0
No. 3828. **Glass slides,** 3×1, extra thin, white per gross 0 5 6
No. 3830. **Ditto,** extra thin, half white ... per gross 0 4 6
No. 3831. **Ditto,** thin, half white ... ... per gross 0 3 9
No. 3832. **Ditto,** ordinary, half white ... per gross 0 3 0
No. 3829. **Glass slides,** 3×1½, extra thin, white per gross 0 8 6
No. 3833. **Ditto,** 3×1½, extra thin, half white per gross 0 6 0
No. 3834. **Ditto,** thin, half white ... ... per gross 0 5 0
No. 3835. **Ditto,** ordinary, half white ... per gross 0 4 6
No. 3405. **Glass slides,** 3×1, ground edges and excavated hollow ... ... ... ... ... each 0 0 2
per doz. 0 1 6
No. 3390. **Cover glasses,** No. 1, average thickness ·006, circular ... ... ... ... per oz. 0 6 0
No. 3391. **Ditto,** square or rectangular ... per oz. 0 3 9
No. 3392. **Cover glasses,** No. 2, average thickness ·008, circular ... ... ... ... per oz. 0 4 6
No. 3393. **Ditto,** square or rectangular ... per oz. 0 3 9
No. 3394. **Cover glasses,** No. 3, average thickness ·01, circular ... ... ... ... per oz. 0 3 6
No. 3395. **Ditto,** square or rectangular ... per oz. 0 3 0

**Cover glass** is stocked in ¼ oz. or ½ oz. boxes and in ⅝ in., ¾ in., ⅞ in. squares and circles, or 1 in. × ⅞ in., 2 in. × ⅞ in., 2¼ in. × ⅞ in., 2½ in. × ⅞ in. rectangles.

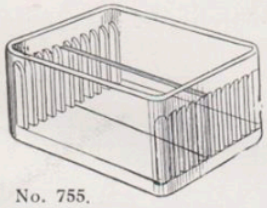
No. 3406. **Glass slide** with ledge ... ... ... ... 0 1 0
No. 3409. **Cells, metal, circular** ... ... per 100 0 6 0
No. 3410. **Cells, glass** ... ... ... per doz. 0 5 0
No. 525. **Labels** for naming objects ... per 100 0 0 6
No. 3388. **Micrometer screw gauge,** for measuring thickness of cover glass, slides, etc. ... ... 0 12 6



No. 3386.

No. 3386. **Turntable** ... ... ... ... 1 1 0

This is constructed on ball bearing principle giving a perfectly even motion.



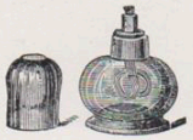
No. 755.



No. 774.

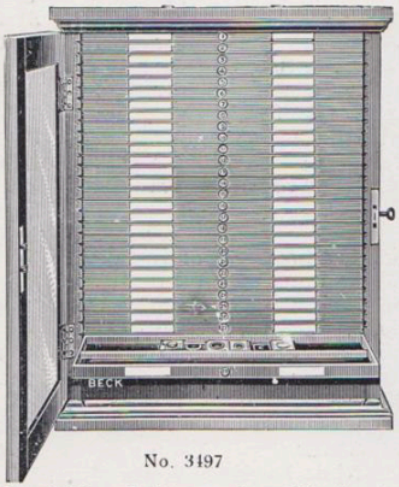


No. 624.



No. 508.

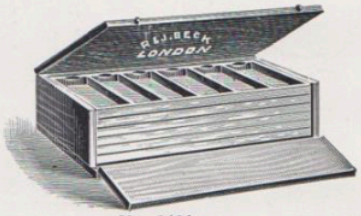
No. 755. **Glass staining dish** with cover, with racks to carry 10 3×1 slides ... ... £0 2 3
No. 774. **Drop bottles,** with combined stopper and pipette ... ... ... 1 oz. 0 1 0
2 oz. 0 1 6
No. 624. **Capped balsam bottle,** with ground in cap and dipping rod ... 1 oz. 0 1 6
2 oz. 0 2 0
No. 508. **Spirit lamp** ... ... ... ... ... ... ... ... 1 oz. 0 2 0
No. 612. **Watch glasses,** flat bottom ... ... ... 50 m/m dia. per doz. 0 2 6
75 m/m dia. per doz. 0 3 6
No. 744. **Bell jar** with knob, for covering microscopes 16 in. high, 9 in. dia. ... ... 0 11 6
No. 760. **Cedar oil bottle,** in glass, with rod and ground on cap ... ... ... 0 2 0




No. 3497

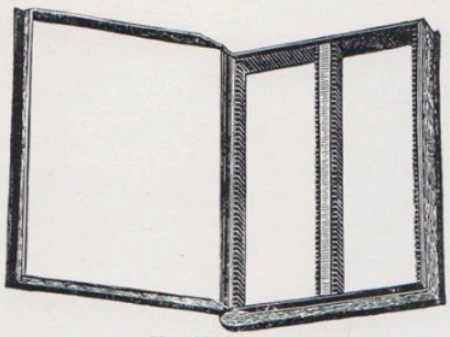
| | | |
|---|---|---|
| No. 3497. | Mahogany cabinet to hold 1000 specimens .. .. .. | £15 10 0 |
| No. 3498. | Mahogany cabinet to hold 750 specimens .. .. .. | 10 10 0 |
| No. 3499. | Mahogany cabinet to hold 500 specimens .. .. .. | 7 10 0 |

These cabinets are well made in mahogany, great care being exercised in the fitting of the drawers, so that they will slide easily. Each drawer is numbered and is provided with a tablet for indicating the type of specimen. The cabinets can be supplied either with glass door, as illustrated, or roll-up shutter.




No. 3491.

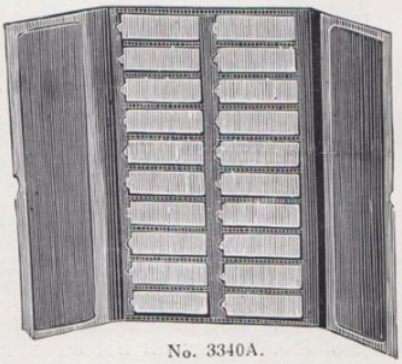
| | | |
|---|---|---|
| No. 3490. | **Cabinet** of polished pine, to hold 3 doz. .. .. .. .. | £0 5 6 |
| No. 3491. | To hold 6 doz. .. .. .. | 0 7 0 |
| No. 3492. | To hold 12 doz. .. .. .. | 0 11 0 |



No. 681A.

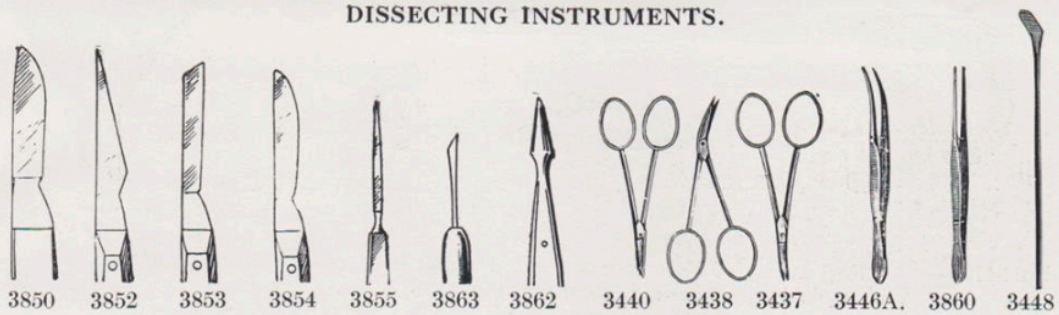
| | | |
|---|---|---|
| No. 681A | **Cloth-covered boxes,** with racks, book-form, to hold 100 | £0 6 6 |
| No. 682A. | **Cloth-covered boxes**, with racks, box-form to hold 100 | 0 4 0 |
| No. 682B. | Ditto, to hold 50 .. .. | 0 3 0 |
| No. 3494. | **Cardboard boxes,** box-form, covered with 6 trays each holding 9 slides .. .. | 0 2 6 |
| No. 3495. | As No. 3494 but with 12 trays | 0 4 6 |

| | | |
|---|---|---|
| No. 3496. | **Cardboard trays,** with folding flaps to hold 20 slides .. .. .. | £0 1 0 |
| No. 3496A. | As No. 3496 but with two fasteners hold flaps .. .. .. .. | 0 1 3 |



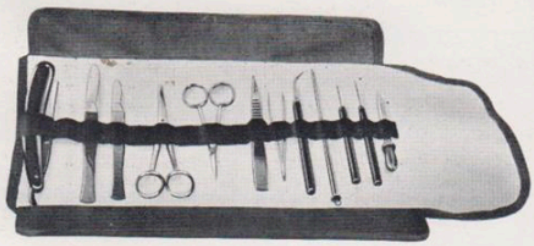
No. 3340A.

## DISSECTING INSTRUMENTS.



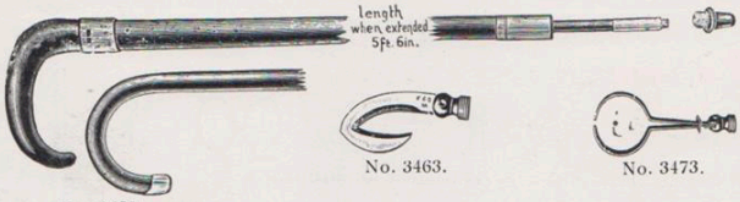
3850 3852 3853 3854 3855 3863 3862 3440 3438 3437 3446A. 3860 3448

| | | | | | |
|---|---|---|---|---|---|
| No. 3850. | Scalpels, all metal handles, sizes of blades $1\frac{1}{4}''$, $1\frac{3}{8}''$, $1\frac{1}{2}''$, $1\frac{5}{8}''$, $1\frac{7}{8}''$ and $2''$ | each | £0 | 2 | 0 |
| No. 3851. | Scalpel, as No. 3850, size of blades $1''$ ... ... ... ... ... | „ | 0 | 2 | 6 |
| No. 3852. | Scalpel, ebony handle, size of blade $1\frac{1}{4}''$ ... ... ... ... | „ | 0 | 1 | 9 |
| No. 3853. | Scalpel, ebony handle, size of blade $1\frac{1}{4}''$ ... ... ... ... | „ | 0 | 1 | 9 |
| No. 3854. | Scalpel, ebony handle, size of blade, $1\frac{1}{4}''$ ... ... ... ... | „ | 0 | 1 | 9 |
| No. 3855. | Greafe's knife, for very fine dissection ... ... ... ... | „ | 0 | 5 | 0 |
| No. 3856. | Scissors, straight, $5\frac{1}{2}''$ ... ... ... ... ... ... ... | „ | 0 | 2 | 6 |
| No. 3857. | Scissors, straight, $5''$ ... ... ... ... ... ... ... | „ | 0 | 2 | 0 |
| No. 3440. | Scissors, straight, $4\frac{1}{2}''$ ... ... ... ... ... ... ... | „ | 0 | 1 | 9 |
| No. 3439. | Scissors, straight, $4''$, very fine points ... ... ... ... ... | „ | 0 | 2 | 6 |
| No. 3437. | Scissors, curved, $4''$, very fine points ... ... ... ... ... | „ | 0 | 2 | 6 |
| No. 3438. | Scissors, elbow ... ... ... ... ... ... ... | „ | 0 | 5 | 6 |
| No. 3445. | Forceps, straight, $6''$, blunt points ... ... ... ... ... | „ | 0 | 1 | 9 |
| No. 3858. | Forceps, straight, $5''$, blunt points ... ... ... ... ... | „ | 0 | 1 | 6 |
| No. 3859. | Forceps, straight, $5''$, fine points and steady pin ... ... ... | „ | 0 | 2 | 0 |
| No. 3444. | Forceps, straight, $4\frac{1}{2}''$, fine points ... ... ... ... ... | „ | 0 | 1 | 9 |
| No. 3860. | Forceps, straight, $4''$, fine points and steady pin ... ... ... | „ | 0 | 2 | 0 |
| No. 3861. | Forceps, straight, $4\frac{1}{4}''$, spear-headed with steady pin ... ... | „ | 0 | 1 | 9 |
| No. 3446A. | Forceps, curved, $4''$, fine points and steady pin ... ... ... | „ | 0 | 2 | 0 |
| No. 3447. | Forceps, Cornett's cover glass ... ... ... ... ... ... | „ | 0 | 2 | 3 |
| No. 3434. | Needles, straight, in rosewood handles with ferrule ... ... ... | „ | 0 | 0 | 4 |
| No. 3862. | Needles, triangular, in plain wooden handles ... ... ... ... | „ | 0 | 0 | 4 |
| No. 3863. | Needles, with one cutting edge ... ... ... ... ... ... | „ | 0 | 0 | 8 |
| No. 3864. | Needles, spear-headed, as No. 3861 Forceps ... ... ... ... | „ | 0 | 0 | 7 |
| No. 3436. | Needles, platinum, in glass handles ... ... .. ... ... | „ | 0 | 2 | 6 |
| No. 3443. | Chain hooks ... ... ... ... ... ... ... | per set | 0 | 3 | 0 |
| No. 3865. | Bone-cutting forceps, $5\frac{1}{2}''$ ... ... ... ... ... ... | each | 0 | 7 | 0 |
| No. 3431. | Blow-pipe with stilette ... ... ... ... ... ... ... | „ | 0 | 1 | 0 |
| No. 3432. | Razor, hollow-ground one side, flat other side ... ... ... | „ | 0 | 2 | 9 |
| No. 3448. | Section lifter, in copper or aluminium ... ... ... ... ... | „ | 0 | 0 | 6 |
| No. 3442. | Seeker, in rosewood handle ... ... ... ... ... ... | „ | 0 | 0 | 6 |
| No. 3427. | Metal holder for platinum wire needles, etc. .. ... ... ... | „ | 0 | 1 | 9 |
| No. 3450. | Metallic hone, for sharpening razors, scalpels, etc. ... ... ... | „ | 0 | 2 | 6 |
| No. 3429. | Glass pipette, straight ... ... ... ... ... ... | „ | 0 | 0 | 2 |
| No. 3430. | Glass pipette, straight, with teat ... ... ... ... ... | „ | 0 | 0 | 4 |
| No. 3451. | Case of dissecting instruments, consisting of three pairs of scissors, two scalpels, razor, two pairs of forceps, seeker, section lifter, blow-pipe, two needles, pipette with teat, magnifier, in walnut case ... ... | | 1 | 7 | 6 |



No. 3428

No. 3428. Roll-up canvas kit, containing two pairs of scissors, two scalpels, razor, two pairs of forceps, seeker, two needles, blow-pipe, pipette with teat £0 15 6




No. 3459.

No. 3463.

No. 3473.



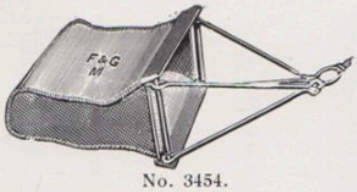
No. 3460.

| | | | | | |
|---|---|---|---|---|---|
| No. 3470. | **Collecting stick,** of Malacca cane with buffalo horn crook, silver mount. With inner lengthening rod, total extension 5′ 6″ | | £0 | 19 | 6 |
| No. 3459. | **Collecting stick,** of polished cane, crook handle. With inner lengthening rod, total extension 5′ 6″ | | 0 | 14 | 6 |
| No. 3460. | **Round net frame,** 5″ diameter, with bolting silk net and tube | | 0 | 5 | 0 |
| No. 3461. | **Ditto,** 6″ diameter | | 0 | 6 | 6 |
| No. 3462. | **Flanged tubes,** for collecting nets | | 0 | 0 | 6 |
| No. 3463. | **Cutting hook** | | 0 | 3 | 9 |
| No. 3472. | **Clip,** for holding bottles, etc. | | 0 | 2 | 9 |
| No. 3473. | **Bottle,** for using with clip | each, 6d. ; doz. | 0 | 5 | 0 |
| No. 3464. | **Collecting bottles,** 6″×1″ | per doz. | 0 | 3 | 6 |
| No. 3465. | ,, ,, 4″×1″ | ,, | 0 | 3 | 0 |
| No. 3466. | ,, ,, 3″×1″ | ,, | 0 | 2 | 9 |
| No. 3467. | ,, ,, 3″×¾″ | ,, | 0 | 2 | 0 |
| No. 3468. | ,, ,, 2″×⅝″ | ,, | 0 | 1 | 6 |
| No. 3469. | ,, ,, 1⅜″×½″ | ,, | 0 | 1 | 0 |



No. 3452.

| | | | | | |
|---|---|---|---|---|---|
| No. 3452. | **Tow net,** for collecting marine specimens, 11″ diameter, with fine muslin bag and bottle attached with 24 yds. of stout cord on wood frame | | 0 | 15 | 0¶ |
| No. 3453. | **Ditto,** made of bolting silk | | 1 | 15 | 0¶ |
| No. 3454. | **Dredge,** for bottom sea collecting, with canvas and net bag, 12″ | | 1 | 1 | 0¶ |
| No. 3456. | **Ditto,** 18″ | | 1 | 7 | 6¶ |



No. 3454.

## STAINS. ¶

| | | | | | |
|---|---|---|---|---|---|
| Bismarck brown (aqueous) | per 25 cc. | 1/6 | Leishman's stain (Wright's modification) | per 25 cc. | 3/0 |
| Carbol fuchsin (Zeihl Neelsen's stain) | ,, 50 ,, | 1/9 | Methyl green | ,, 25 ,, | 1/0 |
| Congo red | ,, 25 ,, | 1/3 | Methylene blue (aqueous) | ,, 25 ,, | 1/0 |
| Ehrich's triple stain | ,, 25 ,, | 1/0 | ,, ,, Loffler's | ,, 25 ,, | 1/0 |
| Eosin 2% solution (alcoholic) | ,, 25 ,, | 2/0 | Methyl violet | ,, 25 ,, | 1/0 |
| ,, ,, (aqueous) | ,, 50 ,, | 1/9 | Neisser's stain A | ,, 25 ,, | 1/3 |
| Fuchsin (aqueous) | ,, 25 ,, | 1/6 | ,, ,, B | ,, 25 ,, | 1/3 |
| ,, (aniline water) | ,, 25 ,, | 1/6 | Neutral red | ,, 25 ,, | 1/0 |
| ,, (saturated alcoholic) | ,, 25 ,, | 3/0 | Picric acid (aqueous) | ,, 100 ,, | 1/0 |
| Gentian violet (aqueous) | ,, 25 ,, | 1/6 | ,, ,, in 70% alcohol | ,, 25 ,, | 1/6 |
| ,, ,, (aniline water) | ,, 25 ,, | 1/9 | Picro-carmine ammonia | ,, 25 ,, | 1/0 |
| Gibbe's double stain | ,, 25 ,, | 2/6 | Rubin and orange | ,, 25 ,, | 1/6 |
| Gram's iodine | ,, 100 ,, | 1/0 | Scarlet red (alcoholic) | ,, 25 ,, | 2/0 |
| Grenacher's borax carmine | ,, 50 ,, | 1/9 | Safranin | ,, 50 ,, | 2/0 |
| Hæmatoxylin, Delafield's | ,, 25 ,, | 1/0 | Schulze's solution | ,, 25 ,, | 1/3 |
| ,, Ehrlich's | ,, 25 ,, | 1/6 | Toison's ,, | ,, 50 ,, | 1/6 |
| Jenner's stain | ,, 25 ,, | 3/0 | | | |

## MOUNTING MATERIALS, ETC. ¶

| | | | | | |
|---|---|---|---|---|---|
| Asphalt varnish | per 25 g. | 0/10 | Gold size | per 25 g. | 0/10 |
| Canada balsam (filtered) | ,, 25 ,, | 1/9 | Hollis glue | ,, 52 ,, | 1/0 |
| ,, ,, (dried) | ,, 25 ,, | 2/0 | Marine glue | ,, 25 ,, | 1/3 |
| ,, ,, (in benzol) | ,, 25 ,, | 1/9 | Zinc cement | ,, 25 ,, | 1/3 |
| ,, ,, (in xylol) | ,, 25 ,, | 1/9 | Oil of cedar wood | ,, 25 cc. | 1/6 |
| Dammar varnish | ,, 25 ,, | 1/3 | ,, ,, cloves | ,, 25 ,, | 1/9 |
| Deane's medium | ,, 25 ,, | 1/6 | Osmic acid 1% | ,, 25 ,, | 12/6 |
| Glycerine jelly | ,, 25 ,, | 0/10 | Sira immersion oil | ,, bottle | 2/6 |
| | | | Xylol | ,, 100 cc. | 1/6 |

Prices include bottles and are subject to market fluctuations. Other stains supplied to order.

# Beck Magnifiers and Reading Glasses

### Folding pocket magnifiers.

Made with single, double or triple lenses in vulcanite mountings.

They are light in weight, durable and of good appearance.



No. 3161.

| | | £ | s. | d. |
|---|---|---|---|---|
| No. 3161. | Three lens combination in vulcanite, with $\frac{7}{8}$ in., $\frac{3}{4}$ in., and $\frac{5}{8}$ in. diameter lenses ... | 0 | 2 | 6 |
| No. 3163. | Three lens combination in vulcanite, with 1 in., $\frac{7}{8}$ in., and $\frac{3}{4}$ in. diameter lenses ... | 0 | 3 | 6 |
| No. 3165. | Two lens combination in vulcanite, with $\frac{7}{8}$ in., and $\frac{3}{4}$ in. diameter lenses ... ... | 0 | 2 | 0 |
| No. 3166. | Ditto, with 1 in. and $\frac{7}{8}$ in. diameter lenses ... | 0 | 2 | 3 |
| No. 3167. | Single lens magnifier, box frame in vulcanite, $\frac{7}{8}$ in. diameter ... ... ... ... | 0 | 1 | 0 |
| No. 3168. | Ditto, 1 in. diameter ... ... ... ... | 0 | 1 | 3 |
| No. 3169. | Ditto, $1\frac{1}{4}$ in. diameter ... ... ... ... | 0 | 1 | 9 |
| No. 3170. | Ditto, $1\frac{1}{2}$ in. diameter ... ... ... ... | 0 | 2 | 6 |




No. 3167.

### Achromatic pocket magnifiers.

The optical properties of this series of magnifiers are of the highest order, giving a large, flat field of view free from distortion and colour. They are mounted in strongly made nickel-plated mounts and are supplied in chamois leather cases.



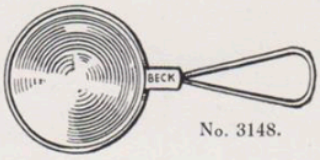

No. 3174.

| Cat. No. | Dia. of lenses. | Magnification. | Working distance. | Dia. of field of view. | £ | s. | d. |
|---|---|---|---|---|---|---|---|
| 3171 | 1″ | ×5 | 1·4″ | 1·3″ | 1 | 2 | 0 |
| 3172 | ·625″ | ×12 | ·5″ | ·6″ | 1 | 2 | 0 |
| 3173 | ·325″ | ×20 | ·375″ | ·3″ | 1 | 5 | 0 |
| 3174 Double Magnifier | ·625″ & ·325″ | ×10 & ×20 | ·8″ & ·375″ | ·7″ & ·3″ | 1 | 18 | 6 |

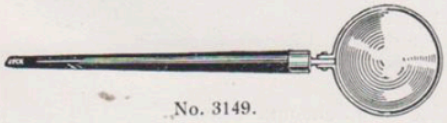
### Single lens magnifiers.

A magnifier suited for all general purposes, having a power of 12 and diameter of ·75 in. It is mounted in nickel plated frame and each magnifier is supplied in chamois leather bag.

No. 3148 ... ... ... ... ... ... ... 6s. 6d.




No. 3148.



No. 3149.

An extremely useful magnifier for the reading of scales or examining objects situated in places where the hands cannot be readily introduced. The length of the handle is $3\frac{1}{2}$ in., diameter of lens 1·1 in., magnification 4·5. The hinged joint allows the lens to be placed approximately parallel to the scale or object being examined. thus an undistorted reading or view is obtained. No. 3149 ... ... ... ... 7s. 6d.




No. 3145.

### Luvex illuminating magnifier.

The Luvex magnifier consists of a lens surrounded by a mirror which concentrates a reflected light on the object under examination. It is therefore, admirably suited for the examination of cavities and objects having irregular surfaces.

No. 3145. ×5 ... ... ... ... ... ... £0 8 6
No. 3146. ×10 ... ... ... ... ... ... 0 5 6

The above are mounted in vulcanite mounts.

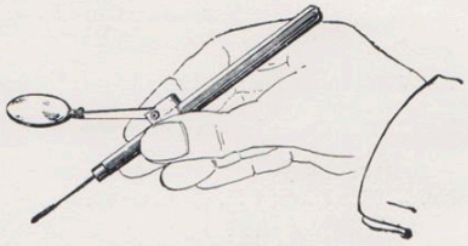
No. 3145A. ×5 ... ... ... ... ... ... £0 15 6

Mounted in nickel-plated mount.

### Focostat magnifier.

This lens fits the handle of a dissecting instrument, mapping pen, pencil, or needle, and magnifies the point of the instrument together with the object being dissected or the drawing being made.

No. 3378. Focostat lens complete with dissecting needle... ... £0 10 6
No. 3378A. Ditto with mapping pen... 0 10 6
No. 3378B. Ditto with two scalpels ... 0 16 6



No. 3378.

### Workshop magnifier.

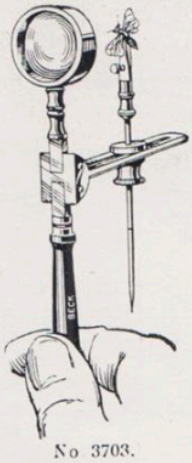
This magnifier is made in two powers, ×5 and ×10, and is mounted into a substantial fitting with foot, as illustrated. The field of view given is flat and free from distortion and colour.

| Cat. No. | Magnification. | Dia. of field of view. | £ s. d. |
|---|---|---|---|
| 3700 | ×5 | 1·4″ | 1 1 0 |
| 3700A | ×10 | 1″ | 1 10 0 |



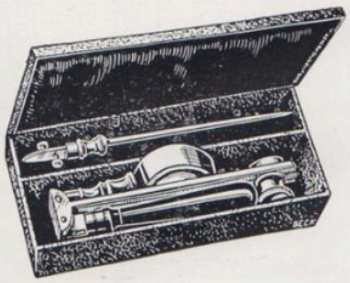
No. 3700

### Entomological magnifier.

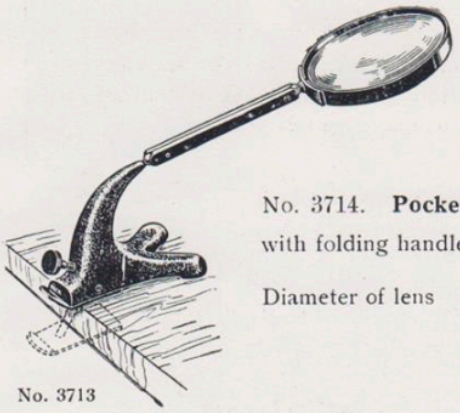


No. 3703.

This consists of a magnifier (×12) which together with a handle, by which the instrument is held, is hinged upon a slotted bar. In this slot is placed a fitting having at one end a forceps for holding an object and at the other end a spike upon which suitable objects can be impaled. A cork upon which entomological objects are pinned can be mounted on this spike. The forceps slides along the bar for focussing and can also be raised or lowered, and rotated. The whole appliance folds into a case $3\frac{1}{2}'' \times 2\frac{1}{4}'' \times \frac{7}{8}''$ in the achromatic type and $3\frac{1}{2}'' \times 1\frac{3}{4}'' \times \frac{7}{8}''$ in the single type.



No. 3702. Entomological magnifier with achromatic lens ... £1 15 0
No. 3703. ,, ,, single lens ... ... 1 5 0



No. 3713

No. 3713. **Reading glass** on stand.

| Diameter of lens | $3\frac{3}{4}$ in. | 4 in. |
|---|---|---|
| | £2 5 0 | £2 8 9 |

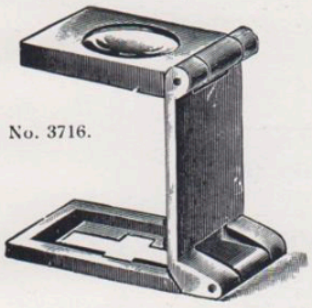
No. 3714. **Pocket reading glass,** with folding handle, in nickel mount.

Diameter of lens 2 in.

5s. 9d.



No. 3714



No. 3716.

No. 3716. **Linen provers.**

| | | s. | d. | | s. | d. |
|---|---|---|---|---|---|---|
| 1 in. × $\frac{1}{2}$ in. × $\frac{1}{4}$ in. | Brass mount | 10 | 0 | Nickel mount | 11 | 6 |
| 1 in. × $\frac{1}{2}$ in. × $\frac{1}{4}$ in. × $\frac{37}{200}$ in. | ,, | 10 | 6 | ,, | 11 | 9 |
| $\frac{1}{2}$ in. × $\frac{1}{4}$ in. × $\frac{37}{200}$ in. | ,, | 9 | 6 | ,, | 10 | 3 |
| 1 in. × 1 in. | ,, | 14 | 6 | ,, | 16 | 0 |

No. 3718. **Oculists' magnifier,** in vulcanite mount.

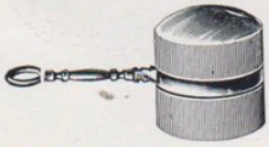
2 in. diameter, 4s. 6d. $2\frac{1}{2}$ in. diameter, 6s. 0d.



No. 3718

No. 3719. **Reducing glass,** in solid aluminium mounts (as No. 3709), round lens.

| Diameter of lens | $2\frac{1}{2}$ in. | 3 in. | $3\frac{1}{4}$ in. |
|---|---|---|---|
| | £1 7 0 | £1 10 0 | £1 13 0 |



No. 3720

No. 3720. **Stamp magnifier.**

Diameter of lens, 30 m/m. ... ... 9s. 6d.



No. 4564.

**Watchmakers' eyeglass.**

| | s. | d. |
|---|---|---|
| No. 4564 in vulcanite mount ... ... | 1 | 6 |
| No. 4564A in aluminium mount ... | 2 | 0 |

**Engravers' glass.**

| | | |
|---|---|---|
| No. 3705. In vulcanite mount, lens 1½ in. dia. | 6 | 0 |
| No. 3706. ,, ,, ,, 2 ,, | 8 | 6 |



No. 3705.

**Reading glasses.**

No. 3707 in aluminium rim with black handle.

| Diameter of lens ... | 2½ in. | 3 in. | 3½ in. | 4 in. |
|---|---|---|---|---|
| | 2/9 | 3/6 | 4/9 | 5/9 |

No. 3708 in nickel rim with ebonised handle, best quality.

| Diameter of lens | 1⅝ in. | 2⅜ in. | 2⅞ in. | 3½ in. | 4 in. |
|---|---|---|---|---|---|
| | 3/9 | 5/- | 6/6 | 8/- | 11/- |

No. 3709 in solid aluminium mounts with loop-shaped handle.

| Diameter of lens | 2½ in. | 3 in. | 3½ in. | 4 in. | 4½ in. |
|---|---|---|---|---|---|
| | 8/6 | 9/6 | 12/- | 14/6 | 17/6 |

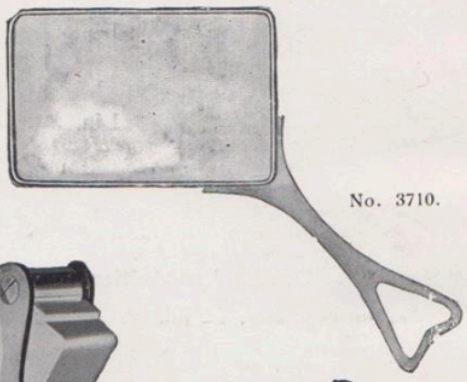
No. 3710 in solid aluminium mounts with loop-shaped handle or corner handles and with bi-cylindrical lenses.

| Size of lens | 3 in. × 2 in. | 3½ in. × 2¼ in. | 4 in. × 2½ in. |
|---|---|---|---|
| | 16/- | 18/- | £1 4 0 |



No. 3709.

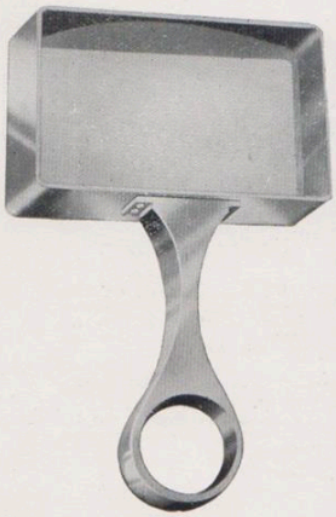
The glasses can also be supplied with imitation tortoiseshell and mother-of-pearl handles. Prices on application.



No. 3710.

No. 3711. With folding handle, solid aluminium mounts, spherical lenses.

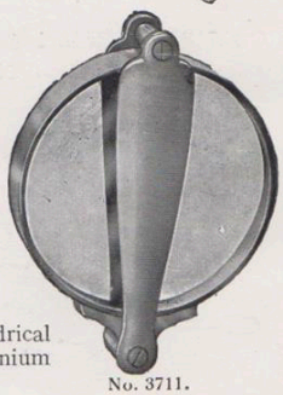
| Diameter of lens ... | 2½ in. | 3 in. | 3½ in. |
|---|---|---|---|
| | 11/- | 12/6 | 15/- |



No. 710.



No. 3712.



No. 3711.

No. 3712. Rectangular shape, bicylindrical lenses, folding handle, solid aluminium mount.

| Size of lens | 3″ × 2″ | 3½″ × 2¼″ | 4″ × 2½″ |
|---|---|---|---|
| | 18/6 | £1 3 0 | £1 8 0 |

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**Chapter IX.—Polarized Light as applied to the Microscope.**
Explanation of Plane, Circular, and Eliptical Polarisation. Application to Petrological Microscope. Special Appliances for Petrology.

# INDEX.


Abbe condensers ... ... ... 69
Achromatic condensers ... ... 69
Achromatic object glasses 65, 66
Akehurst compressorium ... 85
Apertometer ... ... ... 68
Apochromatic object glasses 65, 66
Apparatus for collecting ... ... 80
Arc lamp ... ... ... ... 77
Arms, dissecting ... ... ... 55

Baby London microscope, No. 2580 ... ... 42, 43
Barnard compressor ... ... 86
Bell jars ... ... ... ... 87
Benches, optical ... ... ... 82
Binocular high-power microscopes 44–47
Binomax magnifier ... 48–51
Books ... ... ... ... 95
Bottles, balsam ... ... ... 87
„ cedar wood ... ... 87
„ collecting ... ... 90
„ dropping ... ... ... 87
Cabinets ... ... ... ... 88
Camera lucidas ... ... ... 81
Cameras, photomicrographic 77–79
Cathcart microtome ... ... 84
Cedar oil bottles ... ... ... 87
Cedar wood oil ... ... ... 90
Cells for mounting ... ... 87
Centrifuge ... ... ... ... 85
Changer, objective ... ... 73
Cobweb eyepiece micrometer ... 67
Collecting apparatus ... ... 90
Colour screens ... ... 77–79
„ trough ... ... ... 71
Compensating eyepieces ... ... 67
Compressors ... ... 85–86
Condensers, bull's-eye ... ... 72
„ substage, Abbe ... 69
„ „ achromatic 69
Cornex dissecting microscope ... 55
Counting chamber... ... ... 86
Cover glass ... ... ... 87
Crescent dissecting microscope ... 54

Dark ground illuminators 69–70
Dark well ... ... ... ... 71
Demonstration eyepiece ... ... 67
Diaphragm, pinhole ... ... 70
Didymium screen ... ... ... 77
Dishes, staining ... ... ... 87
Dissecting arms ... ... ... 55
„ instruments ... ... 89
„ microscope, Binomax 48–51
„ „ Cornex ... 55
„ „ Crescent ... 54
„ „ Greenough 52, 53
„ „ Platen ... 56
Double nosepiece ... ... ... 73
Drawing apparatus ... 80, 81
„ table ... ... ... 81
Drop bottles ... ... ... 87

Ehrlich eyepiece ... ... ... 68
Electric lamps ... ... 74–76
Engraver's glass ... ... ... 94
Entomological magnifier ... ... 92
Erecting eyepieces... ... ... 67
Eyepieces ... ... ... 66–68
Eyepiece micrometers ... 68–73
Eyepieces, micrometer ... 67
Eyepiece, Ramsden ... ... 68
Eyeshade ... ... ... ... 73
Filters, colour ... ... 71, 77, 79
Fittings for optical benches ... 82
Focostat magnifier ... ... 92
Focussing glass ... ... ... 79
Forceps, stage ... ... 42, 86

Gas lamp ... ... ... ... 76
Gauge, micrometer ... ... 87
Greenough binocular microscope ... ... ... 52–53
Hæmacytometers ... ... ... 86
Hand microtome ... ... ... 84
High-power binocular microscope 44–47
Huyghenian eyepieces ... ... 66
Illuminants, microscopic ... 74–77
Illuminator, ring ... ... 70, 71
Illuminators, dark ground 69, 70
Indicator eyepieces ... 66, 67
Instruments, dissecting ... ... 89
Interferometer plates ... ... 68
Iris diaphragm, bull's-eye ... 72
„ „ nosepiece ... 68
Labels ... ... ... ... 87
Lamps, arc ... ... ... 77
„ electric ... ... 74–76
„ incandescent gas ... ... 76
„ mercury vapour ... ... 76
„ paraffin ... ... ... 76
„ spirit ... ... ... 87
Ledge, sliding ... ... ... 72
Lenses, Microstigmar ... ... 79
Light moderator ... ... ... 71
Linen provers ... ... ... 93
Live box ... ... ... ... 85
London microscope, Baby, No. 2580 42, 43
„ „ No. 10 ... 4,5
„ „ No. 22 ... 6–9
„ „ No. 29 10–19
„ „ Standard 28, 29
Luvex magnifier ... ... ... 92
Magnifier, Binomax ... 48–51
„ dissecting ... ... 55
Magnifiers ... ... ... 91–94
Marker, object ... ... ... 73
Mechanical stages ... ... ... 72
Mercury vapour lamp ... ... 76
Micrometer eyepieces ... ... 67
Micrometers, eyepiece ... 68, 73
Micrometer gauge ... ... ... 87
Micrometers, stage ... ... 73
Microscope, Aquarium ... ... 57
„ Baby London, No. 2580 ... 42–43
„ Cornex dissecting ... 55
„ Crescent „ ... 54
„ Greenough binocular 52–53
„ High-power binocular 44–47
„ London No. 10 ... 4, 5
„ „ No. 22 ... 6–9
„ „ No. 29 10–19
„ Low-power binocular, Binomax ... 48–51
„ Massive, No. 3201 30–33
„ Pathological, No. 31 22
„ „ No. 32 20–22
„ „ No. 3740 23–27
„ „ No. 3741 27
„ Platen dissecting ... 56
„ Portable Pathological, No. 3745 ... 40, 41
„ Radial Research 34–39
„ Standard London 28, 29
„ Ultra ... ... 57
„ „ violet ... 58–64
Microstigmar lenses ... ... 79
Microtomes... ... ... 83–84
Moderator, light ... ... ... 71
Mounting materials ... ... 90

Nosepiece, double, triple and quadruple ... ... 73
„ iris diaphragm ... 68
„ rotating ... ... 68
Object glasses ... ... 65–66
„ marker ... ... ... 73
Objective changer ... ... 73
Oculist magnifier ... ... 93
Optical benches ... ... ... 82
„ bench fittings ... ... 82
Orthoscopic eyepieces ... ... 67
Paraffin lamp ... ... ... 76
Patch stops ... ... ... 69
Pathological microscope—
No. 31 ... ... ... 22
No. 32 ... ... 20–22
No. 3740 ... ... 23–27
No. 3741 ... ... ... 27
Photomicrographic cameras 77–79
Pinhole diaphragm ... ... 70
Pipettes, hæmacytometer ... 86
Platen dissecting microscope ... 56
Polarising apparatus ... ... 71
Portable Pathological microscope, No. 3745 ... ... 40, 41
Projection eyepieces ... ... 67
Quadruple nosepiece ... ... 73
Quartz mercury vapour lamp ... 76
Radial research microscope 34–39
Ramsden eyepiece... ... ... 68
Reading glasses ... ... 93, 94
Rectifier ... ... ... ... 77
Reducing glass ... ... ... 93
Ring illuminator ... ... 70, 71
Rocking microtome ... 83, 84
Rotary microtome ... ... 83
Rousselet compressor ... ... 85
„ live box... ... ... 85
Screen, didymium ... ... 77
Silver film slide ... ... ... 68
Sira wax ... ... ... ... 86
Slide cabinets ... ... ... 88
Slides, glass ... ... ... 87
Slide holder ... ... ... 86
Sliding ledge ... ... ... 72
Sloan objective changer ... ... 73
Spirit lamp ... ... ... 87
Spot lens ... ... ... ... 69
Stage forceps ... ... ... 86
Stages, mechanical ... ... 72
Stage micrometers ... ... 73
Stage, warm ... ... ... 86
Staining dishes ... ... ... 87
Stains ... ... ... ... 90
Stamp magnifier ... ... ... 93
Standard London microscope 28, 29
Stops, patch ... ... ... 69
„ Travis expanding ... ... 69
Substage condensers ... ... 69
„ spiral ... ... ... 69
Super eyepiece carrier ... ... 68
Table, drawing ... ... ... 81
Testing apparatus for object glasses ... ... ... ... 68
Travis expanding stop ... ... 69
Triple nosepiece ... ... ... 73
Trough, colour ... ... ... 71
„ glass ... ... 85, 86
Turntable ... ... ... ... 87
Ultra microscope ... ... ... 57
„ violet microscope ... 58–64
Uranium glass cube ... ... 68
Warm stage ... ... ... 86
Watch glasses ... ... ... 87
Watchmaker's eyeglass ... ... 94
Wax, Sira ... ... ... ... 86
Workshop magnifier ... ... 92
Wratten filters ... ... ... 79


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