Beck Microscopes

BECK
MICROSCOPES

R. & J. BECK, Ltd.
LONDON, ENGLAND.

SEPTEMBER 1939.

PRICES ADVANCED 10%

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R. & J. BECK LTD.

BECK
MICROSCOPES

R. & J. BECK, Ltd.
LONDON, ENGLAND.

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Telephone: MUSeum ~~1521, 1522~~ 9696.
Telegrams: "OBJECTIVE, WESDO, LONDON."

Dept. 68 Cornhill, E.C. 3
Telephone: AVEnue 5772

Lister Works, Kentish Town, N.W.5.
Telephone: GULliver 2281, 2282

1939.

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 and experimental models made to order must be paid for half in advance and half on delivery. We take no responsibility as to the performance of experimental models.

(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, carriage paid, will be credited at full price if in good condition.

(6) Goods are delivered free in the Central 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 seven days of the receipt of the goods.

(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.

FOREWORD

This new edition of our catalogue describes our complete range of microscopes and appliances, with the exception of those for metallurgical and petrological purposes, which are embodied in a separate catalogue. We believe that the range of instruments will be found to cover all requirements, from the simple microscope required for elementary school use to the elaborate instrument for the most exacting research.

Our No. 29 series provides a complete range of microscopes for routine work, and represents a combination of sound design and construction with economy in cost. This model has gained great popularity and is used as the standard equipment in many of the best known laboratories and teaching establishments.

In this catalogue are also described microscopes specially designed for high power research work, in both monocular and binocular form. The Massive microscope is probably the most stable and rigid microscope which is produced and is unequalled for the highest class of research work. The Angular microscope is specially suited where work is done on fluid specimens and where consequently the stage must be kept horizontal. Also, due to its novel design, it enables quick interchange of bodies, monocular, binocular and photographic and is designed to support these heavy pieces of apparatus, without impairing the performance of the focussing adjustments. The Pathological microscope has been redesigned retaining its special features but improving the general construction and performance of adjustments.

Microscopes and apparatus for specialized branches of research, such as ultra-violet and fluorescent microscopy are described. There are many other highly specialized purposes for which apparatus is from time to time constructed, but which, owing to its great variety and to its limited appeal, we do not catalogue. We shall be pleased to receive enquiries for such special apparatus and can often, due to experience, assist research workers in the acquisition of their requirements.

We describe a range of object glasses, condensers, dark ground and other illuminators which we believe covers the requirements for all branches of work. The perfection of construction of these optical parts has advanced greatly in recent years and our object glasses and illuminators have been subjected to exhaustive tests by independent workers, with most satisfactory results. We consequently are able to claim the very highest qualities for our optical products.

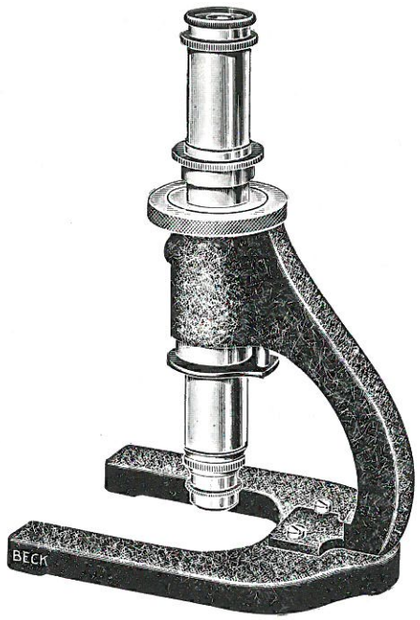
The catalogue first deals with the simplest forms of compound microscopes and proceeds through the various types of more elaborate instruments up to the most complete research microscopes. Binocular microscopes in all forms are then described. Particulars of microscopic apparatus and accessories are then given, after which micro-projectors are dealt with. A complete range of magnifiers and reading glasses completes the catalogue.

For convenience, all microscope outfits are shown with prices of the stand and apparatus given separately, so that with any change in the outfit the alteration in price can be determined without difficulty.

Simplex Microscope.



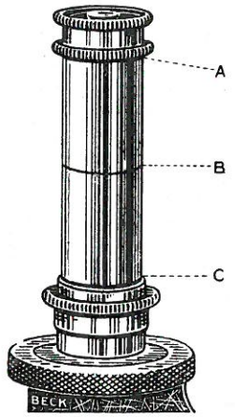
Stand No. 75.



Stand No. 77.

Simplex Microscope.

All classes of microscopic examination do not require an instrument of the highest magnification, with its consequent elaboration and high cost. There is much work where a simple instrument of moderate power is all that is necessary. The Simplex microscope meets this requirement. It is readily set up and manipulated, and will be found a most satisfactory instrument. It is made with the same precision of workmanship as our standard instruments. The instrument is of moderate size, the illustration being approximately one-third size.



In the No. 75, the base and the limb are of solid construction and of sufficient size and weight to ensure the instrument standing firmly, either in its vertical or inclined position.

The focussing adjustment is operated by a large milled ring placed in a convenient position accessible to either hand. The stage measures $3\frac{1}{2}$ in. $\times$ $3\frac{1}{4}$ in., and is provided with stage clips for holding the object.

The drawtube has an adjustment for length by means of which the magnifying power is changed in conjunction with the eyepieces.

The range of magnifying powers is from $\times 35$ to $\times 200$. The drawtube is engraved with lines as indicated in diagram, and the following table gives the magnifying powers with the drawtube set at these positions and with the two eyepieces.

Drawtube set at position.	$\times 6$ Eyepiece.	$\times 15$ Eyepiece.
A	35	120
B	55	150
C	75	200

Intermediate magnifying powers are obtained at intermediate positions. The object glass and eyepieces are of the standard series, and the optical performance is, therefore, equal to that of our larger instruments, so that clear and distinct definition, with good field of view, is obtained.

The instrument is contained in a strong case, which measures $9\frac{1}{2}$ in. $\times$ $6\frac{1}{2}$ in. $\times$ $5\frac{1}{4}$ in.

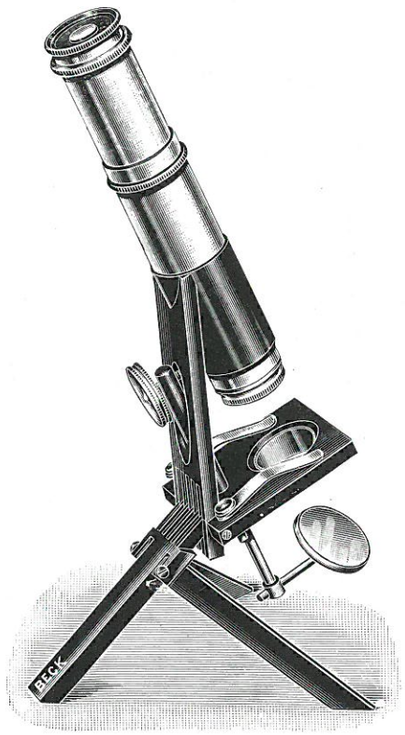
In No. 77 the limb is fitted on to a horseshoe base without stage so that the microscope can be place direct upon a large object or surface. The focussing adjustments and the magnifying powers are similar to the No. 75.

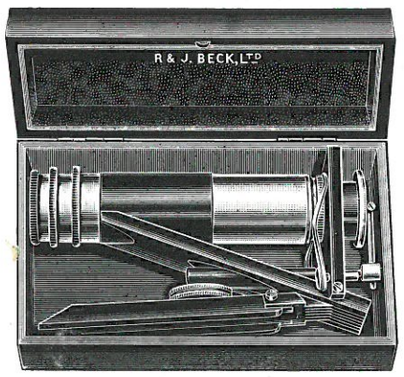
No. 75 Simplex microscope complete, without case £4 10 0

No. 76 Simplex microscope complete, with case 4 17 6

No. 77 Simplex microscope on horse-shoe base, without case 4 4 0

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 in the field with the greatest ease. 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 eyepieces 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 $5\frac{1}{4}$ in. by $2\frac{1}{2}$ in. by 2 in.

A complete range of accessories including substage condensers is manufactured. The mirror usually fitted to the microscope is concave, but when the instrument is fitted with a substage 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 substage apparatus to be used a tubular fitting is supplied which screws into a thread in the stage. Two forms of substage condensers are available, 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 substage 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 $\frac{2}{3}$ in. (16 m.m.) 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.

No. 10 London Microscope.



Stand No. 10

No. 10 London Microscope.

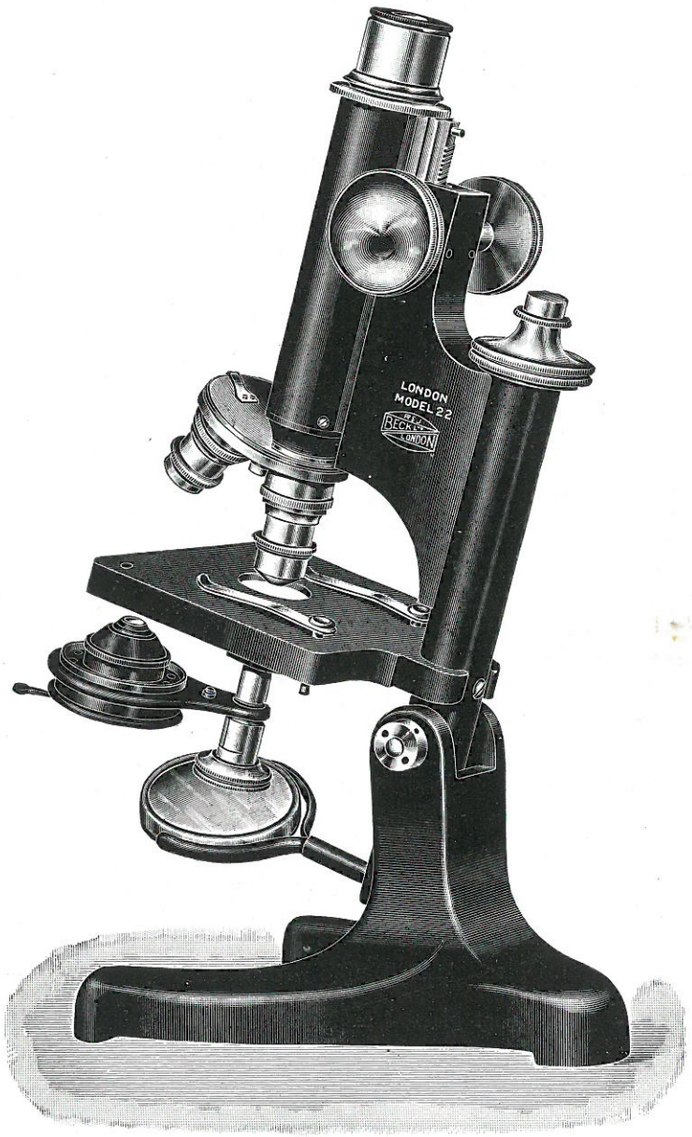
The No. 10 microscope is a simple instrument suitable for general purposes and especially for school work where the highest powers are not employed. The adjustments are simple to use and the construction is very robust.

The microscope is 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. (4 m/m.). 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.

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	£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	
	No. 3234A. $\frac{1}{6}$ in. Object glass, 4 m/m without box	2 13 0	
	No. 3300. Double nosepiece	1 1 0	
		———	£9 0 0
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

No. 22 London Microscope.



Stand No. 22 B.

No. 22 London Microscope.

The No. 22 London microscope is an instrument of strong construction and with adjustments suitable for all general purposes, for teaching establishments and medical work. It is convenient in use and the manipulation is simple, as the adjustments are confined to those which are necessary for the work for which it is intended.

The following is a specification of the instrument:—

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, inclined or horizontal 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 simple form No. 22A has no substage but a revolving dome shaped diaphragm with a number of apertures of varying sizes can be supplied. The No. 22B has a substage, which is focussed by a spiral screw, and which can be swung aside when not in use.

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 the Abbe condenser on these microscopes.

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

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

Mechanical stage can be fitted, the pattern being illustrated on page 87 (No. 3305).

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. 3251. 1/12 in. Object glass, 2 m/m. oil immersion	3	18	6	
No. 760. Cedar oil bottle, with dipper, ground on cap and supply of oil	0	2	0	
No. 3285. Abbe condenser and iris diaphragm	1	9	6	
No. 3301. Triple nosepiece	1	10	0	
				£19 3 6
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. 3305. Detachable mechanical stage to any above models				6 0 0
No. 3779. Angular eyepiece attachment...				1 15 0

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

No. 29 London Microscope.

A complete series of No. 29 microscopes is made covering the requirements for all purposes.

Every point in the design and manufacture of a microscope, which tends to make it efficient and serviceable, has been considered and incorporated into this 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. For use in teaching and research institutions where instruments receive constant and hard use, this microscope will give the best possible service, both as regards convenience in use and in lasting properties.

The differences in the various models are in the stages and substages of which there are several forms.

They are 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 (7½ × 5½ 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 and is shaped for conveniently lifting the instrument without risk of damage to the adjustable parts.

Stage is of extra large size, measuring about 4½ in. square, so arranged that the distance from its centre to the limb is 3¼ 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. In model No. 29H the stage is circular, 4½ in. diameter and has centring and rotating movements.

Focussing adjustments. The microscope has a coarse adjustment, actuated by helical rack and pinion, and is provided with a device by which its action can be regulated. 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. The models Nos. 29H J, K, L and M are always supplied with a graduated drawtube.

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. Nos. 29B and J have a substage with focussing adjustment actuated by spiral screw, and which can be swung aside when not in use. Nos. 29C, G and L have substages which are focussed by rack and pinion, and which also have an adjustment for centring the condenser or dark ground illuminator. Nos. 29D, F and K have similar substages, but have not the centring adjustment. In Nos. 29H and M the substage has a rack and pinion focussing motion and also centring adjustment. In addition the whole substage can be swung aside, out of the optic axis. This adjustment is most useful for removing the condenser when not in use and in facilitating the changing of substage apparatus.

Nosepieces. Double, triple or quadruple 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.

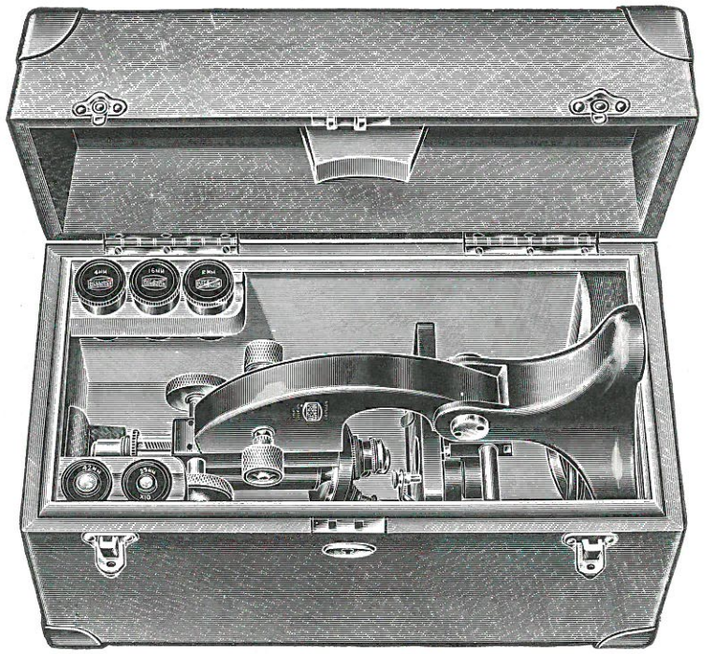
Condensers of various types are supplied on these instruments. For general work Abbe condensers are fitted or for high power work achromatic condensers and dark ground illuminators are supplied. The latter should be used on the model with centring adjustment to the substage.

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

Mechanical stage. On models Nos. 29A, B, C and D, a detachable mechanical stage illustrated on page 87 giving 1 in. vertical and $2\frac{3}{4}$ 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 simple type is fitted. This gives a travel in either direction of $\frac{1}{2}$ 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 a large travel. 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 stage where different portions of the slide have to be examined in succession. The mechanical stage provided for

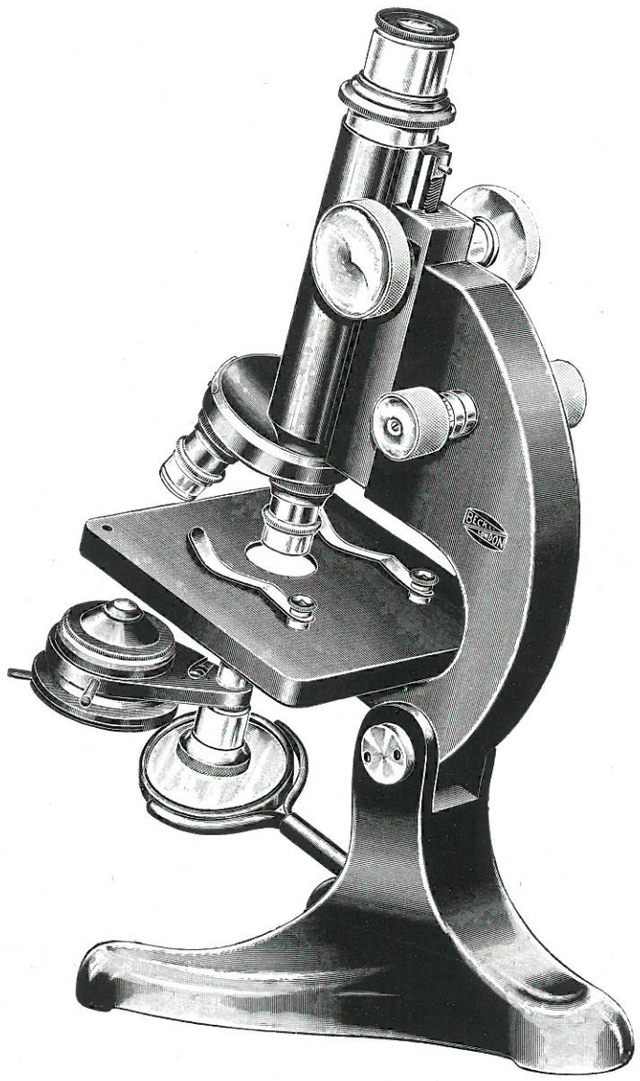
No. 29H is built into the circular stage, the pattern being No. 3306 illustrated on page 87. Nos. 29 J, K, L and M are fiitted with the No. 3515 stage described on page 87, which is built into the instrument. It has a vertical travel of $1\frac{1}{4}$ in., and a horizontal travel of 3 in. This type of stage is particularly suitable for the examination of specimens consisting of smears covering practically the whole of a 3 × 1 in. slide or of a number of serial sections, occupying a large portion of the slide and which are examined consecutively. To allow of the necessary large travel, the stage itself is made of a larger size than is usual, being 5 in. square. It is fitted with scales and verniers for both movements. The slide holders are both adjustable so that slides of different sizes can be used. The left hand holder has an indicator to set it to the correct position for the use of the scales. The scales read to ·1 m/m. by means of the verniers. The slide holders can be entirely removed to leave the stage clear for Petri dishes, culture plates or large objects. A clamp is supplied to the vertical movement so that when the instrument is used in a horizontal position for photography, there is no risk of a movement of the stage.

Case.—The No. 29 London microscope is supplied in a well constructed oak case, which is provided with a leather carrying handle and lock and key. For tropical climates we advise a teak case, specially screwed. The carrying handle of the teak case is of metal, chromium-plated lock and key also being provided. There is also available a new type of carrying case, as illustrated.



This is soundly constructed in wood, covered in leatherette, leather carrying handle and lock and key are fitted, and, in addition to the latter, two safety catches. It forms an extremely convenient case and is very popular with the medical student. In all types of cases provision is made for object glasses and eyepieces, and the microscope can be accommodated with the mechanical stage in situ.

No. 29 London Microscope.



Stand No. 29 B.

No. 29 London Microscope.

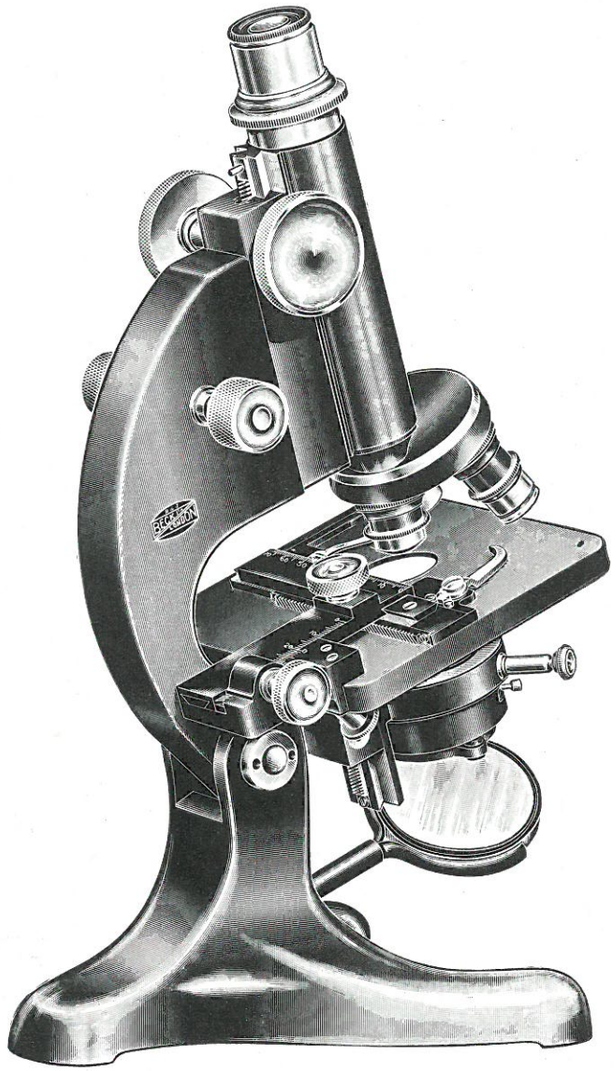
No. 29A (1).	Stand, with tubular substage and iris diaphragm ...	£6 13 0		
No. 3260.	Eyepiece, 42 m/m. (×6)	0 12 0		
No. 3231A.	⅔ in. Object glass, 16 m/m., without box ...	0 12 0		
No. 3234A.	⅙ in. Object glass, 4 m/m., without box ...	2 13 0		
		———	£10 10 0	
No. 29A (2).	Outfit as 29A (1)	£10 10 0		
No. 3300.	Double nosepiece	1 1 0		
		———	£11 11 0	
No. 29B (1).	Stand, with swing-out 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 swing-out 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. 3251.	$\frac{1}{12}$ in. Object glass, 2 m/m. oil immersion ...	3 18 6		
No. 760.	Cedar oil bottle, with dipper, ground on cap and supply of oil	0 2 0		
No. 3285.	Abbe condenser and iris diaphragm	1 9 6		
No. 3301.	Triple nosepiece	1 10 0		
		———	£18 10 6	
No. 29B (3).	Outfit as No. 29B (2)	£18 10 6		
No. 3305.	Detachable mechanical stage	6 0 0		
		———	£24 10 6	
No. 29B (4).	Outfit as No. 29B (3)	£24 10 6		
No. 3779.	Angular eyepiece attachment	1 15 0		
		———	£26 5 6	

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 drawtube in millimetres	extra	0 7 6
No. 3819.	Carrying case, new pattern, description see page 15	extra	0 12 6

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

No. 29 London Microscope.



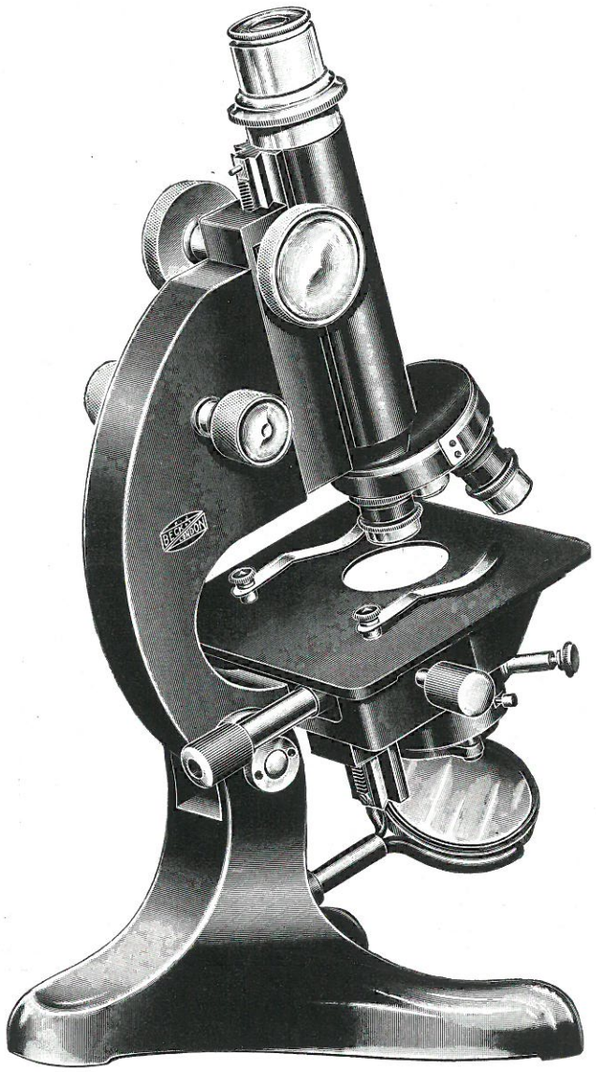
Stand No. 29C with No. 3305 mechanical stage.

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. 3251.	1/12 in. Object glass, 2 m/m., oil immersion	3 18 6		
No. 760.	Cedar oil bottle with dipper, ground on cap and supply of oil	0 2 0		
No. 3286.	Abbe condenser and iris diaphragm ...	2 10 0		
No. 3301.	Triple nosepiece	1 10 0		
		———	£22 12 0	
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)		£23 12 0	
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.	1/12 in. Object glass, 2 m/m. oil immersion	6 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		
		———	£40 2 0	
No. 3818.	Teak cabinet in place of oak case, screwed, for tropical climates	extra	£1 5 0	
No. 3819.	Carrying case, new pattern, description see page 15	extra	0 12 6	
No. 3304.	Graduations to drawtube in millimetres	extra	0 7 6	
No. 3779.	Angular eyepiece attachment	extra	1 15 0	

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

No. 29 London Microscope.



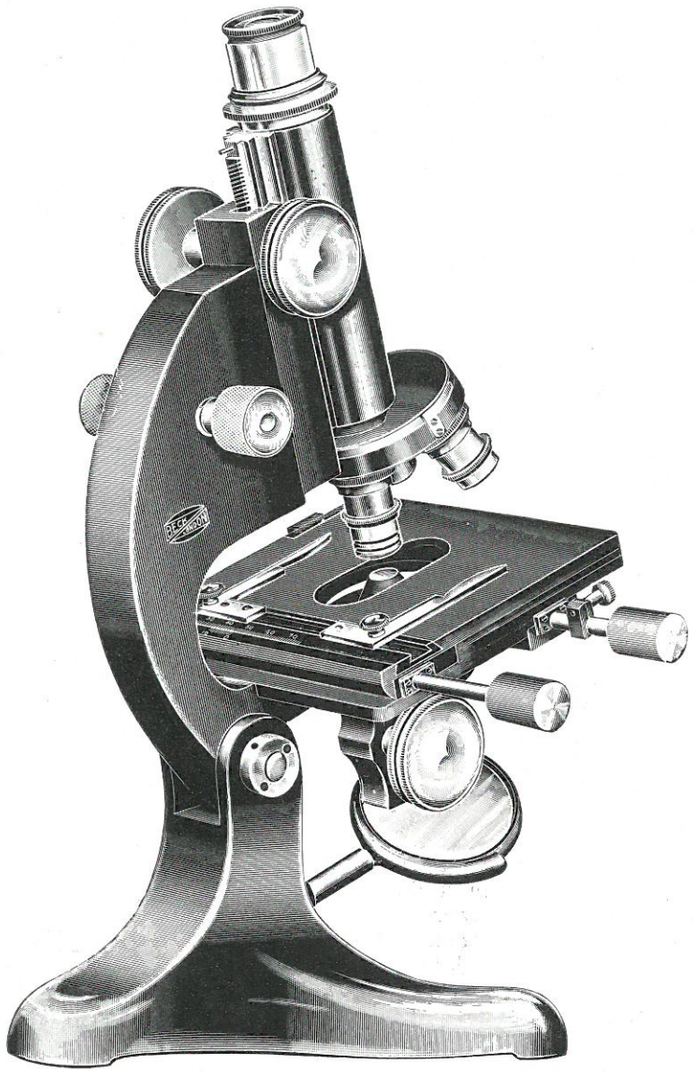
Stand No. 29 G.

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. 3251.	1/12 in. Object glass, 2 m/m., oil immersion	3 18 6		
No. 760.	Cedar oil bottle with dipper, ground on cap and supply of oil	0 2 0		
No. 3286.	Abbe condenser and iris diaphragm ...	2 10 0		
No. 3301.	Triple nosepiece	1 10 0		
			£26	5 6
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	6 10 0		
No. 3286.	Abbe condenser	2 10 0		
No. 3301.	Triple nosepiece	1 10 0		
			£29	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	6 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		
			£37	2 0
No. 3818.	Teak cabinet in place of oak case, screwed, for tropical climates ... extra		£1	5 0
No. 3819.	Carrying case, new pattern, description see page 15. ... ... extra		0 17	6
No. 3304.	Graduations to drawtube in millimetres ... ... extra		0 7	6
No. 3779.	Angular eyepiece attachment ... ... extra		1 15	0

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

No. 29 London Microscope.



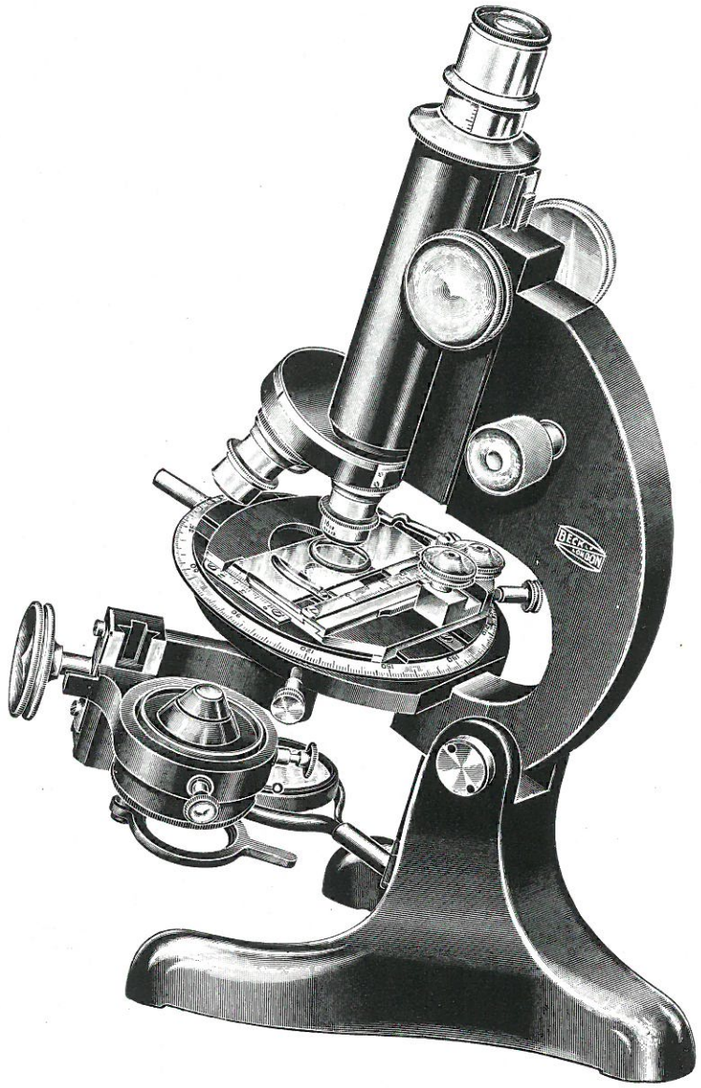
Stand No. 29M.

No. 29 London Microscope.

No. 29J (1).	Stand, with built-in mechanical stage, spiral screw focussing and swing-out substage, in oak case	£18	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.	1/6 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
				£25 1 0
No. 29J (2).	Stand, with built-in mechanical stage, spiral screw focussing and swing-out substage, in oak case	£18	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.	0	16	6
No. 3234A.	1/6 in. Object glass, 4 m/m.	2	17	6
No. 3251.	1/12 in. Object glass, 2 m/m., oil immersion ...	3	18	6
No. 760.	Cedar oil bottle, with dipper, ground in cap and supply of oil	0	2	0
No. 3286.	Abbe condenser and iris diaphragm	2	10	0
No. 3301.	Triple nosepiece	1	10	0
				£31 0 0
No. 29K (1).	Stand, with built-in mechanical stage, rack and pinion focussing substage, in oak case, and apparatus as No. 29J (1)			£26 13 0
No. 29K (2).	Stand, with built-in mechanical stage, rack and pinion focussing substage, in oak case, and apparatus as No. 29J (2)			£32 12 0
No. 29L (3).	Stand, with built-in mechanical stage, rack and pinion focussing and centring substage, in oak case	£20	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.	1/6 in. Object glass, 4 m/m.	3	15	0
No. 3235.	1/12 in. Object glass, 2 m/m., oil immersion ...	6	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
				£44 2 0
No. 29M (3).	Stand, with built-in mechanical stage, rack and pinion focussing, centring and swing-out substage, in oak case, and apparatus as No. 29L(3)			£45 2 0
No. 3818.	Teak cabinet in place of oak case, screwed, for tropical climates ... extra			£1 5 0
No. 3819.	Carrying case, new pattern, description, see page 15 ... ... extra			£1 5 0

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

No. 29 London Microscope.



Stand No. 29 H with No. 3306 mechanical stage.

No. 29 H London Microscope.

This microscope has the usual features of the No. 29 microscopes but is provided with a circular rotating stage with adjusting side screws for either centring the axis of rotation of the stage or for use as a delicate means of moving the object, forming a mechanical stage with a limited travel.

The stage is divided in degrees for determining axes and angles of crystals and other petrological purposes.

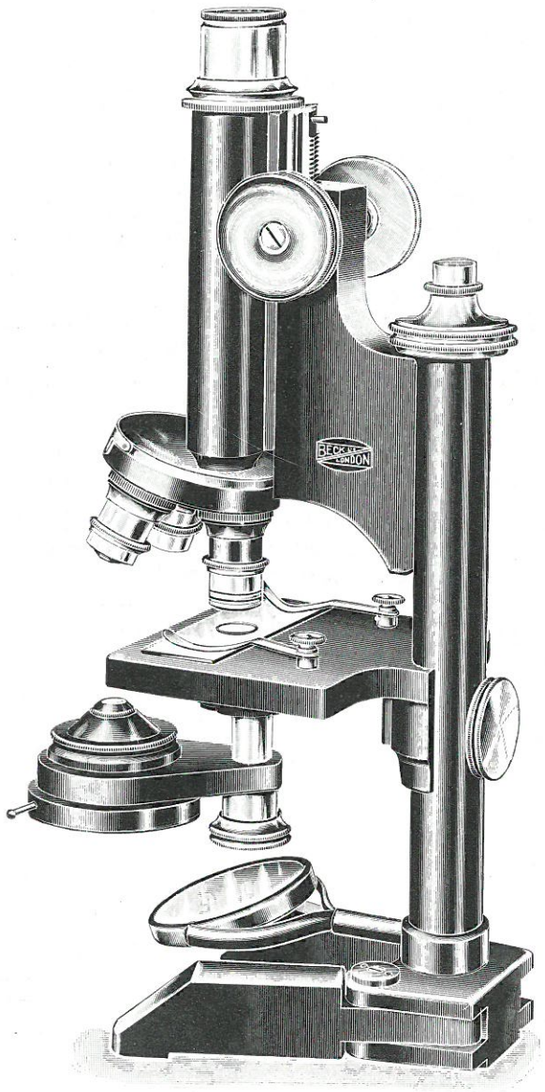
The substage has focussing and centring adjustments, and can be swung out of the axis, a convenience for the rapid change or removal of substage apparatus.

A drawtube with rack and pinion extension, giving a range of tube length from 140 to 200 m/m., can be supplied.

No. 29H.	Stand only in case		£17 0 0
No. 29H (1).	Stand only in case	£17 0 0	
No. 3260.	3 Eyepieces, 42 m/m. (× 6), 25 m/m. (× 10) and 17 m/m. (× 15)	1 16 0	
No. 3230.	1½ in. Object glass, 32 m/m.	2 5 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 ...	6 10 0	
No. 3288.	Achromatic condenser N.A. 1.	5 15 0	
No. 3293.	High power focussing dark ground illuminator	5 7 6	
No. 3302.	Dust-tight quadruple nosepiece	1 15 0	
No. 3298.	Stop for $\frac{1}{12}$ in. object glass	0 2 6	
			£45 16 0
No. 29H (2).	Stand only in case	£17 0 0	
No. 3268.	3 Compensating eyepieces, 45 m/m. (× 6), 22 m/m. (× 11) and 10 m/m. (× 25)	7 2 0	
No. 3240.	1½ in. Apochromatic object glass, 40 m/m....	6 0 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. 3250.	$\frac{1}{12}$ in. Apochromatic object glass, oil immersion, 2 m/m. N.A. 1.2	18 0 0	
No. 3291.	Dry and immersion achromatic condenser N.A. 1.3	9 15 0	
No. 3288P.	Set of patch stops	0 7 6	
No. 3293.	High power focussing dark ground illuminator	5 7 6	
No. 3280.	Sloan objective changer with 6 fittings in cases	4 12 6	
No. 3306.	Circular mechanical stage	12 0 0	
			£109 9 6
No. 3309A.	Rack and pinion drawtube	... extra	3 15 0
No. 3779.	Angular eyepiece attachment	... ...	1 15 0
No. 3345.	Polarising apparatus...	... ...	4 4 0

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

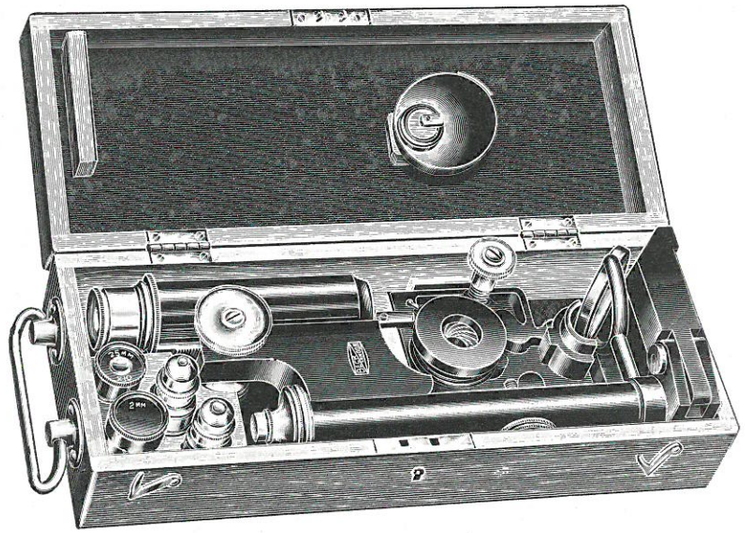
Portable Microscope.



Stand No. 3755.

No. 3755 Portable Microscope.

This microscope provides, at a moderate price, an instrument which, when set up, is of standard size, and possesses all the usual and necessary adjustments for general and medical work. It has rack and pinion coarse adjustment and fine adjustment by micrometer screw. The stage measures $3\frac{3}{4}$ in. × 3 in. The substage is focussed by a screw and milled head, and can be swung out of the axis if desired. The object glasses and eyepieces are of our standard series. The instrument is packed in a very strong teak case with lock and key and carrying handle, measuring $3\frac{1}{4}$ in. × $5\frac{1}{4}$ in. × $13\frac{1}{4}$ in.



No. 3755.	Stand only in case			£11 0 0
No. 3755A.	Stand in case	£11 0 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.	0 12 0		
	No. 3234A. $\frac{1}{6}$ in. Object glass, 4 m/m.	2 13 0		
	No. 3285. Abbe condenser and Iris diaphragm	1 9 6		
	No. 3301. Triple nosepiece	1 10 0		
				£18 8 6
No. 3755B.	No. 3755A as above	£18 8 6		
	No. 3251. $\frac{1}{12}$ in. Object glass 2 m/m. oil immersion ...	3 18 6		
	No. 760. Cedar oil bottle and supply of oil	0 2 0		
				£22 9 0
	No. 3305. Detachable mechanical stage in case ...	... extra		£7 5 0

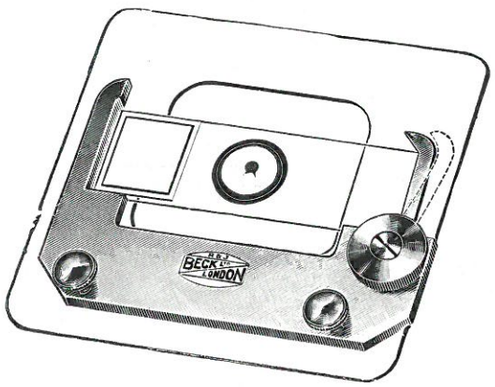
Pathological Microscope.

The Pathological microscope is an instrument which has been specially designed for high power and dark ground work. It 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 a large number of research and teaching establishments as the standard instrument for the purposes mentioned.

This microscope is of large size and it has several 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 (Akehurst) 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. A well fitted dovetailed slide with an efficient clamping screw is a more accurate method of ensuring the correct alignment of substage apparatus.

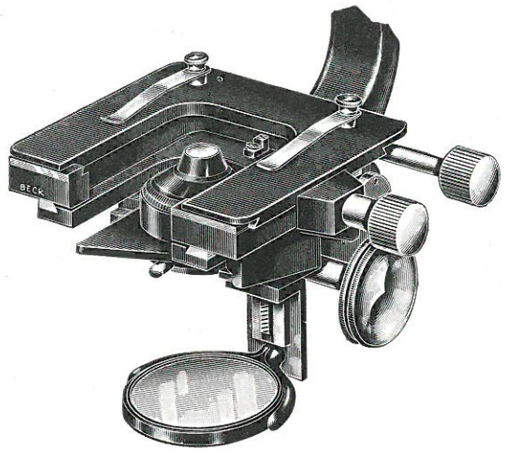
Base and pillar are of one heavy casting, the base being of the horseshoe pattern resting on three points, and having a spread of 5½in. by 7¼in. The pillar has joint for inclination with stops for the vertical and horizontal positions.



Topley top stage

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 heads 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. The milled heads can be fitted on either the right hand or left hand side as may be preferred. When fitted on the left, the worker's right hand is free for drawing. For objects mounted upon 3in. × 1in. slides, stage clips are provided, or the Topley top stage can be employed. The construction of this can be seen by the illustration. 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 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 made with the front part of the stage cut away as illustrated below. 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 with practically no disturbance of the adjustments of the instrument.



Body is of a large size, 1·8 in diameter, and has 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.

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

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.

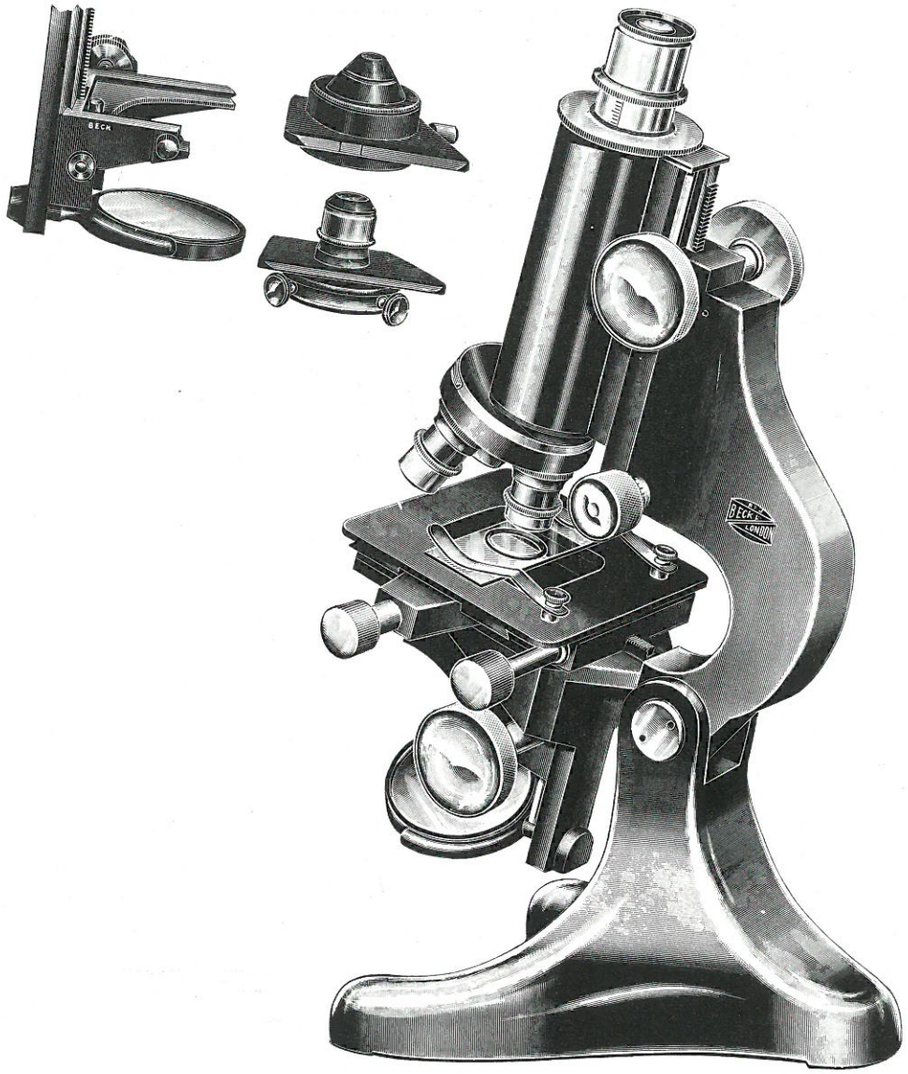
Fine adjustment is on a patented design and is operated by two milled drums, one on each side of the limb. The adjustment works with levers and point contact, and only by this means can the necessary delicacy be obtained. The friction is reduced to a minimum, and all drag and heavy movement and backlash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

Substage is one of the principal 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 30. 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 mahogany cabinet with carrying handle.

High power binocular attachments as described on pages 79 and 80 can be fitted to all models. The angular eyepiece attachment as described on page 80 will be found a most useful addition where the microscope is used in vertical position.



Stand No. 3740.

No. 3740A.	Stand only in case	£25 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	
			£33 9 0
No. 3740B.	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		£37 18 6
No 3740C.	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		£40 8 0
No. 3740D.	Stand only in case	£25 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 ...	6 10 0	
	No. 3286. Abbe condenser	2 10 0	
	No. 3301. Dust-tight triple nosepiece	1 10 0	
			£41 19 0
No. 3740E.	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.	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

Pathological Microscope.

No. 3440H.	Stand only in case	£25	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 attachment, angular model	13	10	0
No. 3240.	1½ in. Apochromatic object glass, 40 m/m. ...	6	0	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. 3294.	High power patent focussing dark ground illuminator in centring fitting	6	2	6
No. 3397.	Metal holder for ½ m/m slides	0	6	6
No. 3398.	1 doz. ½ m/m slides for No. 3397	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. 3779.	Angular eyepiece attachment	1	15	0
		£147	5	0

EXTRAS FOR ALL OUTFITS.

No. 3750.	Topley top plate	£0	17	6
No. 3751.	Sliding ledge	1	10	0
No. 3752.	Verniers to mechanical stage	1	10	0
No. 3779.	Angular eyepiece attachment	1	15	0

Particulars of high power binocular attachments see pages 79 and 80.

PATHOLOGICAL MICROSCOPE WITH CUT OUT STAGE.

No. 3741	Stand only in case	£27	0	0

Sets of apparatus for this are supplied as Nos. 3740A-H the catalogue numbers being Nos. 3741A to 3741H.

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

Massive Microscope.

The Massive microscope was designed to provide an instrument for the use of research workers, which by reason of its great rigidity and accuracy of construction, would enable the full advantage to be taken of the latest forms of high power object glasses, achromatic condensers and dark ground illuminators, which have reached a very high standard, and which therefore require similar perfection in the mechanical adjustments of the microscope upon which they are used. This rigidity of construction allows for the interchange of the object glasses and substage apparatus, without any danger of disturbing the adjustments, so that the change over from transmitted to dark ground illumination can be made rapidly and without incurring the necessity of any general readjustment of the microscope. The advantages of such an instrument, in the saving of time and in the high order of performance obtained will readily be appreciated. For such work as photo-micrography this great rigidity is also of the utmost benefit.

The following is a brief description of the main constructional details.

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 base and pillar supporting the limb are heavy and so designed to render the instrument equally rigid in all positions. 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 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.

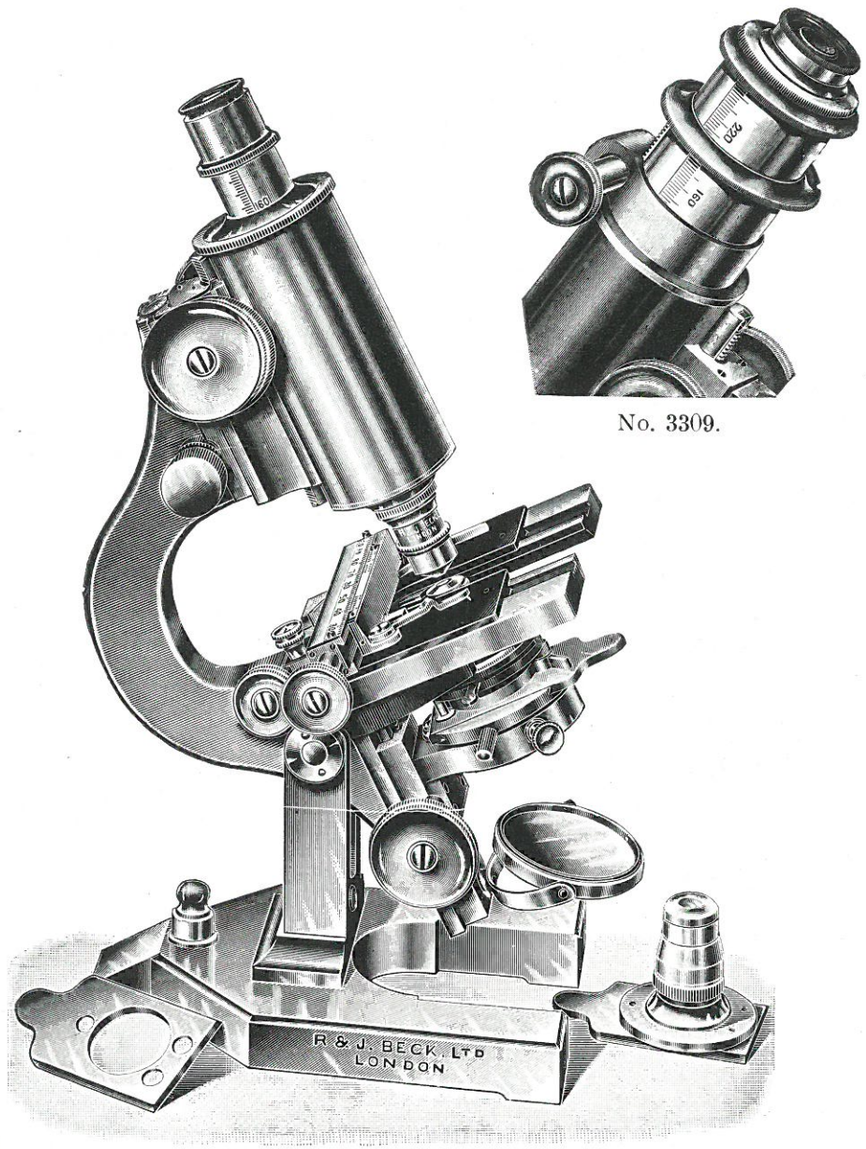
The stage measures $4\frac{1}{2} \times 4\frac{5}{8}$ inches. It is cut out in front to enable substage apparatus to be readily changed without altering the focussing adjustments. The mechanical stage, which fits into dovetails cut in the flat stage, has specially delicate motions actuated by milled 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. These 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 body is of 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 34 can be fitted if desired. A high power binocular attachment can also be fitted to the instrument.

The microscope is packed into a solid mahogany cabinet.

Massive Microscope.



No. 3309.

Stand No. 3201.

Massive Microscope.

No. 3201.	Stand and 3 substage fittings in case			£60 0 0
No. 3201A.	Stand No. 3201 and 3 substage fittings in case	£60 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 ½ m/m slides	0 6 6		
	No. 3398. 12 ½ m/m slides for No. 3397	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. ⅔ in. Object glass, 16 m/m.	1 10 0		
	No. 3232. ⅓ in. Object glass, 8 m/m.	3 5 0		
	No. 3236. ⅙ 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		
				£92 12 0
No. 3201B.	Set as 3201A, but with dust-tight triple nosepiece No. 3300 in place of Sloan changer			£91 5 0
No. 3201C.	Stand No. 3201 and 3 substage fittings in case	£60 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 ½ m/m. slides	0 6 6		
	No. 3398. 12 ½ m/m. slides for No. 3397	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. 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. 3247. ⅛ 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		
				£117 18 0
No. 3201D.	Set as No. 3201C, but with dust-tight triple nosepiece No. 3300 in place of Sloan changers			£116 11 0
No. 3780.	High power binocular attachment, straight model			10 10 0
No. 3781.	High power binocular attachment, angular model			13 10 0
	Extra eyepieces for binocular at listed prices.			
No. 3779.	Angular eyepiece attachment			1 15 0

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	£60 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. 3326. Barnard compressor and supply of glasses	2 2 6	
	No. 3397. Metal holder for ½ m/m. slides	0 6 6	
	No. 3398. 12 ½ m/m. slides for No 3397	0 5 0	
	No. 3399. ½ gross ½ m/m 3 × 1 slides	0 4 3	
	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. 3242. ⅓ in. Apochromatic object glass, 8 m/m.	9 10 0	
	No. 3250. 1/12 in. Apochromatic object glass 1·2 N.A., 2 m/m., oil immersion	18 0 0	
	No. 3280. Sloan objective changer with 3 fittings in case	2 17 0	
	No. 3328. Double wedge light moderator	4 17 6	
	No. 3333. Set of Wratten & Wainwright screens	3 7 6¶	
	No. 3650. Photomicrographic camera	20 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 0 0¶	
			£178 9 9

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

Massive Microscope.

No. 3201M.	Stand and 3 substage fittings in case	£60	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 glass slides	2	2	6
No. 3397.	Metal holders ½ m/m. slides	0	6	6
No. 3398.	12 ½ m/m. slides for No. 3397	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.	6	0	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.	15	0	0
No. 3249.	$\frac{1}{12}$-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. 3328.	Double wedge light moderator	4	17	6
No. 3333.	Set of colour filters	3	7	6
No. 3315.	Bull's eye condenser on stand	2	10	0
No. 3359.	Beck aplanatic ring reflector for ⅔-in. and ⅓-in. object glasses	2	10	0
No. 3359A.	Beck aplanatic ring reflector for ⅙-in. object glass	2	10	0
No. 4960.	Beck vertical illuminator with thin glass and prism reflectors	2	17	6
No. 3367.	Dark well	1	1	0
No. 3416.	Beck glass trough	0	9	0
No. 3420.	Live box	0	8	6
No. 3421.	Beck compressor	1	1	0
No. 3422.	Stage forceps	0	14	0
No. 3325A.	Thoma Hawkesley hæmacytometer	2	2	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. 3370.	Abbe camera lucida	4	5	0
No. 3375.	Drawing table	0	15	0
No. 3345.	Polarising apparatus	4	4	0
No. 3358.	Iris diaphragm in nosepiece adapter	0	16	6
No. 3276A.	Cobweb micrometer	9	0	0
No. 3050.	Tourmaline	1	15	0
No. 3258.	Goniometer eyepiece	4	15	0
No. 3349.	Holder for tourmaline or compensating eyepiece over eyepiece	1	15	0
No. 3379.	Apertometer	0	6	0
No. 3781.	High power binocular attachment, angular model	13	10	0
Nos. 3266, 3268, 3269.	Extra compensating eyepieces for binocular (3)	7	2	0
No. 3657.	Eyepiece camera with observing tube	12	12	0
	Selected apparatus for testing object glasses	18	0	0
	Case to hold apparatus	7	10	0
	Assortment of slips, covers, forceps, scissors, needles, pipettes, etc.	2	2	0
			£294	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.

The Radial microscope in its complete form (No. 3190) is a 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 dovetailed slide provided with a rack along its entire length, and all the parts of the microscope fit this dovetail and are moved upon it, and with the exception of the mirror slide, are actuated by racks, pinions and milled heads. Upon the upper part of this slide is fitted the body of the microscope with its fine adjustment. In a position near the middle is fitted the stage and substage which are in one unit. The lower end of the main slide carries the mirror.

The rack and pinion actuating the body forms a coarse focussing adjustment. The body fitting 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. The slow motion slide only carries the object glass and does not support the weight of the body,

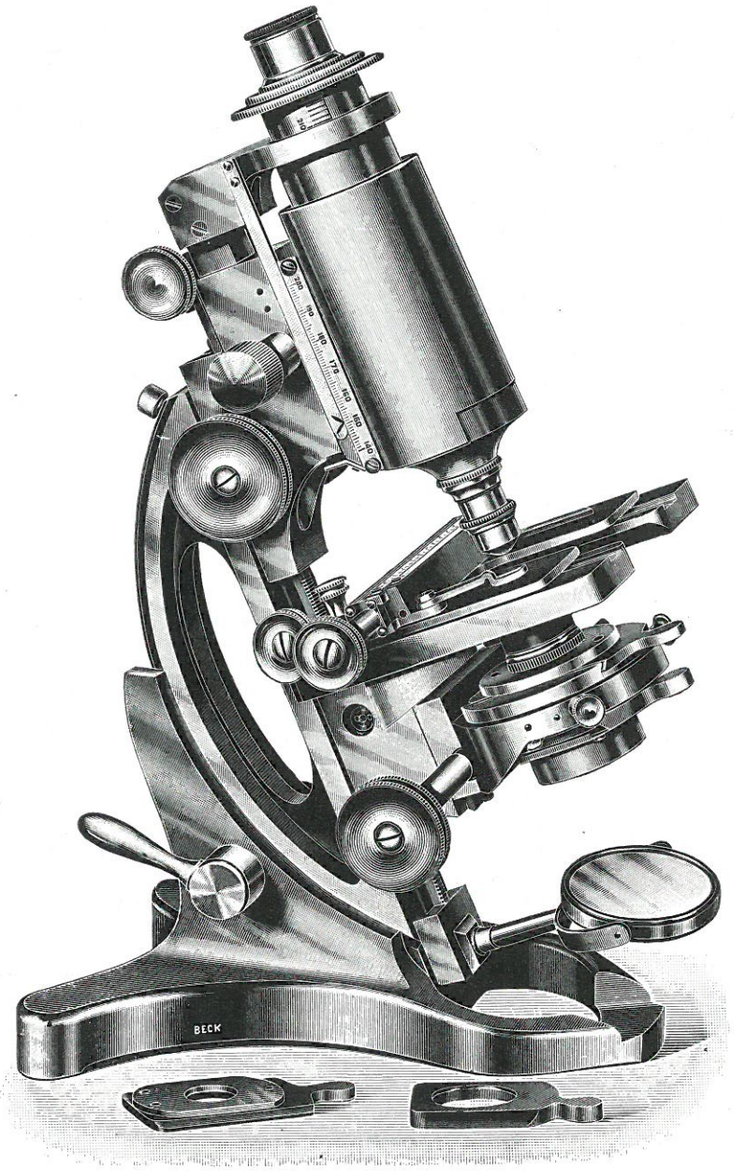
The body fitting has a square hole down its entire length, in which fits a bar. At the upper end of this bar is fitted a bracket to which a telescopic drawtube is attached. By means of a rack and pinion this drawtube can be raised for a distance of 2½ in. Also by means of the telescopic tube it can be raised further giving a variation in tube length of from 110 to 250 m/m. This bar and its drawtube can be completely removed and replaced by a high power binocular body. Apparatus such as a spectroscope 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 dovetail slide of the microscope.

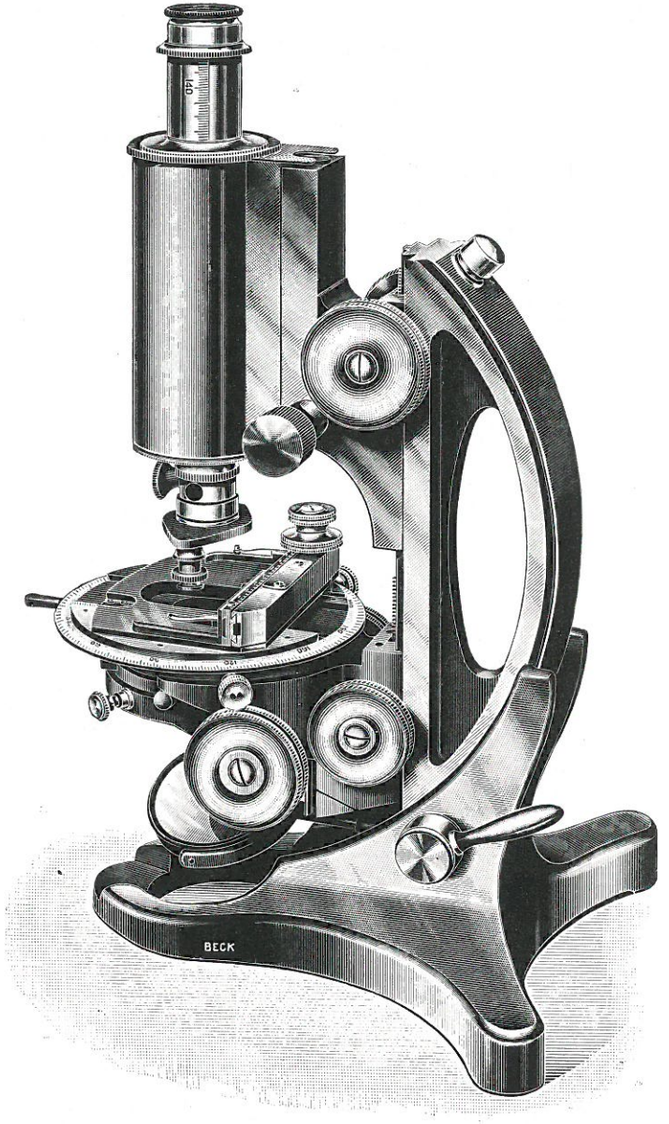
The stage slide consists of a focussing carriage, the upper portion of which carries the stage and the lower portion of which carries the substage. Two forms of stage are supplied: one is the square stage as fitted to the Massive microscope, and the other is the complete circular rotating stage with centring motion as described on page 87. The square stage is cut out 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 dovetailed slide similar to the system adopted in the 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.

A simpler form of Radial research microscope is also made (No. 3192). In this the body fitting has a different arrangement for the fine adjustment slide which carries the whole body. The arrangements for carrying the various interchangeable bodies is not provided and the petrological apparatus cannot be fitted.

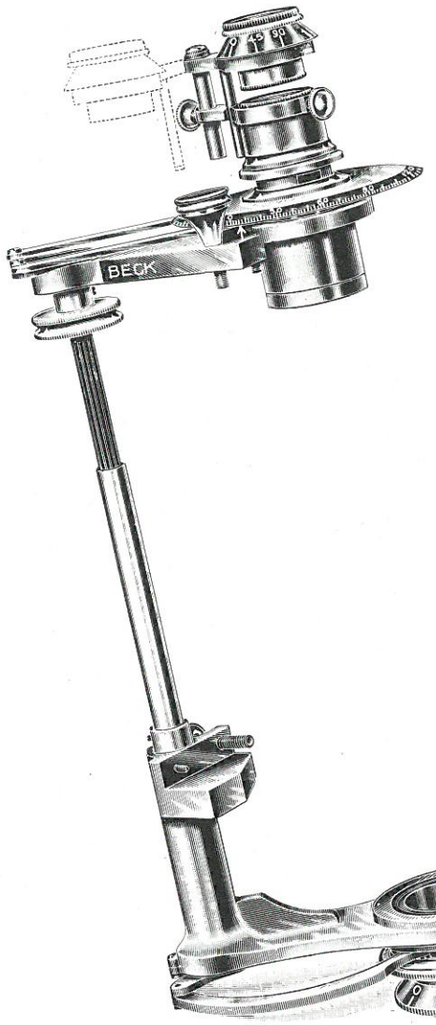


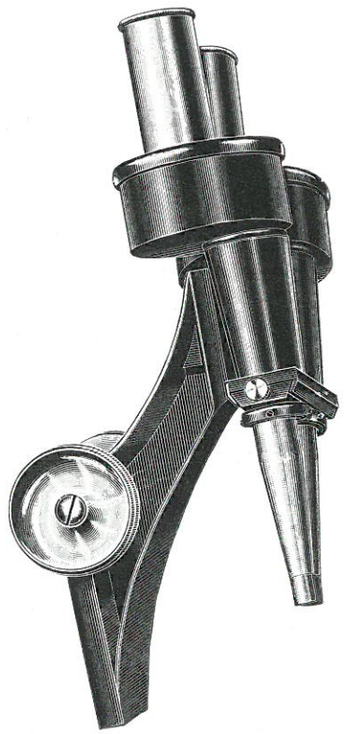
Stand No. 3190.



Stand No. 3192.

Radial Research Microscope.





Greenough binocular body.

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

Radial Research Microscope.

No. 3190.	**Stand,** coarse and fine focussing adjustments, focussing stage, focussing and centring substage, mirror, in case. Stage, square, with cut out 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 with 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 body on extension arm with rack and pinion adjustment to use interchangeably with monocular body and drawtube. Greenough binocular body 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 four positions and with divided circles, independent swing-out adjustments to each prism, eyepiece with cross lines, slot for quartz wedges ...	£250	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 with drawtube, 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 body and interchangeable monocular body in case ...	136	0	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 MICROSCOPE.

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 $\frac{1}{2}$ m/m. slides	0	6	6
	No. 3398.	12 $\frac{1}{2}$ m m. slides for No. 3397	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. 3280	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 $\frac{1}{2}$ m m. slides	0	6	6
	No. 3398.	12 $\frac{1}{2}$ m/m. slides for No. 3397	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. ...	6	0	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
				£108 6 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, 59 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. 3998.	¼ Mica wave plate	0	15	0
No. 3997.	Gypsum plate, 1st order	0	17	0
No. 3060.	Bertrand eyepiece	4	0	0
No. 3058.	Babinet's compensator	15	10	0
No. 3258.	Goniometer eyepiece	4	15	0
No. 3073s.	Small stage goniometer	5	15	6 ¶
No. 3080s.	Wright's stage refractometer	1	16	0 ¶
No. 3081.	Clarici cell	1	8	6
No. 3085s.	Shand micrometer	13	15	0 ¶
No 3988.	Micro spectroscopic eyepiece	2	10	0
				£55 12 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. 3231.	⅔ in. Achromatic object glass, 16 m/m., short mounted	2	0	0
No. 3232.	⅓ in. Achromatic object glass, 8 m/m., short mounted	3	15	0
No. 3244.	⅙ in. Apochromatic object glass, 4 m/m., short mounted	11	10	0
No. 3248.	1/12 in. Apochromatic object glass, 1·3 N.A., 2 m/m. oil immersion, short mounted	18	10	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. 4960.	Vertical illuminator, thin glass pattern	1	15	0
No. 3315.	Bull's eye condenser on stand	2	10	0
				£52 2 0

Set D.* The above set D with achromatic instead of apochromatic object glass and Huyghenian eyepieces instead of compensating £28 7 0

If the binocular body is supplied, the eyepieces must be duplicated at a corresponding additional price.

Angular Model Microscope.

This microscope is of an original type, the design rendering it possible to embody striking features which make it a universal instrument suitable for almost every kind of work both visual and photographic, with a maximum degree of ease of manipulation and comfort in working.

The rigidity obtained by fixing the body on the combined limb and base of the instrument gives a freedom from flexure and vibration not hitherto reached with the ordinary forms of microscope. This gives a great advantage not only for photography but for observation with high powers or for the examination of objects in fluid.

With the ordinary microscope the operator finds considerable discomfort when the instrument is vertical, but with the Angular microscope the body is inclined at a convenient angle, so that he may be in a natural position when working.

The stand itself is always vertical and the stage horizontal, so that fluids or specimens in liquid can be placed in troughs or dishes upon the stage. A further advantage of the stage and substage being kept in a horizontal position is that the immersion fluids of an oil immersion object glass, and more particularly of a dark ground illuminator, have no tendency to run.

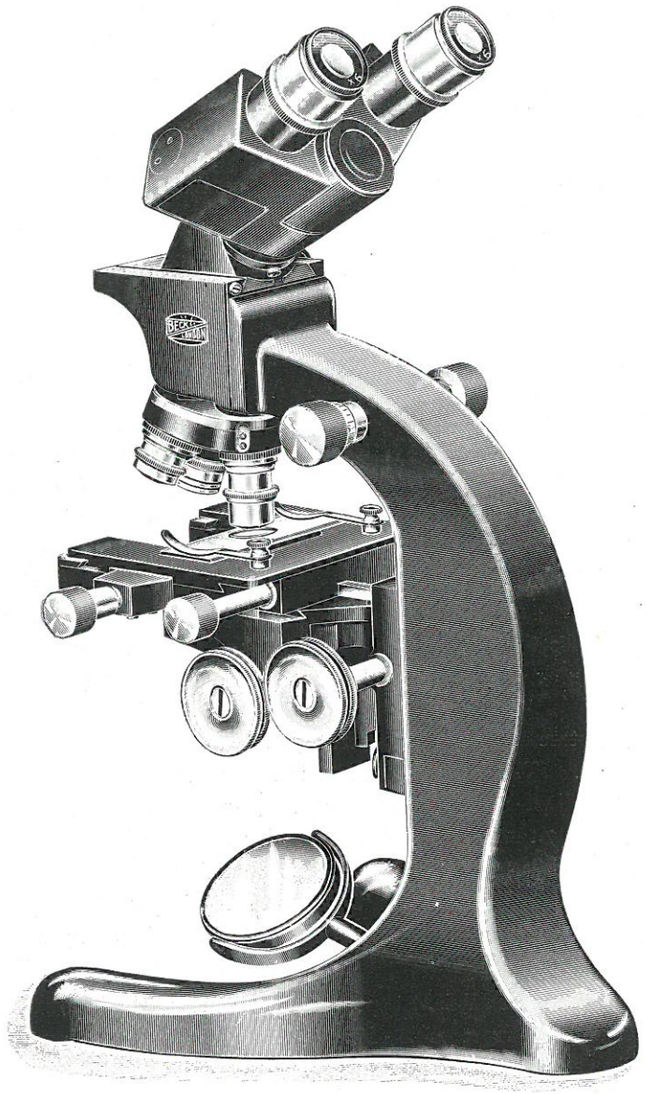
The method of interchangeability of the various bodies and the photographic camera is an important improvement. They fit by means of a dovetailed slide in the top of the main limb casting, giving complete rigidity in fixing, but can be changed with great rapidity. A specimen can be examined either with the monocular or binocular body, or when the combined monocular and photographic body is in use the camera can be instantly slid into the optic axis and a photograph taken without refocussing or disturbing the adjustment of the microscope.

The focussing adjustments do not operate upon the bodies of the microscope or upon the slides which carry them. The weight of these is taken direct upon the limb and base of the instrument. The fine adjustment operates only a collar carrying the object glasses, so that no undue weight is carried by the fine adjustment, and an extremely efficient motion is obtained. The coarse adjustment moves the stage and its focussing slide has a clamp so that it may be regulated or actually fixed. These points are of the greatest importance in photography, obviating any tendency for the focussing adjustments to settle during a long exposure.

The binocular is of the most efficient type, suitable for use with all powers and having its tubes inclined to each other at the correct angle of convergence as described on page 49. It is provided with adjustment for the accurate setting of the interocular distance. It gives the greatest comfort in working and the definition given is critical.

The Angular microscope, beside having the advantages referred to for ordinary work and for biological or medical research, is specially adapted for use with all forms of opaque and vertical illuminators. With such illumination it is desirable to fix the illuminating system, which is possible with this microscope, the focussing being effected by movement of the stage. Where research

Angular Model Microscope.



Stand No. 3872 with cut out stage.

is required on a great variety of subjects, this instrument will function for transmitted light, dark ground illumination, metallurgical work or the examination of all opaque objects or the study of opaque ores with polarised light.

BRIEF SPECIFICATION OF THE ANGULAR MICROSCOPE.

Bodies.

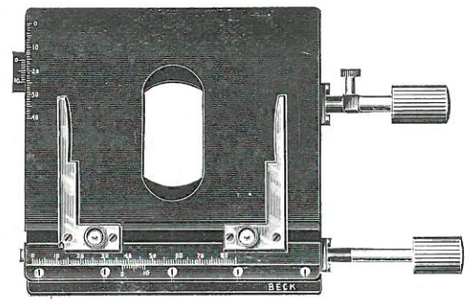
1. Binocular, with adjustments for interocular distance.
2. Monocular body with graduated drawtube.
3. Monocular body with drawtube, combined with a vertical tube and detachable camera ($\frac{1}{4}$ plate, $4\frac{1}{4}$ in. $\times$ $3\frac{1}{4}$ in.) with exposing shutter. The vertical tube is provided with a focussing adjustment to set the focus on the plate to correspond with the visual focus. With camera removed it can be used for drawing with a camera lucida or for projection with prism mounted over the eyepiece.

Fine adjustment actuated on both sides of the limb, provided with divided drum.

Coarse adjustment, helical rack and pinion with clamp for regulating or fixing position.

Stages. Five alternative forms :—

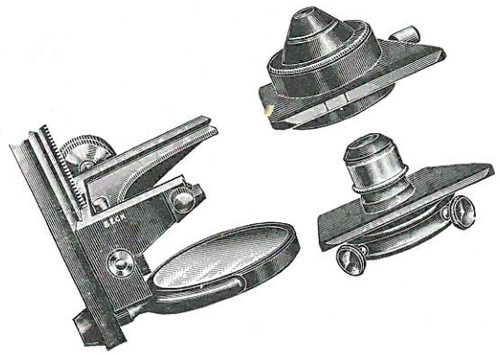
1. Plain stage with detachable mechanical stage No. 3305 as illustrated on page 87.
2. Built-in mechanical stage in which the large square top plate is moved in both directions instead of the object being moved over the surface of the stage, enabling large objects or culture plates to be moved mechanically as readily as 3×1 slides. The front of this stage is cut away for the rapid interchange of the substage apparatus, as illustration page 44.
3. Mechanical stage as above, but not cut away in front.
4. Mechanical stage No. 3515 as described on page 87 having horizontal travel of 3 inches and vertical travel of $1\frac{1}{4}$ inches (as illustrated).
5. Circular revolving stage with centring adjustments, with or without mechanical motions (No. 3306 page 87).



No. 3515.

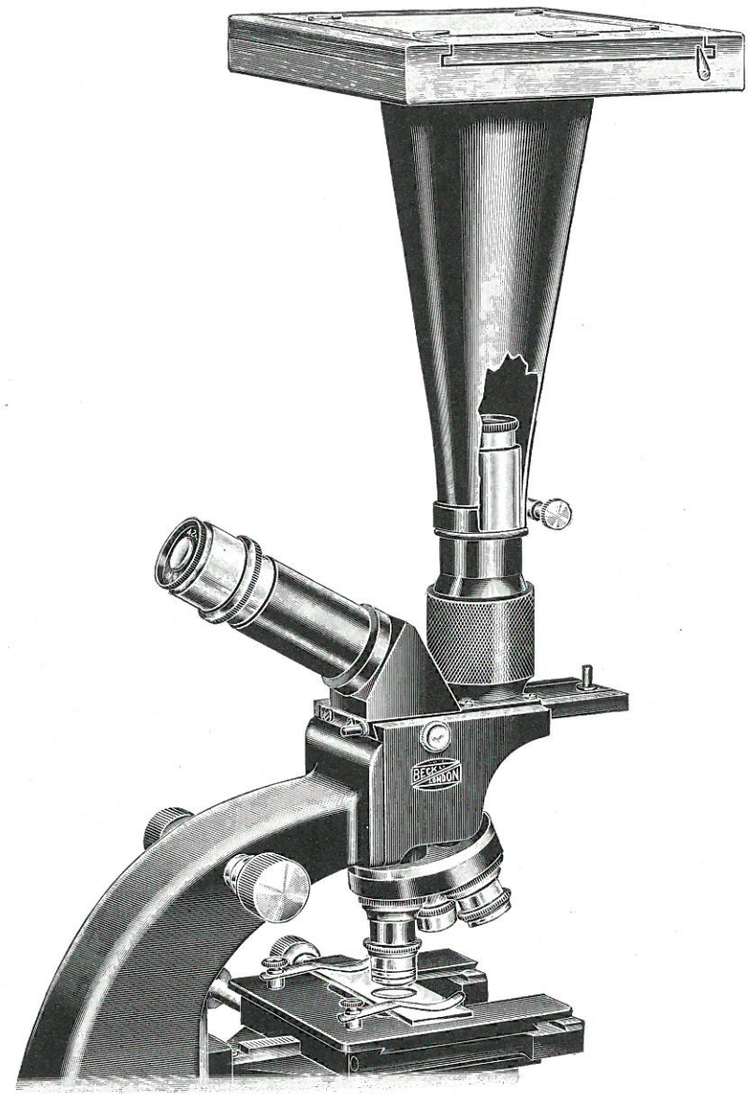
Substages. Three alternative forms :—

1. Rack and pinion focussing with Akehurst slides for interchanging apparatus (as illustration), applicable to stages 2 and 3.
2. Rack and pinion focussing and centring, with standard size cylindrical fitting applicable to stages Nos. 1 or 4.
3. Rack and pinion focussing and centring, with addition of a swing-out motion with standard size cylindrical fitting, applicable to stages Nos. 1, 4 or 5.



Mirror. Plane one side, concave the other, on gimbals. Mirrors can be supplied with special plating for fluorescent work.

Angular Model Microscope.



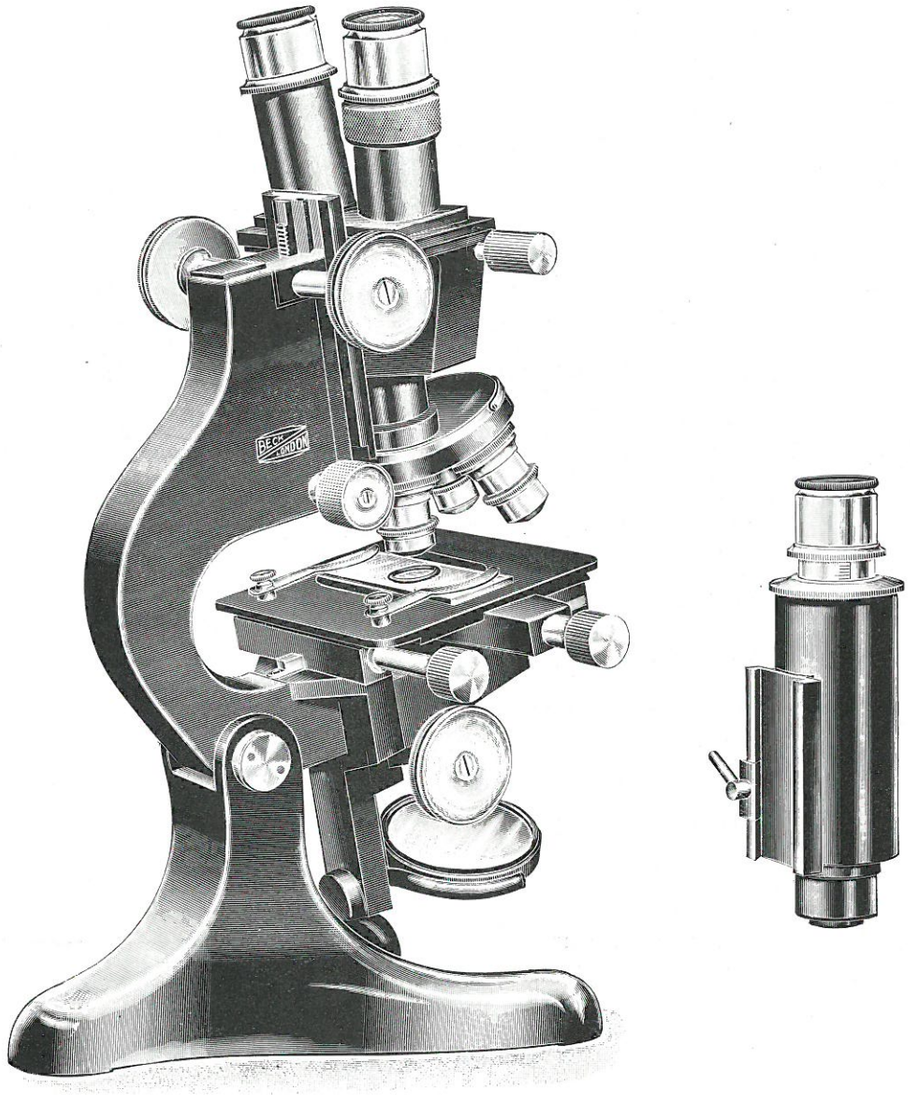
Combined monocular observing tube with vertical tube and camera.
Suitable for fitting to Nos. 3866, 3867, 3872, 3876, 3877, 3878.

Angular Model Microscope.

No. 3866.	Angular model microscope with :—				
	Monocular body,				
	Plain square stage,				
	Focussing and centring substage,				
	Stand only in case		£51	0	0
No. 3867.	No. 3866 with detachable mechanical stage No. 3305,				
	Stand only in case		57	0	0
No. 3878.	No. 3866 with mechanical stage No. 3515.				
	Stand only in case		60	10	0
	Swing out motion to substage	extra	1	0	0
No. 3872.	Angular model microscope with :—				
	Monocular body,				
	Built-in mechanical stage as illustrated on page 30,				
	Akehurst substage,				
	Stand only in case		60	10	0
	Stage with front cut out	extra	2	0	0
	Verniers to mechanical stage	extra	1	10	0
	Topley top stage	extra	0	17	6
No. 3876.	Angular model microscope with :—				
	Monocular body,				
	Circular rotating and centring stage,				
	Focussing, centring and swing out substage,				
	Stand only in case		44	0	0
No. 3877.	No. 3876, but with mechanical stage		56	0	0
Binocular body in place of monocular body		extra	9	0	0
Binocular body in addition to monocular body		extra	14	0	0
Monocular body combined with camera		extra	17	10	0

For optical outfits for the above see page 54.

Beck Combined Binocular and Monocular Microscope.



Stand No. 1340.

Combined Binocular and Monocular Microscope.

Due to the comfort and freedom from eyestrain afforded by the use of both eyes, the binocular microscope has, of late years, increased in popularity. The microscope here described is specially designed so that binocular and monocular observation can be alternatively employed by a simple interchange of two bodies. In the binocular body the greatest care has been taken to ensure that the optical performance is of the highest order with both high and low powers, and features are embodied not hitherto found in binocular instruments. The tubes of the binocular are inclined towards each other, at the natural convergence angle of the eyes when working under indoor conditions. This method has always been adopted by all makers, in the low power binoculars and the advantage applies to high power binoculars, with equal force, all eyestrain involved in the use of parallel tubes being avoided. When objects at a distance are viewed the two eyes naturally look out in a parallel direction, but indoors or even when inclining the head downwards, they automatically converge to a near object. For this reason a binocular microscope constructed with parallel tubes is fatiguing to use.

A convenient adjustment actuated by a screw motion and a milled head is provided for setting the interocular distance. One tube has an adjustment to compensate for any difference in focus between the two eyes. The monocular body is supplied in the usual straight form with both types, as this is the most convenient pattern for photography or drawing, it is fitted with an extending drawtube.

The binocular body is made in the usual pattern as illustrated on page 48 and with the tubes inclined at an angle illustration page 50 so that when the microscope is used in a vertical position, the eyepieces project at a convenient angle for comfortable observation. Many workers are obliged to use their microscopes in a vertical position, as due to the use of fluid specimens, the stage must be kept horizontal and the inclined form of binocular will be found of the greatest service under such circumstances. In other respects the two forms of binocular are similar.

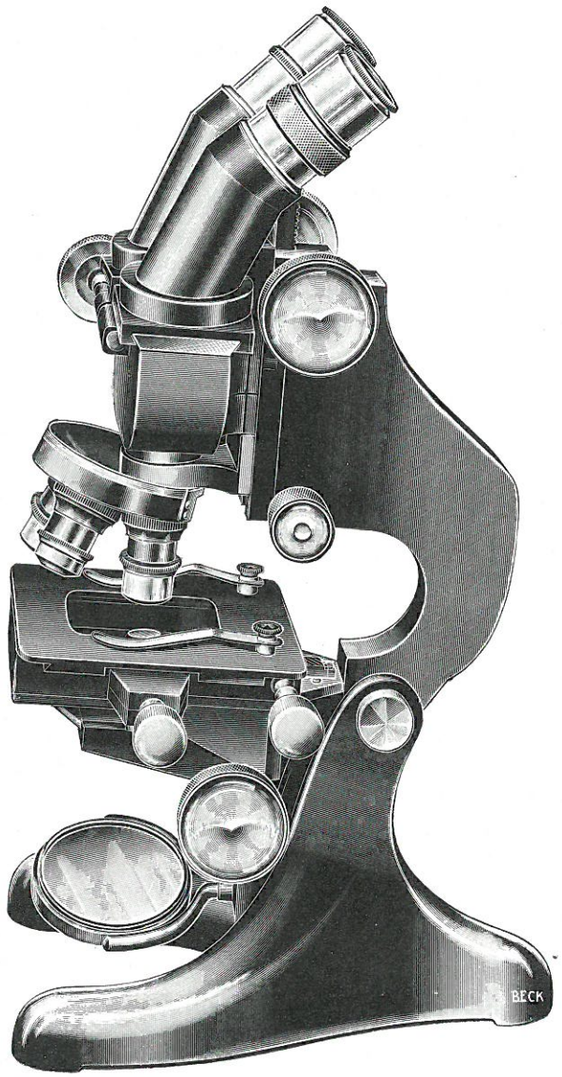
The binocular and monocular bodies slide interchangeably on a dovetailed fitting and can be clamped in any position. In addition to providing a quick and easy means of interchange, this provides a method of varying the tube length, compensating for different thicknesses of cover glass and mounting material. The tube length is 160 m/m. when a revolving nosepiece is in use, without the intervention of any optical correctors. By the means above mentioned, it can be extended for 35 m/m.

The microscope is fitted with various forms of stages. The plain stage is of large size and is made to accommodate a detachable mechanical stage having a travel of $2\frac{3}{4}$ in. $\times$ 1 in., No. 3305, page 87.

The built-in mechanical stages are of two types. In one of these the whole top plate moves by means of the mechanical motions. It can therefore be used for large objects as well as for the usual slides. The travel is $1\frac{1}{2}$ in. by 1 in. The other stage is the No. 3515 described and illustrated on page 87. The travel is 3 in. by $1\frac{1}{4}$ in. Another model has a rotating circular stage with centring adjustments, either plain or with mechanical motions.

Four forms of substage are provided. They are all focussed by rack and pinion motion. The simplest form has no centring adjustment and is suitable for use with the non-achromatic condenser. For use with the achromatic condenser a centring substage is required and this is made in two forms, one fixed in the optic axis and the other capable of being swung aside when desired. In the other form the substage apparatus is changed by means of dovetailed (Akehurst) slides. In this the pieces of apparatus where necessary have centring adjustments upon the slides so that they may be individually centred. The great feature of this substage is the rapidity with which the condensers can be interchanged, without disturbance of the adjustments.

Beck Combined Binocular and Monocular Microscope.



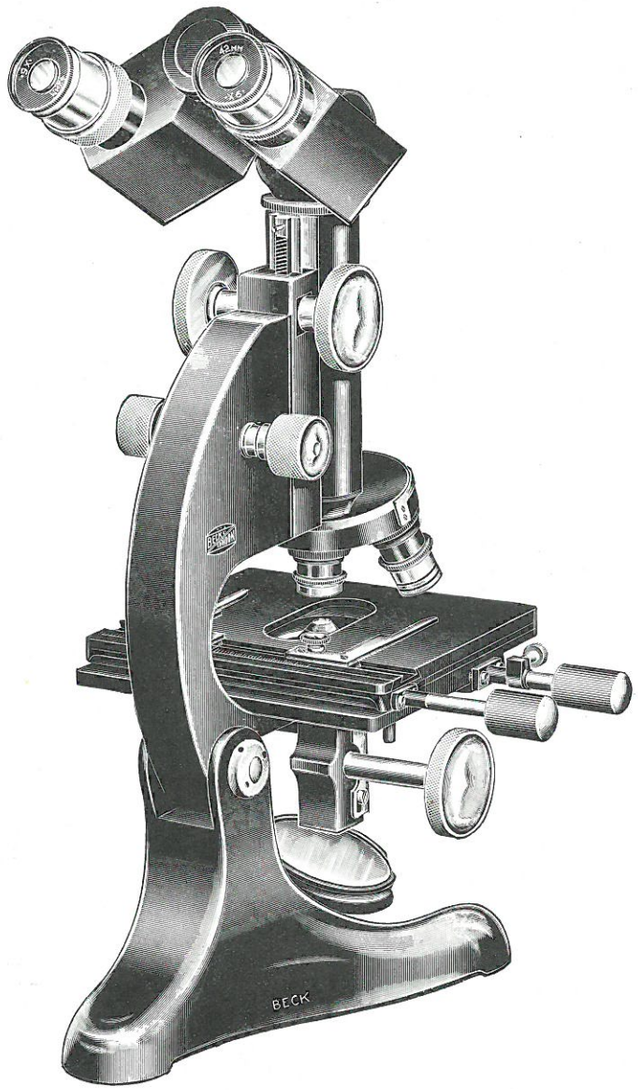
Stand No. 1386.

Combined Binocular and Monocular Microscope.

No. 1335.	Combined binocular and monocular microscope, with plain stage, rack and pinion focussing substage, stand only in case ...	£34 10 0
No. 1336.	As No. 1335 as above with centring substage	35 10 0
No. 1337.	As No. 1336 as above with swing out adjustment to substage ...	36 10 0
No. 1381.	Combined binocular and monocular microscope, inclined eyepieces, with plain stage, rack and pinion focussing substage, stand only in case	41 7 6
No. 1382.	As No. 1381 as above with centring substage...	42 7 6
No. 1383.	As No. 1382 as above with swing out adjustment to substage ...	43 7 6
No. 3305.	Detachable mechanical stage (see page 87) to any of above models extra	6 0 0
No. 3515.	Built-in mechanical stage (see page 87) to any of above models extra	9 10 0
No. 1340.	Combined binocular and monocular microscope, with built in mechanical stage with travel 1½ in. by 1 in., as shown in illustration of microscope page 48, with Akehurst pattern rack and pinion focussing substage stand only in case	45 0 0
No. 1386.	As No. 1340 but with inclined eyepieces	51 17 6
No. 3750.	Topley top stage to mechanical stage on Nos. 1340 and 1386 extra	0 17 6
No. 3752.	Verniers to mechanical stage on Nos. 1340 and 1386 ... extra	1 10 0
	Cut out stage for Nos. 1340 and 1386 ... ... extra	2 0 0
No. 1342.	Combined binocular and monocular microscope circular rotating and centring stage, rack and pinion focussing, centring and swing out substage, stand only in case	39 0 0
No. 1388.	As No. 1342 but with inclined eyepieces	45 17 6
No. 3306.	Mechanical stage to Nos. 1342 and 1388 ... ... extra	12 0 0

Optical outfits including eyepieces, object glasses, condensers, dark ground illuminators and double, triple and quadruple nosepieces will be found on page 54.

No. 29 Inclined Binocular Microscope.



Stand No. 29 MB.

No. 29 Inclined Binocular Microscope.

This microscope is a further model of the popular No. 29 London series, having high power binocular body with inclined eyepieces. The advantages and comfort of use of this type of binocular are fully dealt with in the preceding pages. The optical qualities are of the highest order and all powers of object glasses, including the oil immersion, can be employed. The adjustments of the microscope are fully described on pages 13 to 15, as are also the forms of mechanical stages and substages. The binocular body is provided with the necessary adjustment for setting the interocular distance, and one eyepiece has an adjustment to compensate for any difference in focus between the two eyes.

We have designed for use with this model microscope a ×6 eyepiece with a specially long eyepoint, and we advise this to be selected due to the extra comfort in use afforded. The cost is slightly higher than the ordinary ×6 Huyghenian eyepiece and is given on page 54. This applies only to power ×6, all other eyepieces being satisfactory for use with the No. 29 Inclined binocular.

The No. 29 Inclined binocular is supplied only as a binocular instrument; it cannot be converted into a monocular model.

No. 29 B.B.	Stand only with plain stage and swing out substage with focussing screw, in case	£	23	0	0
No. 29 B.D.	Stand only with plain stage and rack and pinion focussing substage, in case		24	15	0
No. 29 B.C.	Stand only with plain stage and rack and pinion focussing and centring substage, in case		25	15	0
No. 3305.	Detachable mechanical stage to any of above instruments ... extra		6	0	0
No. 29 J.B.	Stand only with built in mechanical stage (No. 3515, page 87) and swing out substage with focussing screw, in case		33	0	0
No. 29 K.B.	Stand only with built in mechanical stage (No. 3515, page 87) and with rack and pinion focussing substage, in case		35	0	0
No. 29 L.B.	Stand only with built in mechanical stage (No. 3515, page 87) and with rack and pinion focussing and centring substage, in case		36	0	0
No. 29 M.B.	Stand only with built in mechanical stage (No. 3515, page 87) and with rack and pinion focussing, centring and swing out substage, in case		37	0	0
No. 3818.	Teak cabinet in place of oak case, screwed, for tropical climates ... extra		1	5	0

Optical outfits, including eyepieces, object glasses, condensers, dark ground illuminators and double, triple and quadruple nosepieces, will be found on page 54.

OPTICAL OUTFITS FOR ANGULAR, COMBINED BINOCULAR AND MONOCULAR, AND No. 29 INCLINED BINOCULAR MICROSCOPES.

Set F.	No. 3285.	Condenser and iris diaphragm	£1 9 6		
	No. 3260.	2 pairs Eyepieces (×6) and (×10)	2 8 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. 3300.	Double nosepiece	1 1 0		
				£10	3 6
Set G.	Set as above, but with				
	No. 3235.	1/12 in. Oil immersion object glass (2 m/m.) and No. 3301 triple nosepiece in place of No. 3300 double nosepiece		£17	2 6
Set H.	No. 3288.	Achromatic condenser in centring fitting	£6 10 0		
	No. 3260.	3 pairs Eyepieces, (×6), (×10) and (×15) ...	3 12 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. 3235.	1/12 in. Oil immersion object glass 2 m/m.	6 10 0		
	No. 3298.	Stop for 1/12 in object glass	0 2 6		
	No. 3293.	High power focussing dark ground illuminator in centring fitting	6 2 6		
	No. 3302.	Quadruple nosepiece	1 15 0		
				£33	2 0
	No. 3260B.	Extra for ×6 long eyepoint eyepieces for No. 29 Inclined binocular		£0	13 0

OPTICAL OUTFITS WITH APOCHROMATIC OBJECT GLASSES.

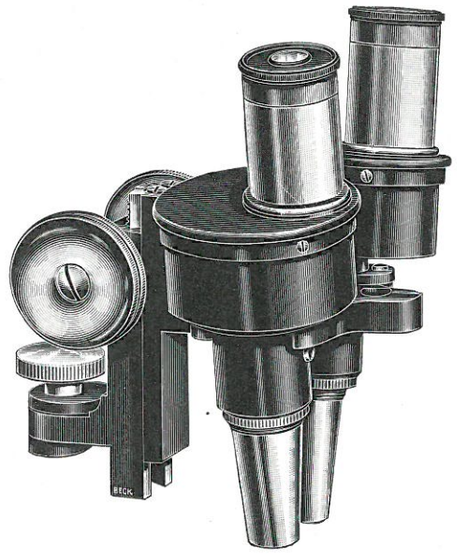
Set J.	No. 3288.	Achromatic condenser in centring fitting	£6 10 0		
	No. 3266 and 3268.	2 pairs Compensating eypieces (×6) and (×11)	9 4 0		
	No. 3241.	⅔ in. Object glass 16 m/m.	7 15 0		
	No. 3244.	⅙ in. Object glass 4 m/m.	11 0 0		
	No. 3300.	Double nosepiece	1 1 0		
				£35	10 0
Set K.	Set as above, but with				
	No. 3248.	1/12 in. Oil immersion object glass (2 m/m). N.A. 1.3 and No. 3301 triple nosepiece in place of No. 3300 double nosepiece ...		£53	19 0
Set L.	No. 3291.	Dry and immersion achromatic condenser N.A.1.3 in centring fitting	£10 10 0		
	No. 3266, 3268, 3270.	3 pairs Compensating eyepieces (×6), (×11) and (×25)	14 4 0		
	No. 3241.	⅔ in. Object glass 16 m/m.	7 15 0		
	No. 3242.	⅓ in. Object glass 8 m/m.	9 10 0		
	No. 3244.	⅙ in. Object glass 4 m/m.	11 0 0		
	No. 3250.	1/12 in. Oil immersion object glass (2 m/m.) N.A. 1.2, with stop to N.A. .95	18 0 0		
	No. 3249.	1/12 in. Oil immersion object glass, N.A. 1.4 ...	25 0 0		
	No. 3293.	High power focussing dark ground illuminator in centring fitting	6 2 6		
	No. 3302.	Quadruple nosepiece	1 15 0		
				£103	16 6

If the microscope stand is fitted with centring substage, the cost of achromatic condensers and high power focussing dark ground illuminator is reduced 15s. 0d.

Any apparatus can be omitted from these sets or other apparatus added at a corresponding difference in price.

Binomax Low Power Binocular.

The advantages of the Binomax binocular for certain classes of examination are numerous, and of great importance. The saving of eyestrain by the use of both eyes is well known, as no fatigue is experienced even over long periods of working. In addition to this, the binocular, having two object glasses, gives a true stereoscopic image which shows the object in its natural relief and consequently gives a true picture similar to what is seen by the eye, except that it is on a large scale.



The image seen is not inverted or reversed right and left, which is an essential feature when the object under the microscope consists of a material which is being manipulated by the observer, as in the case of dissection. The working distance in the space between the object glasses and the object when focussed, is very long, so that there is ample room for the employment of instruments. The field of view is large, as will be seen by the table page 56. Wide field eyepieces giving an exceptional large field, are made for the ×8 and ×32 power.

The Binomax binocular consists of two complete microscope systems inclined to each other at the natural convergence of the eye and each has a prismatic erecting arrangement. The interocular distance is adjusted to suit the observer's eyes by revolving the prism boxes. Four magnifying powers are given, these being 4, 8, 16 and 32. These powers are obtained by using two powers of eyepiece and by reversing the object glasses in the mounts. Each object glass is so threaded that it can be screwed into the body in two positions, one in which the tubular mount projects and the other in which the mount is inside the body. By this means the distance between

object glass and eyepiece is made to differ and the magnifying power altered. The following table gives particulars of magnifying power, working distance and field of view with the two forms of eyepiece.

Magnifying powers.	Working distance.	Diameter of field of view with Huyghenian eyepieces	Diameter of field of view with wide field 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.

A rack and pinion focussing motion is provided.

The Binomax binocular is suitable for examining either transparent or opaque objects. For transparent objects it is mounted on a stand provided with stage and mirror. For opaque objects other stands are made to suit various purposes and the light may be thrown upon the objects from the top either by means of a separate lamp, preferably with a suitable condenser, or by means of an attachment fixed to the binocular which throws a concentrated beam of light on to the object.

The purposes to which the Binomax binocular can be put are too numerous to detail, but the following description of some of the more usual types of work for which it is employed may be of interest.

Medical purposes : For examining skin, hair, bones, teeth and similar material, for examining plate cultures and dissection. It is an excellent corneal microscope.

Botanical specimens, leaves, stems, pollen, etc.

Engineering work : For the examination of castings for defects, flaws in metal.

Foundry work : For examination of metal and finished castings and materials used such as sand.

Repetition parts : For examining shape of teeth in gears, screwthreads, shape and finish of stampings, finish of turned parts, etc.

Instrument manufacture, watch and clock making : For inspecting small parts for accuracy and finish, and especially for the examination of pivots and jewels for scratches and flaws.

Paints, varnishes, printing inks, and enamels : For examining materials used in production and for examining finished work.

Textiles and paper : For raw and finished materials.

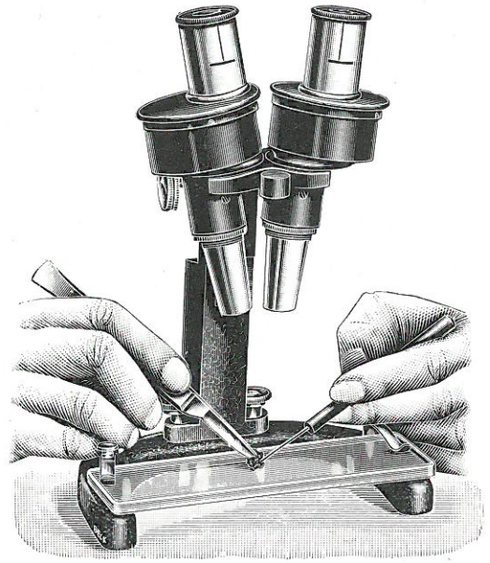
Grain size and regularity in chemicals, abrasives, powders and food products.

Printing block manufacture and stereotyping examination : For defects.

Pottery : For clays, glazes and finished work.

Manuscripts, pictures, stamps, etchings and photogravures, finger-prints.

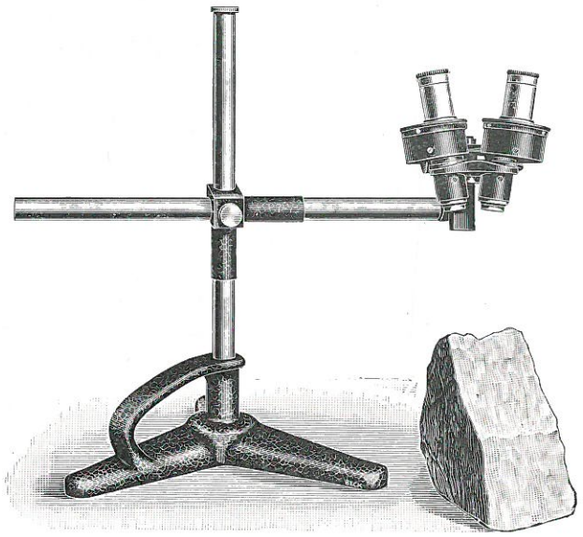
The Binomax binocular is fitted to a variety of stands to suit different purposes. It is so arranged that it can be used interchangeably on any form of the stands listed, so that if desired one Binomax binocular can be purchased and several stands employed.



No. 3760.

No. 3760. Binomax with rack and pinion focussing motion on horseshoe stand. 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 it is desired to examine a large surface, the whole stand can be placed upon it and the magnifier racked down to focus upon the surface.

No. 3762. Binomax with rack and pinion focussing motions on heavy table stand. This stand possesses the same adjustments as the table clamp No. 3761. The maximum height from table is 15½ in., and the length of cross bar, 10 in.



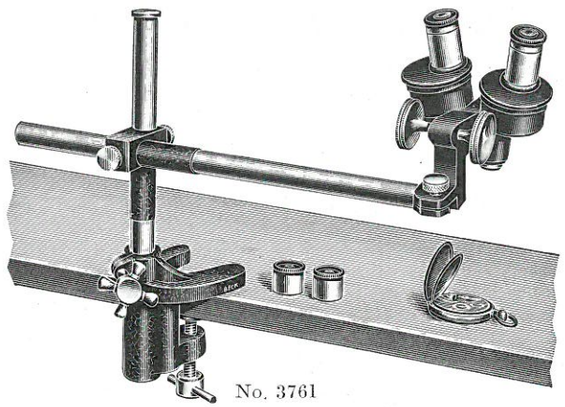
No. 3762



No. 3763

No. 3763. Binomax, mounted on base, provided with large square stage, joint for inclination and double mirror for illuminating transparent objects. Hand-rests can be provided if required. This illustration shows the lighting attachment (No. 3766) for illuminating opaque objects. The instrument is contained in a cabinet.

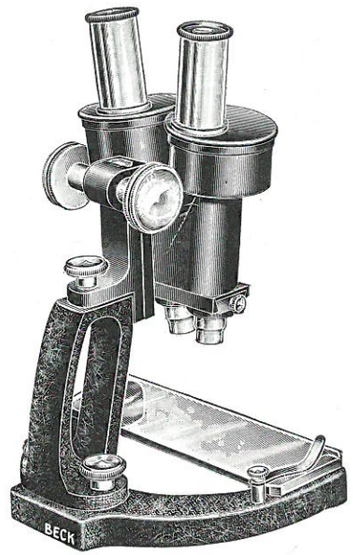
No. 3761. Binomax with rack and pinion focussing motion on table clamp stand In this stand a substantial table clamp holds a rod adjustable in height, and which can be clamped at any required position. Moving up and down this is a fitting, which can also be clamped, and which carries a cross bar to which 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.



No. 3761

No. 3760.	**Binomax binocular** on horse-shoe stand complete with two pairs of Huyghenian eyepieces and object glasses	£16	11	6
No. 3761.	As above but on universal table clamp stand	19	10	0
No. 3762.	As above but on universal table stand	19	10	0
No. 3763.	As above on stand with base, stage and double mirror	19	7	6
No. 3764.	**Hand rests** for No 3763	0	13	0
No. 3822.	Stand No. 3763 if supplied separately	4	7	6
No. 3823.	Stand No. 3760 if supplied separately	1	11	6
No. 3824.	Stand No. 3761 if supplied separately	4	10	0
No. 3825.	Stand No. 3762 if supplied separately	4	10	0
No. 3766.	**Illuminating attachment** for illuminating opaque specimens, as illustrated on No 3763. This employs a small electric lamp, 12 volt, which can be run off accumulators, or direct from the current by by means of a resistance or transformer	3	0	0
No. 3767.	**Resistance** for No. 3766, suitable for voltages from 100—240	2	5	0
No. 3771.	**Transformer** for No. 3766, suitable for alternating current (please specify available current when ordering)	1	2	6
No. 3769.	**Spare lamps** for No. 3766	0	2	0¶
No. 3775.	**Wide field eyepieces** giving large field of view for the powers × 8 and × 32 in place of high power Huyghenian eyepieces. Extra per pair	2	6	0

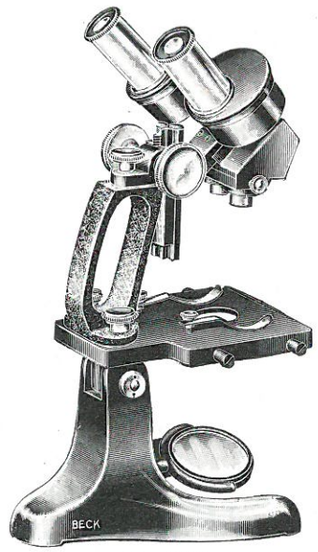
Greenough Binocular Microscope.



No. 3206



No. 3205H



No. 1720

Greenough Binocular Microscope.

This microscope is a further type of low power binocular, and the descriptive matter given on pages 55 and 56 covering the characteristics and uses of this form of microscope apply also to the Greenough.

With the Greenough model it is possible to employ different powers of object glasses as well eyepieces, which enables higher magnifications to be obtained.

The following table gives the range of magnifying powers obtainable as well as the working distances.

No.	Focal Length.	Working distance.	×6 eyepiece 42 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 object glasses are mounted in pairs upon slides which, by means of their dovetailed edge, are attached and interchanged in the corresponding slide upon the nosepiece of the body. These dovetailed slides are accurately made, so that the various object glasses take up their correct position when they are attached. The body has an adjustment for setting the instrument at the correct interocular distance for the observer.

The microscope is supplied in the usual form, also in a form in which the eyepieces are inclined. Where the microscope must be kept in a vertical position, due to the use of troughs of liquid and for other reasons, the inclined model is a great convenience as it enables the observer to retain a comfortable sitting position and avoid stretching over the instrument as is the case with a vertical model.

The Greenough binocular can be mounted in various ways as in the case of the Binomax. No. 3205 has the binocular with rack and pinion focussing adjustment mounted on to a limb which is attached to a base and stage, as shown in the illustration. This has a joint for inclination and also has a mirror for illuminating transparent objects placed upon the stage. Hand rests can be provided which are attached to the sides of the stage, and the whole microscope is an excellent one for dissecting and also for general observations of mounted specimens or objects suitable for placing upon the stage. No. 3206 has the Greenough binocular mounted upon a horseshoe stand as illustrated. This is also suited for dissection and for the examination of unmounted solid objects, which must be illuminated by top lighting. No. 3028 and No. 3029 have the Greenough binocular mounted upon universal stands as Binomax Nos. 3761 and 3762 (pages 57 and 58). These stands have similar adjustments, the difference being that one is made to clamp upon the edge of a bench or table, and the other has a heavy base for standing upon a table. They give large adjustment for height and position, and are suitable for the examination of irregular shaped objects of considerable size. Such objects can be stood upon a bench and the binocular microscope moved and inclined to a convenient position for observation. The Greenough binocular itself, with its rack and pinion focussing motion, is interchangeable upon all these stands, so that advantage of the various forms of stand can be taken by having a selection of stands with one binocular.

Greenough Binocular Microscope

No. 3205.	Greenough binocular on stand with stage and base, in case	£17 5 0
No. 3205H.	Greenough binocular on stand with stage and base, in case, with hand rests, in case	18 0 0
No. 3206.	Greenough binocular on horseshoe stand	12 16 6
No. 3028.	Greenough binocular on universal stand with table clamp	15 15 0
No. 3029.	Greenough binocular on universal stand with table stand	15 15 0
No. 1720.	Greenough binocular, inclined eyepieces, on stand with stage and base in case	21 5 0
No. 1720H.	Greenough binocular, inclined eyepieces, on stand, with stage and base and with hand rests, in case	22 0 0
No. 1721.	Greenough binocular, inclined eyepieces, on horse shoe stand ...	16 16 6
No. 1722.	Greenough binocular, inclined eyepieces, on universal stand with table clamp	19 15 0
No. 1723.	Greenough binocular, inclined eyepieces, on universal stand with table stand	19 15 0

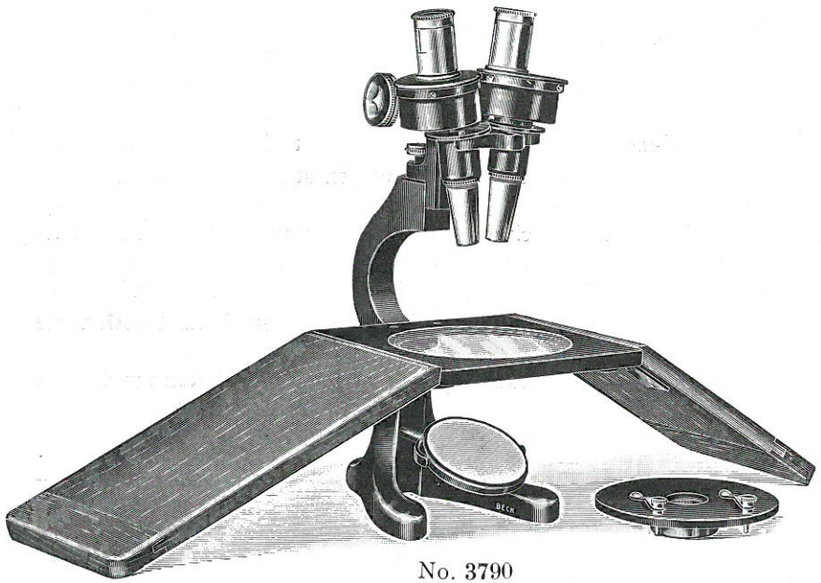
SUGGESTED OPTICAL OUTFITS FOR USE WITH ABOVE.

Outfit A.	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.	Pair of eyepieces, 42 m/m. (× 6)	1 4 0	
				£9 4 0
Outfit B.	Outfit A		£9 4 0	
	No. 3013.	Pair of object glasses, 16 m/m.	5 10 0	
	No. 3260.	Pair of eyepieces, 25 m/m. (× 10)	1 4 0	
				£15 18 0
Outfit C.	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 wide field 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. 3310.	Tubular substage	0 5 0	
				£26 4 0

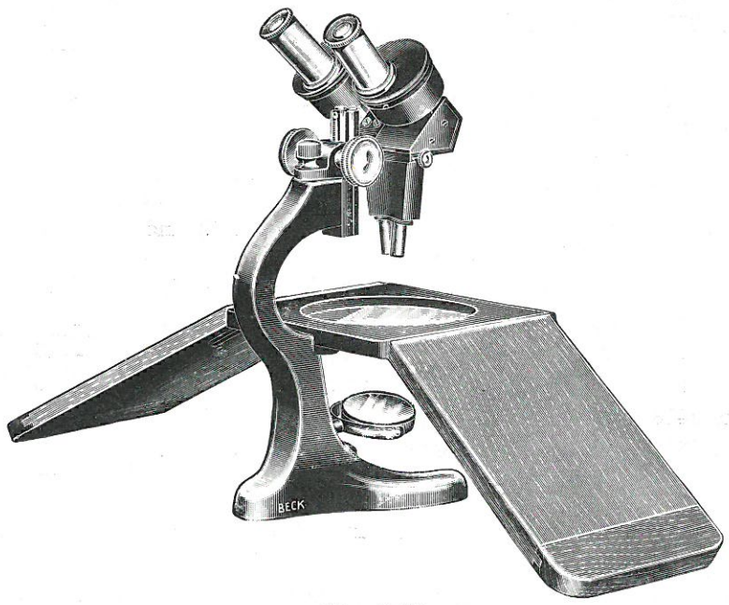
Extra stands, if supplied separately :—

No. 3822.	Stand with base, stage and mirrors	£4 7 6	
No. 3823.	Horseshoe stand	1 11 6	
No. 3824.	Universal stand with table clamp	4 10 0	
No. 3825.	Universal stand with table stand	4 10 0	

Platen Dissecting Microscope.



No. 3790



No. 3793

Platen Dissecting Microscope.

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 not only are the hands given support but also the forearms, giving far greater comfort. The stage is 6 in. square and is recessed to receive either a glass plate or a brass plate with stage clips. The brass stage enables a substage to be fitted for the employment of substage apparatus. The mirror is of extra large size, opal glass on one side, and silvered on the other.

A binocular microscope is employed on this instrument, as the use of the two eyes saves fatigue and gives great comfort, especially when the microscope is used continuously over considerable periods.

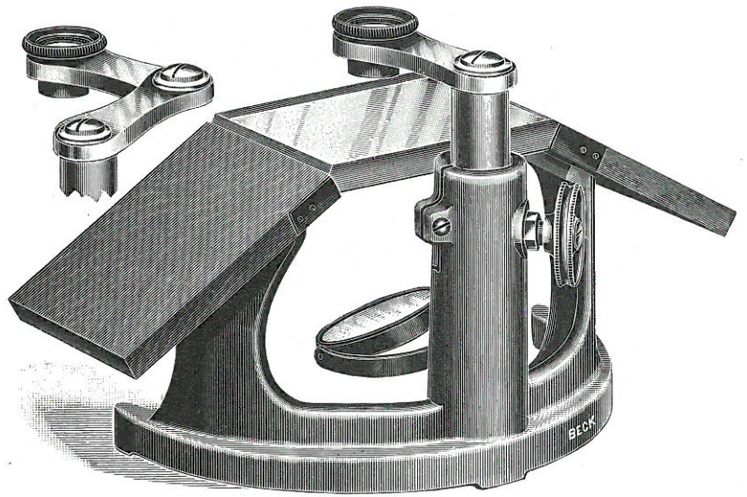
Three forms of binocular are fitted as follows :—

No. 3790 has the Binomax microscope, as described on pages 55 and 56.
No. 3791 has the Greenough Binocular, described on page 60.
No. 3793 has the Greenough Binocular, inclined eyepieces, described on page 60.

The addition of wide field eyepieces is recommended, as a large field of view is of great advantage for dissection.

No. 3790.	Stand with Binomax microscope, with object glasses and Huyghenian eyepieces giving powers ×4, ×8, ×16 and ×32			£22 5 0
No. 3775.	Pair of wide field eyepieces for powers ×8 and ×32, in place of high power Huyghenian eyepieces extra			2 6 0
No. 3791.	Stand with Greenough binocular, without object glasses or eyepieces ...			18 10 0
No. 3791A.	Stand with Greenough binocular	£18 10 0		
	No. 3011. Pair of object glasses, 59 m/m.	3 10 0		
	No. 3012. Pair of object glasses, 32 m/m.	4 10 0		
	No. 3260. 2 pairs of Huyghenian eyepieces, 42 m/m. (×6) and 25 m/m. (×10)	2 8 0		
				£28 18 0
No. 3791C.	Stand with Greenough binocular	£18 10 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 Huyghenian eyepieces 42 m/m. (×6) and 25 m/m. (×10)	2 8 0		
	No. 3775. Pair of wide field eyepieces 17 m/m. (×15) ...	3 10 0		
				£41 8 0
No. 3793.	Stand with Greenough binocular, inclined eyepieces, without object glasses or eyepieces			£22 10 0
No. 3793A.	Stand with Greenough binocular, inclined eyepieces ...	£22 10 0		
	No. 3011. Pair of object glasses, 59 m/m.	3 10 0		
	No. 3012. Pair of object glasses, 32 m/m.	4 10 0		
	No. 3260. 2 pairs of Huyghenian eyepieces 42, m/m. (×6) and 25 m/m. (×10)	2 8 0		
				£32 18 0
No. 3793C.	Stand with Greenough binocular, inclined eyepieces ...	£22 10 0		
	No. 3010. Pair of object glasses, 59 m/m.	3 10 0		
	No. 3011. Pair of object glasses, 49 m/m.	4 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 Huyghenian eyepieces, 42 m/m. (×6) and 25 m/m. (×10)	2 8 0		
	No. 3775. 1 pair of wide field eyepieces, 17 m/m. (×15) ...	3 10 0		
				£46 8 0
No. 3792.	Brass stage interchangeable with glass stage	... ...		0 15 0
No. 3310.	Tubular substage fitted to brass stage No. 3792	... ...		0 5 0
No. 3357.	Spot lens for dark field illumination	... ...		1 0 0

Crescent Dissecting Microscope.



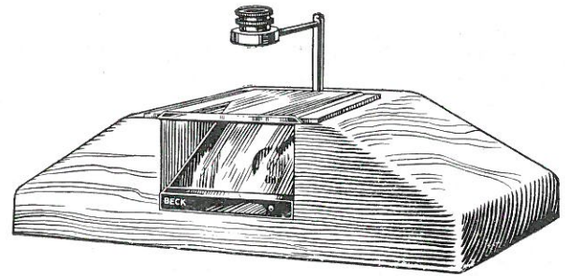
No. 3020.

The design and construction of this instrument have been specially considered with a view to perfect rigidity. Many dissecting microscopes are made on the lines of an ordinary microscope stand, that is with a small base and pillar and a stage with the addition of hand rests. 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 base is a heavy casting on three projecting feet and with two uprights to support the hand rests and stage. The supports are directly under the hand rests, so that weight and pressure upon them have no tendency to tip the instrument. 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 material of considerable thickness can be accommodated. The hand rests are of hard wood and the stage is a thick plate of glass. A mirror is provided below the stage, silvered on one side and opal glass on the other.

The instrument is supplied with a single swinging arm for holding the lenses or with a double arm which gives greater latitude to the movement of the magnifier over the stage plate.

No. 3020.	Stand only	£2	17	6
No. 3020A.	Stand, 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.



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.

The Cornex dissecting microscope is constructed from a solid block of wood and in use will be found very convenient. The sides of the block are cut away at an 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°.

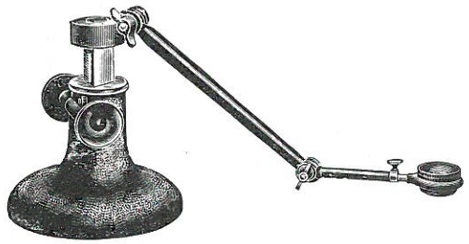
The lenses are carried in an arm which is attached to a rod, the rod being held in a tubular fitting which allows it to be slid up and down for focussing purposes and also to be swung over the stage plate so that objects at different positions can be examined.

With the lenses supplied, magnifications of 7 and 14 are obtained. These lenses are so arranged that they can be used either separately or combined, the higher power being obtained with the two lenses together, the lower power when used separately.

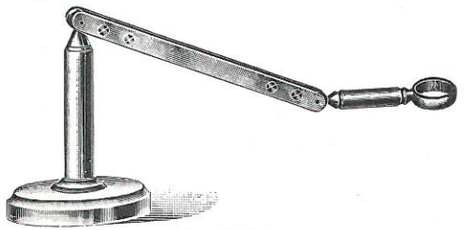
Holes are provided in the top of the microscope into which the lenses can be placed for storage purposes when the instrument is not in use.

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

Dissecting Arms.



No. 3019.



No. 3018.

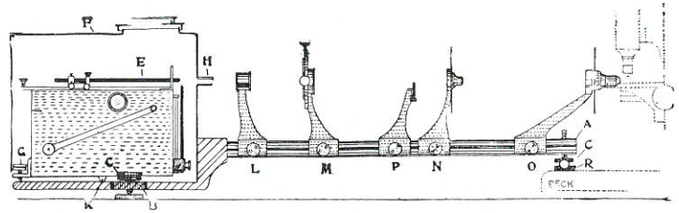
No. 3019.	**Jointed dissecting arm,** mounted on heavy base, rack and pinion focussing adjustment, clamp nuts to joints	£2	2	0
No. 3018.	**Jointed dissecting arm,** simple pattern, mounted on circular base	0	16	6

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

Outfit for Ultra Microscopy.

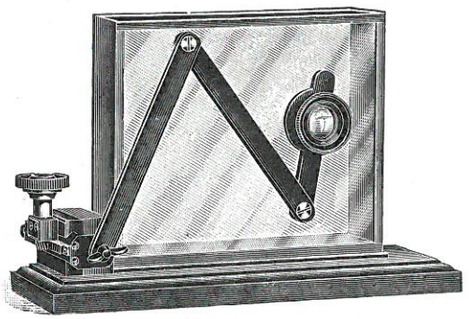
This apparatus provides a complete illuminating system for ultra microscopy which can be used in conjunction with any existing microscope.



The apparatus 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** ... ... £60 0 0¶

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



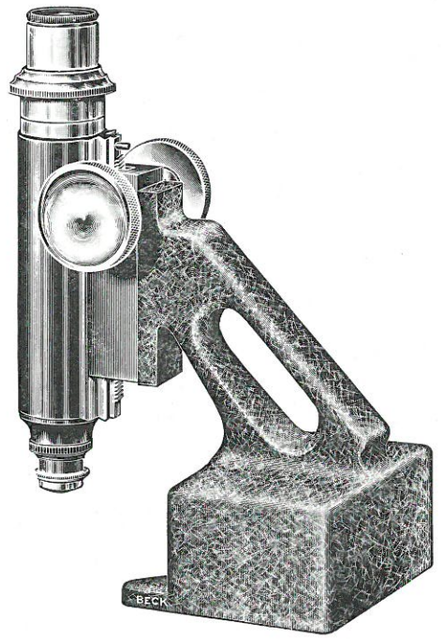
No. 3016.

No. 3016. Aquarium microscope. This instrument consists of a jointed arm moving parallel to the side of an aquarium and carrying either a single lens or an aplanatic magnifier. 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 one 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,** $6\frac{1}{8}\times5\times1\frac{1}{2}$ in. ... ... 0 8 6¶

No. 3195 Bench Microscope.



No. 3195A.

This microscope is of general utility for laboratory and industrial purposes where low and medium powers are required. It is suitable for the examination of any unmounted objects and, being constructed with the microscope overhung from its base, the size of the object is not limited to small specimens.

This construction also has the advantage that delicate surfaces may be examined without having to place the instrument on the surface itself. When fitted with micrometers and calibrated, it forms an excellent microscope for measurement. The focussing is by a smooth working rack and pinion adjustment. Draw tube is provided which enables the instrument to be set to give a definite magnification when needed for measuring. The instrument is of solid construction, being stable and rigid in use.

No. 3195. **Bench microscope,** stand only £4 17 6

No. 3195A. Bench microscope £4 17 6

No. 3260. Eyepiece, 42 mm. (×6) 0 12 0

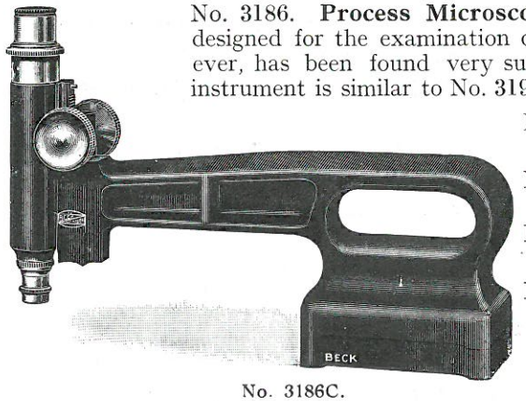
No. 3230A. 1½in. Object glass, 32 mm., without box 1 3 0

No. 3231A. ⅔ in. Object glass, 16 mm., without box 0 12 0

Magnification, ×25 to ×80. ——— £7 4 6

No. 3195M. **Bench microscope** for measuring, giving magnifying power of 100 each division in eyepiece representing 1/50 mm. £7 0 0

No. 3224. **Oak case,** with handle and lock and key... ... ... £0 17 6



No. 3186C.

No. 3186. **Process Microscope.** This model of microscope was primarily designed for the examination of the etching of process plates. Its design, however, has been found very suitable for many other purposes. In the main the instrument is similar to No. 3195, but the overhang of the microscope is 7 in.

No. 3186. **Process microscope,** stand only £4 17 6

No. 3186C. Process microscope £4 17 6

No. 3260. Eyepiece, 42 mm. (×6)... 0 12 0

No. 3230A. ⅔ in. Object glass, 16mm. without box 0 12 0

——— £6 1 6

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

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 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. 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. It will work well for light slightly different from 2,753 AU if a suitable change in the tube length is made.

The focus of a monochromatic lens is in a different position for every wavelength of light. It 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 object glass 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.

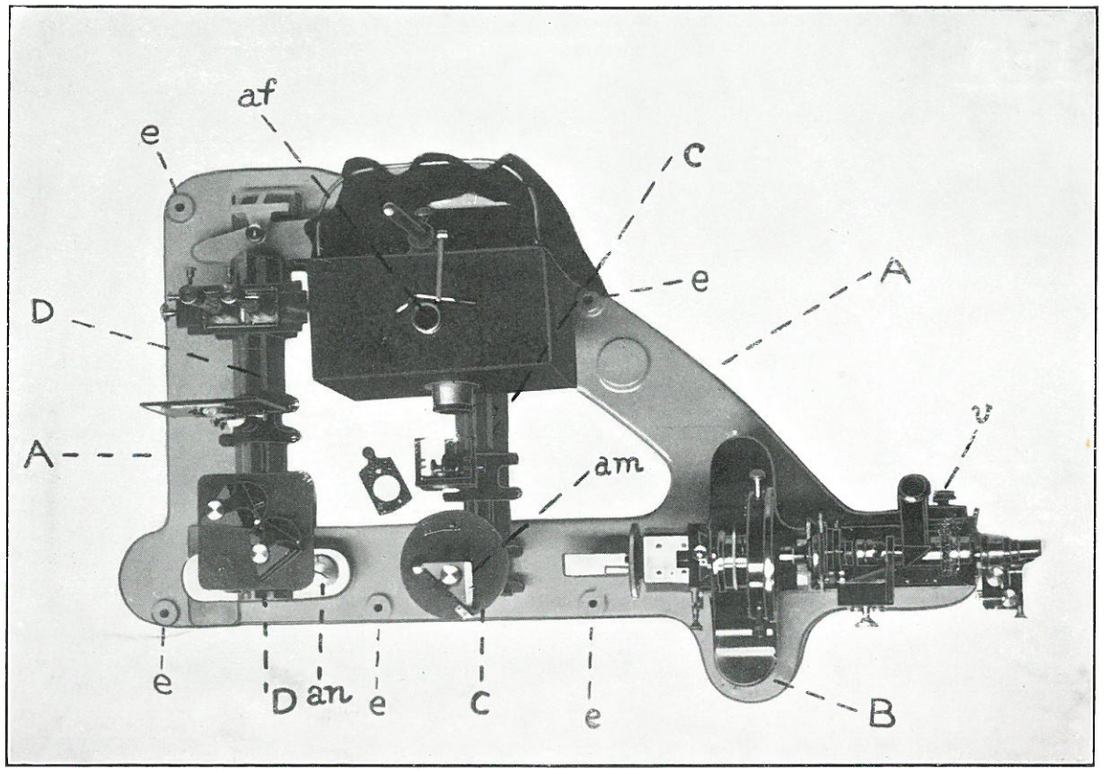
The instrument is so made that this duplex condenser can be changed for a dark ground illuminator by means of a dovetailed slide in the substage into which both pieces of apparatus drop interchangeably. This ultra-violet dark ground illuminator is a reflecting apparatus made from a metal which has a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

The camera is made to attach to the bedplate 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 slide, 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 cements 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 :—

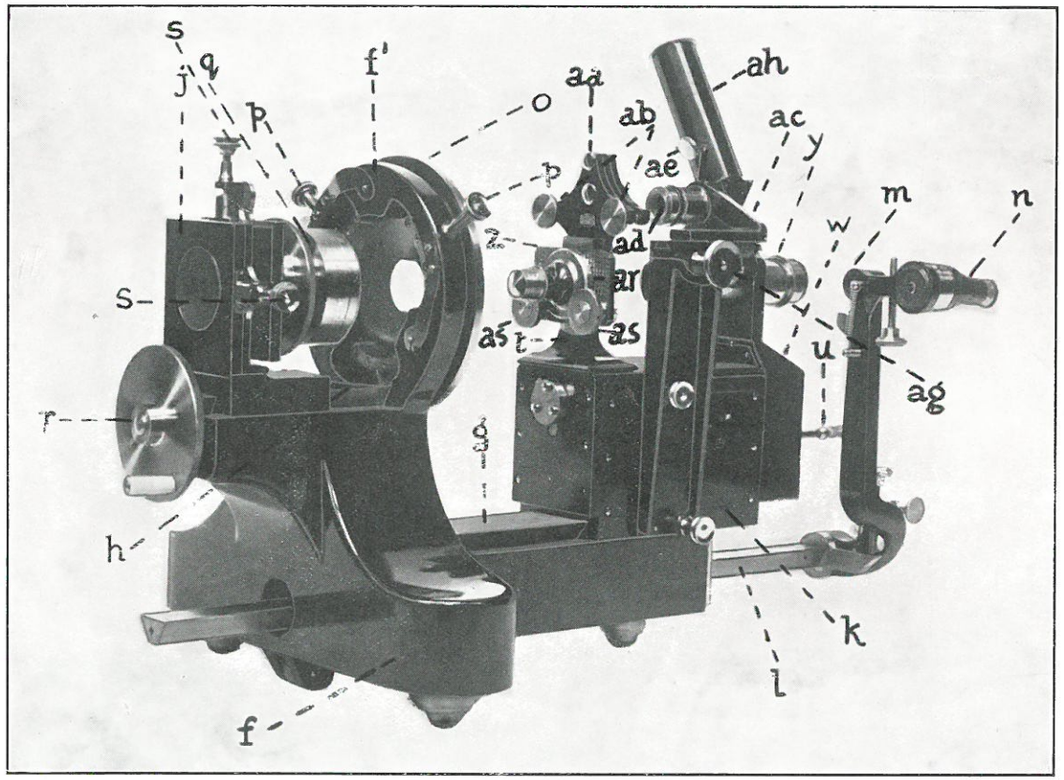
(A) A massive iron bedplate (A, Fig. 1).
(B) The microscope (Figs. 2 and 3 and B, Fig. 1).
(C) The optical bench for illumination with visible light (C, Fig. 1).
(D) The optical bench for ultra-violet illumination (D, Fig. 1).

(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.

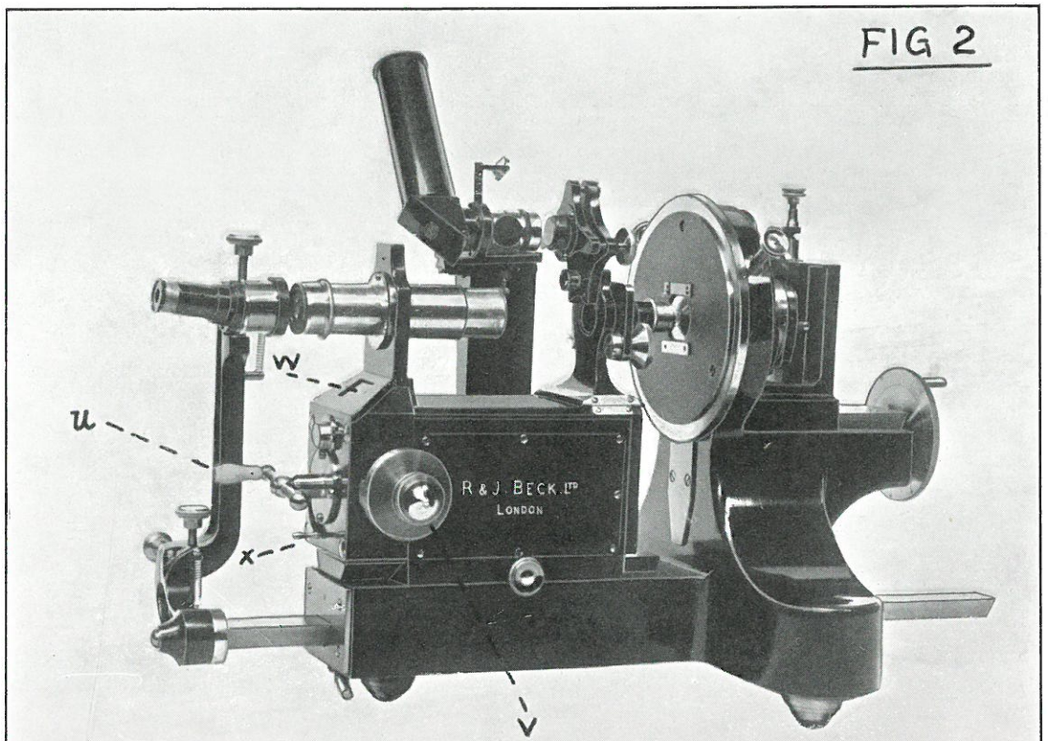
(B) The microscope is illustrated in Figs. 2 and 3. It consists of an iron casting (*f*, Fig. 3) of great rigidity which stands on three toes. Upon it are two dovetail slides (*g* and *h*). The slide (*g*) carries the focussing unit (*k*) and the slide (*h*) carries the substage (*j*). Running in a slide 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 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 adjust a pair of objectives, accurately, 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. An improved form has since been devised in which each object glass is carried in an adjustable frame in place of the rings above described. Three such frames are now supplied with each outfit.

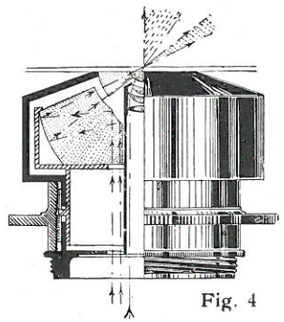


Fig. 4

Duplex dark ground (visual) and transmitted 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 with transmitted light is employed according to which source of illumination is being used. For dark ground illumination with ultra-violet light a special type of illuminator devised by Mr. Smiles is supplied which gives a powerful illumination and with which short exposures can be given.

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, three Barnard interchangeable object glass holders, detachable camera and plate 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.

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.

Price quoted 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.

In ordinary object glasses, 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 near to the theoretical resolving power as is attainable. 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 m/m. 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 coverglass ·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, unless short mounted, when a small extra charge is made.

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.

A special characteristic of the No. 3234A 4 m/m. Achromatic object glass N.A. 0·65 is its working distance. This is 1 m/m and therefore is particularly suitable for use with haemacytometers as it permits for the use of the thick cover glasses and allows a good margin for focussing. The No. 3007 8 m/m. Achromatic object glass which has a long working distance of 5½ m/m. will be found invaluable to those who study life. It will also prove of service to workers who require a moderately high power but must have a long working distance.

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 ½ m/m. slides, the full aperture being employed. For thicker slides up to 1½ 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 (2 m/m.) N.A. 1, achromatic object glasses are suitable for use with any type of high power dark ground illuminator with a slide 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.

Monochromatic object glasses are also made, one specially for metallurgical purposes with the exceptionally large aperture of N.A. 1·6, also a series is made for use with ultra violet light. These will be found described on the following page. These object glasses have been found most satisfactory in use by those who employ them for their special purposes and very successful work has been carried out with them.

Microscope Object Glasses.

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
****3252**	1	25	·28	38	63	95	7	10	13	2 15 0
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
***3007**	⅓	8	·36	115	200	285	20	30	40	2 15 0
3239	¼	6	·85	180	300	450	30	45	70	4 5 0
3234	⅙	4	·85	285	490	690	40	60	80	3 15 0
3234 a	⅙	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
***3251**	1/12	2	1·0	530	900	1275	60	100	150	3 18 6
***3235**	1/12	2	1.2 or 1·3	530	900	1275	60	100	150	6 10 0

APOCHROMATIC OBJECT GLASSES.

No.	English designation. inches.	Focal length. m/m.	Numerical 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	6 0 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. **This object glass has a working distance of 9 m/m.
†Including stop to reduce aperture to ·95 N.A. ***This object glass has working distance of 5½ mm.
§Provided with collar correction for using cover glasses of different thicknesses.

MONOCHROMATIC OBJECT GLASSES.

Monochromatic metallurgical object glass. This object glass has a numerical aperture of 1·6 and is corrected for use with deep blue light. It is an immersion object glass, Monobromide of naphthalene being the fluid employed.

	Focus.	Numerical aperture.	
No. 3674 ...	2·25 m/m.	1·6	£25 0 0

Monochromatic object glasses for ultra-violet light. This series are for use with light of a wave length 2756 A.U. The 6 m/m. is a dry lens the 3 m/m. and 2 m/m. being used in immersion, the fluid used is a mixture of glycerine and water.

	Focus.	Numerical aperture.	
No. 3675 ...	6 m/m.	0·07	
No. 3676 ...	3 m/m. (immersion)	1·2	... ... Prices on application.
No. 3677 ...	2 m/m. (immersion)	1·3	

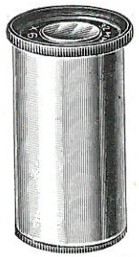
Monochromatic object glasses for metallurgy with ultra-violet light. These are similar to the above but corrected for use with a vertical illuminator and uncovered objects.

	Focus.	Numerical aperture.	
No. 3678 ...	16 m/m.	0·25	
No. 3679 ...	6 m/m.	0·70	... ... Prices on application.
No. 3682 ...	2 m/m. (immersion)	1·4	

Microscope Eyepieces.

All eyepieces except Nos. 3253-5 are made to fit easily into the Royal Microscopical Society's No. 1 Standard, ·917 in. 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.

Huyghenian eyepieces



	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.	
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

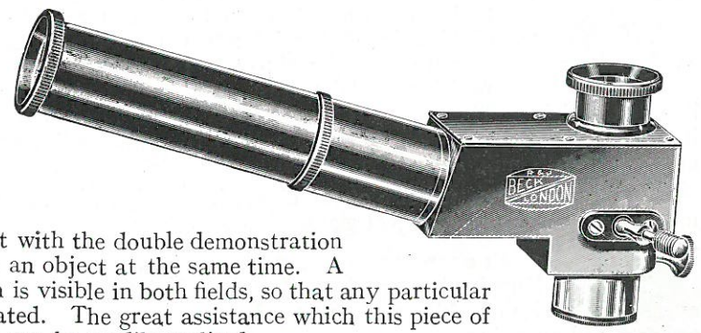
Projection eyepieces. These are specially corrected for photomicrography and projection and give a flatter field than the lower power Huyghenian and compensating eyepieces.

	Focal length.	Magnifying power.	
No. 3685	42 m/m.	× 6	£2 2 0
No. 3686	25 ,, ...	×10	2 10 0

Wide field eyepieces. These eyepieces give a field of view about 40% larger than either the Huyghenian or compensating eyepieces and are especially useful for searching. They also have an advantage for those who use spectacles in that the eyepoint is further away from the upper lens.

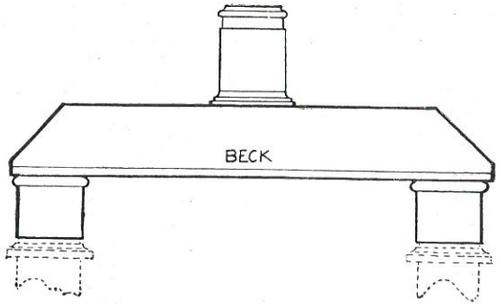
	Focal length.	Magnifying power.	
No. 3773	25 m/m.	×10	£1 15 0
No. 3774	21 ,, ...	×12	1 15 0
No. 3775	17 ,, ...	×15	1 15 0

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



In instructional work, an observer using a microscope frequently desires to show the object under examination to a second person and point out some feature which he wishes to demonstrate. This is difficult with the ordinary microscope, but with the double demonstration eyepiece two persons can observe an object at the same time. A movable pointer is provided which is visible in both fields, so that any particular part of the specimen can be indicated. The great assistance which this piece of apparatus can render in teaching can be readily realised

Microscope Eyepieces.



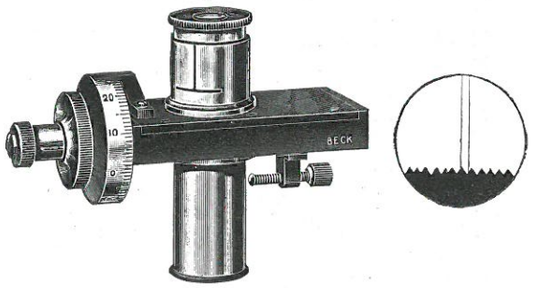
No. 3259

No. 3259. **Comparator eyepiece** £10 10 0

This eyepiece is for use with two microscopes, for giving in one eyepiece, the images in each microscope combined into one field of view for comparison purposes.

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

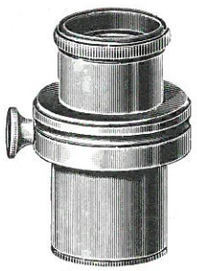
This is a compound eyepiece for use with a 16m/m ($\frac{2}{3}$ inch) object glass. With this object glass it gives a magnifying power 10 to 40 diameters by extending the drawtube and a very large field of view. It gives an erect instead of an inverted image and is particularly useful for dissecting.



No. 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.



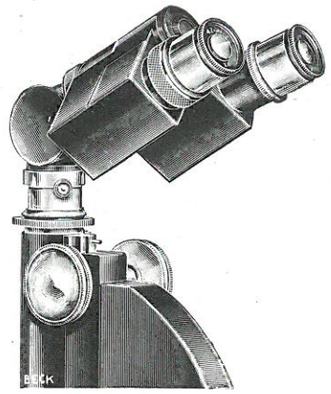
The scale (see diagram) is in millimetres with a vernier reading to 1/10th of a m/m. On the left is a vertical series of divisions divided in half millimetres for rough measurement. For fine measurement the object to be measured is placed in a horizontal position, and is measured to 1/10th m/m. by use 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.

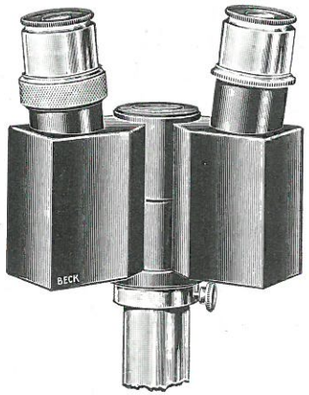
No. 3256. **Ehrlich eyepiece** £3 10 0

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 m/m. It is useful for measurement of areas or for blood counting.

High Power Binocular Attachment.



No. 3781 Inclined model.



No. 3780 Non-inclined model.

This binocular attachment is made in a form which replaces the ordinary eyepiece so that a monocular microscope can be converted into a thoroughly efficient binocular instrument. It is well known that 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. Often however where the worker has already a satisfactory and probably expensive monocular microscope, he is disinclined to dispose of it and purchase a new complete binocular microscope. The Beck binocular eyepiece solves the problem. It has all the qualities of the binocular bodies which are built into microscopes, but is made in a form which permits it to be inserted into any microscope. It can be used with all powers and with any standard objectives, and any eyepieces of the standard (·917″) size. As the full aperture of the object glass is used in each eye, the resolution is unimpaired. A corrector is supplied to compensate for the increased optical path.

The two tubes of the binocular are set in relation to each other at the normal convergence for near objects. The principle of converging tubes in binocular microscopes is discussed on page 49 in connection with our other forms of binocular bodies and applies in the same way to the binocular attachment.

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.

The high power binocular attachment is made in two forms, No. 3780, the non-inclined model and No. 3781, inclined model.

The model 3781 being inclined, allows the microscope to be used vertical, thc eyepieces being in a convenient position for observation.

The model No. 3780 as illustrated on page 79 is suitable where the microscope is used at an inclined position. If used with the microscope vertical it increases the working height of the instrument and may lead to discomfort for the user.

Either form of binocular is suitable for use with microscopes of our make and with many other instruments. It is advisable for us to have the drawtube of the instrument to ensure that there are no obstructions, which would prevent its insertion. If the eyepiece size is not the standard size (·917 in.) a small cost is entailed for adaption.

For use with these attachments we have introduced a power ×6 eyepiece, which has a specially long eyepoint and due to the extra comfort afforded in use, we advise the selection of this type in preference to the ordinary ×6 Huyghenian eyepieces. All other eyepieces catalogued will be found perfectly satisfactory for use with these binocular attachments,

No. 3780. High power binocular, non-inclined (without eyepieces) £10 10 0

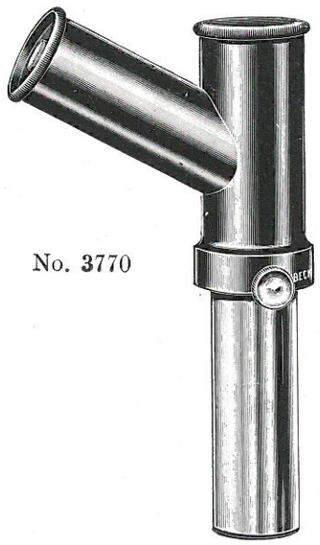
No. 3781. High power binocular, inclined (without eyepieces) 13 10 0

No. 3260b. Huyghenian eyepieces ×6 (42 mm.), with long eyepoint. per pair ... 1 17 0

No. 3261. Huyghenian eyepieces ×10 (25 mm.) per pair 1 4 0

ANGULAR EYEPIECE ATTACHMENT.

When it is necessary to use a microscope vertically, the observer finds that his position when working, gives considerable discomfort. The angular eyepiece bends the path of light so that the eyepiece projects from the microscope at a convenient angle for observation. It will accommodate any power of eyepiece of the standard gauge (·917 in.) and has a correction lens to compensate for the increased optical path.



No. 3770

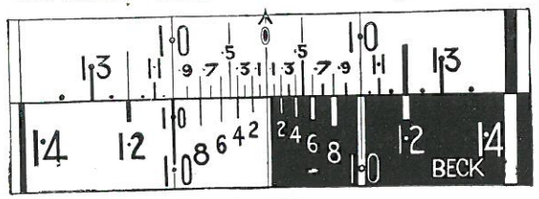
No. 3779. Angular eyepiece attachment.
Without eyepiece Suitable for use with any standard (·917 in.) eyepiece ... £1 15 0

Apparatus for Testing Microscope Object Glasses.

For full information in the selection, use and testing of microscope object glasses, see "The Microscope—Theory and Practice," particulars page 120.

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

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



No. 3379.

No. 3379. **Apertometer** 0 6 0

No. 3385. Brass diaphragm for use in eyepiece with above 0 1 6

No. 3665. **Tube length corrector** 7 10 0

This appliance, designed by the British Scientific Instrument Research Association, screws into the nosepiece of the microscope above the object glass. It consists of two fully corrected optical systems, the separation of which can be varied by turning a milled ring. It has the effect of altering the tube length for which an object glass is corrected without impairing its optical properties.

No. 3358. **Iris diaphragm** to screw into nosepiece of microscope to reduce aperture of object glass £0 16 6



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

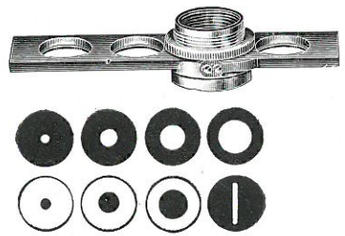


No. 3349.

No. 3349. **Super eyepiece carrier** 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

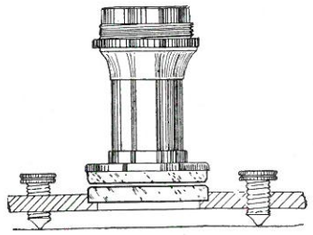
No. 3349B. **Micrometer** to fit on front of Ramsden eyepiece No. 3349A 0 15 0



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

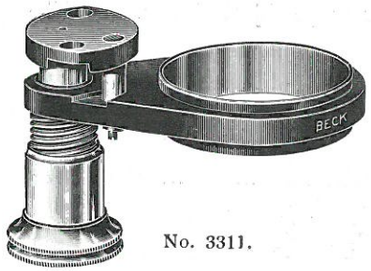


No. 3160.

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 in. ... 0 8 6

Substages and Apparatus.



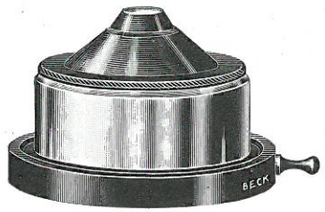
No. 3311.

No. 3311. **Substage,** with focussing adjustment by spiral 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. 3285A. As No. 3285 with the addition of tray for colour screens and patch stops ... 1 14 6

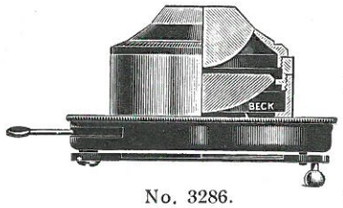
No. 3285P. Set of 3 patch stops for above ... 0 7 6



No 3285.

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

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



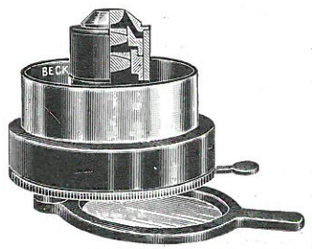
No. 3286.

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

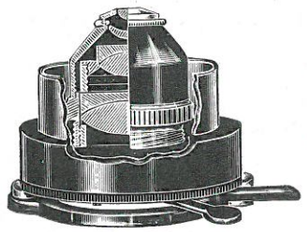
No. 3288P. Set of 3 patch stops for Nos. 3288 or 3291 ... 0 7 6



No. 3288.

No. 3666. **Quartz condenser** for fluorescence work. This is corrected for a wave length of 2750 A.U. It is mounted in a fitting to suit the standard substage or can be mounted on an Akehurst slide. It is fitted with an iris diaphragm 13 10 0

No. 3667 **Quartz condenser** for fluorescence work. Similar in construction to the Abbe condenser and mounted to fit the standard substage 4 10 0


No. 3291.

No. 3668. **Wood's glass filter** 2 in. square. This glass cuts out all visual light except the extreme red of which a very small portion is transmitted 0 15 0

No. 3678. **Mirror** with aluminium reflecting surface for ultra-violet light, 2 in. dia., flat, unmounted 1 1 0

Monochromator for giving beam of pure ultra-violet light Particulars and prices on application.

Objects being examined for fluorescence should be mounted on thin mica or quartz slides. Particulars and prices on application.

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

This illuminator can be accurately focussed for a slide of any thickness from ½ m/m. to 1½ m/m. It has great advantage over the non-focussing condenser, in that, where it is desired to examine already mounted specimens, the thickness of the slide upon which they are mounted is immaterial, provided it is between the above stated limits. In general routine work, the selection of slides for thickness is obviated.

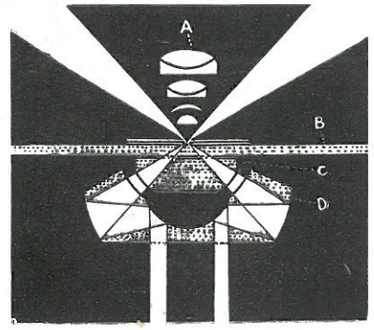


Fig. 4.

The peculiarity of dark ground illumination is that the light is focussed to one definite position and unless this position coincides with 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 slides 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. 4), 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. 5) the focus of the illuminator is adjusted for a slide of any thickness between ½ m/m. and 1½ m/m.

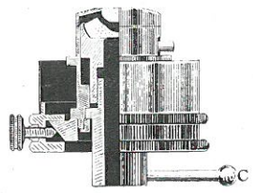


Fig. 5

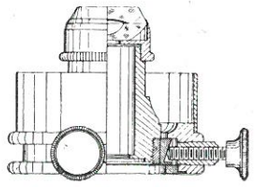
When this illuminator is used on slides varying from 1 m/m. to 1½ m/m. the cone of light which it transmits to the object is between 1 N.A. and 1·4 N.A., which enables any object glass with an aperture not higher than ·95 N.A. to be employed with it. If, however, a slide is used that is not thicker than 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 3 m/m. object glass 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, which can be used dry and not in immersion contact with the slide, with low powers whose angle does not exceed ·7 N.A.

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.

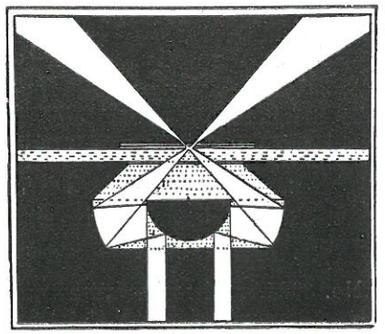
No. 3296. **High power dark ground immersion illuminator,** in plain substage fitting £2 10 0

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


No. 3297.

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.

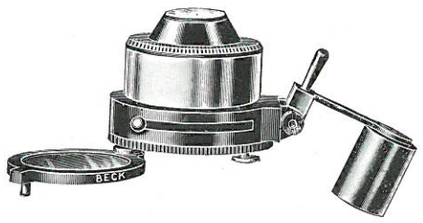
It is specially intended for use with object glasses of high power, as it gives a very small but brilliantly illuminated spot of light. Oil immersion object glasses such as the 3 m/m. with an aperture of .95 can be used with it, but lenses with a greater aperture require to be stopped down by the insertion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



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

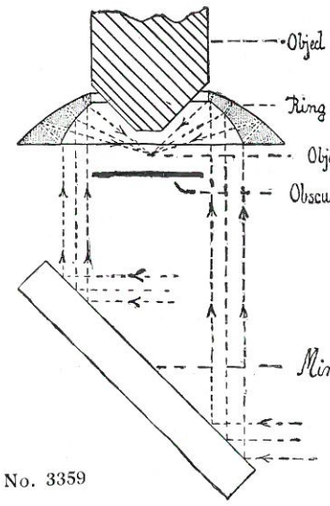
For particulars of special holders for dark ground illumination see page 100.

No. 3644. **Dark ground illuminator** for low and moderate powers £5 0 0



No. 3644.

This illuminator is for use with object glasses the numerical aperture of which is not greater than ·65 N.A. A special stop can be folded in, which converts the apparatus into a dark ground illuminator. To do this the iris diaphram is opened to its fullest extent and the tray swung aside. A neutral glass screen is supplied to fit into the tray, in order to reduce the necessarily strong light required for dark ground illumination to an amount suitable for ordinary transmitted light. With this illuminator, dark ground illumination can be used with all powers up to $\frac{1}{6}$ inch (4 m/m.) provided the object glass has not an aperture exeeding N.A. ·65. For transmitted light the condenser is suitable for all object glasses.

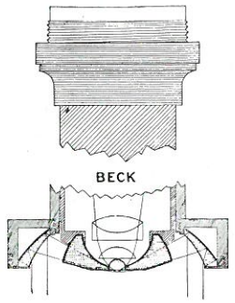


No. 3359

No. 3357. **Spot lens** for low power dark field illumination, mounted to fit standard substage. This is suitable for use with 50, 32 and 16 m/m. object glasses. £1 10 0

No. 3359. **Beck aplanatic ring illuminator** for the illumination of opaque objects with powers of $1\frac{1}{2}$ in., $\frac{2}{3}$ in. and $\frac{1}{3}$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. The size of the object being examined is limited to about $\frac{2}{3}$ in. 2 10 0

No. 3359A. **Beck aplanatic ring illuminator** for $\frac{1}{6}$in. object glass 2 10 0



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.

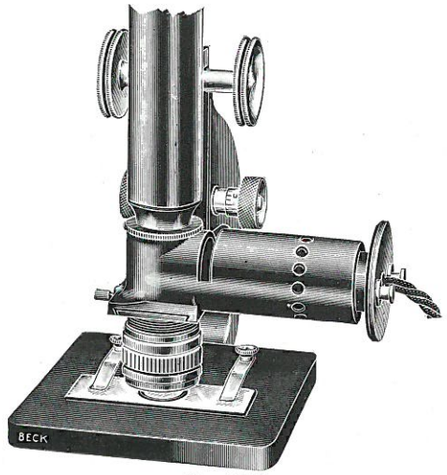
No. 3365. Immersion ring illuminator with 3 m/m. apochromatic object glass 1.3 N.A. £20 0 0

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

Beck-Chapman Opaque Illuminator.

This form of illuminator has several advantages over the aplanatic ring illuminator previously described in that the actual area of the object under examination is not restricted, also the illuminating source is self-contained thus obviating the necessity of a separate light source and simplifying adjustments. It is suitable for the examination of surface structures, glazes, tissures, seeds, grains, powders and similar objects. In the image obtained when examining polished metal surfaces, the reverse appearance to that obtained with usual method of vertical illuminator is given and this form of illuminator is generally only used in metallurgical work for obtaining dark ground effect.



No. 2340.

The construction of this apparatus is shown in Fig. 6. The light from a small electric bulb (A) is directed from the side into the microscope, through a condensing lens (B), upon a mirror (C) placed above the object glass (D). The mirror has an aperture in the centre. The mirror throws an annular ring of light, upon metal reflectors (E, E′ and E″), which surround the object glass and concentrate the light upon the focal plane of the object glass giving a brilliant illumination upon any object or surface being examined. The light falls upon the object in the form of a hollow cone, so that no direct light enters the microscope and the object is rendered visible by reflected light. This method illiminates reflections and does not produce glare and haze in the image,

To avoid the necessity of adjusting the height of an independant lamp when objects of a different thickness are being examined, a self-contained source of light is provided, consisting of a 4 volt lamp with condensing lens, in a well ventilated lamp-house, provided with all necessary adjustments. This lamp may be used with batteries or accumulators, or with suitable resistance or transformer from the mains. The mount of the illuminator, with its angular mirror, lamp-house and condenser, screws into the microscope by means of a revolving fitting (G). Its lower portion has a dovetailed slide (H) into which the various object glasses, with their reflectors are fitted. Object glasses $1\frac{1}{2}$ in. (32 m/m.), $\frac{2}{3}$ in. (16 m/m.), $\frac{1}{3}$ in. (8 m/m.) and $\frac{1}{6}$ in. (4 m/m.) are available for use with this illuminator. The construction of the reflectors is varied according to the magnifying power of the object glass, so that either a larger or smaller field of view is illuminated. The illustration shows the two different forms.

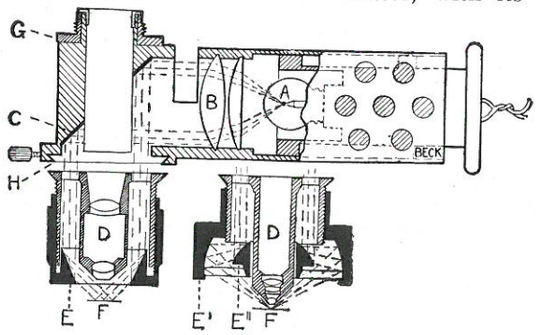


Fig. 6

No. 2340. **Beck-Chapman illuminator,** mount only, with lamp-house, illuminant, mirror and condenser, in case £5 15 0

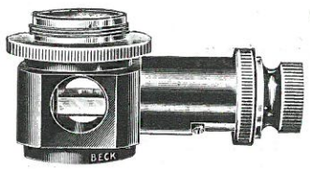
No. 2341. $1\frac{1}{2}$ in. (32 m/m.) Object glass, with reflector 4 0 0

No. 2342. $\frac{2}{3}$ in. (16 m/m.) Object glass, with reflector 4 10 0

No. 2343. $\frac{1}{3}$ in. (8 m/m.) Object glass, with reflector 6 10 0

No. 2344. $\frac{1}{6}$ in. (4 m/m.) Object glass, with reflector 8 10 0

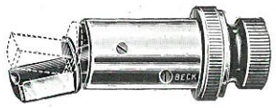
No. 2345. Green and ground glasses ... ... per pair 0 2 6



No. 4960. **Vertical illuminator,** with adjustable illuminating prism or thin glass reflector. This illuminator gives two adjustments to the reflector, one of which moves the light up and down, and the other right and left .. £1 15 0

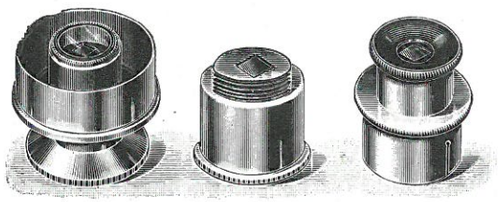


No. 4962. **Prism or thin glass reflector** to use interchangeable with the one in No. 4960 1 2 6



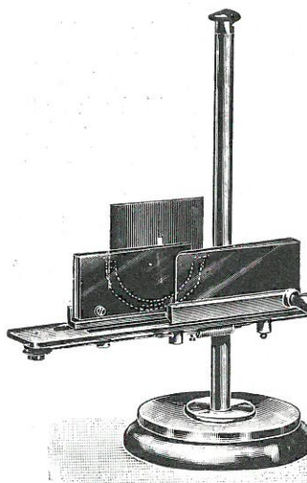
No. 4960

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



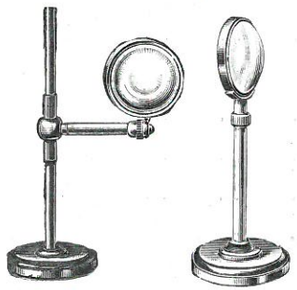
No. 3345

No. 3377. **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 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 3315 No 3315A

No. 3315. **Bulls' eye condenser,** $2\frac{1}{4}$ in. diam. lens, on stand with complete adjustments ... 2 10 0

No. 3315A. **Bulls' eye condenser,** $2\frac{1}{4}$ in. diam. lens, on stand with vertical adjustment only ... 2 0 0

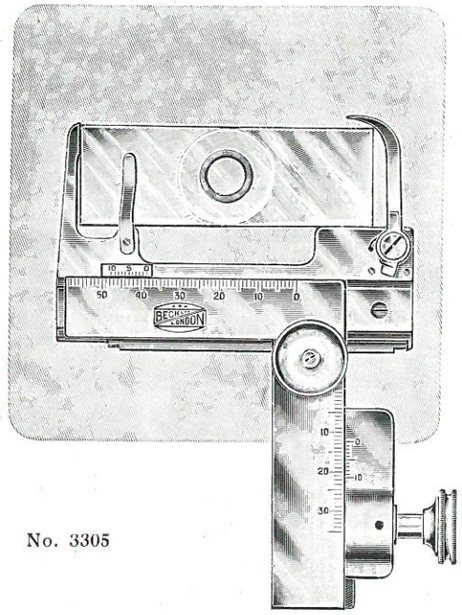
No. 3317. **Bulls' eye condenser,** $1\frac{3}{8}$ in. diam. lens, with iris diaphragm and screen holder, on stand with adjustments 2 15 0

No. 3316. **Bulls' eye condenser,** $1\frac{1}{2}$ in. diam. lens, on stand with complete adjustments ... 1 5 0

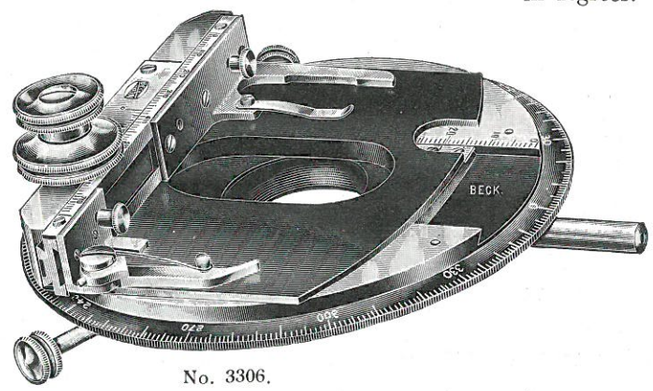
No. 3316A. **Bulls' eye condenser, achromatic and aplanatic,** 1·2 in. diam. on adjustable stand, as No. 3316 ... ... 2 0 0

No. 3515. **Mechanical stage** £10 10 0

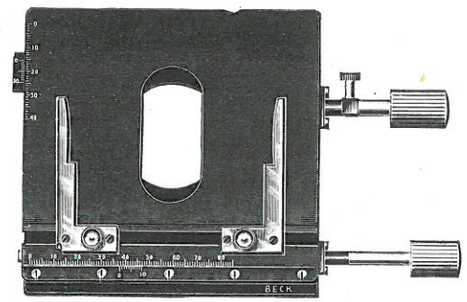
The construction of this stage can be seen from the illustration. It has a travel in the horizontal direction of 75 m/m. and in the vertical direction 30 m/m. It is fitted with scales and verniers for both movements. Microscopes, Angular model No. 3878, Combined binocular and monocular Nos. 1335-7, 1381-3 and No. 29 London models, J, K, L and M are fitted with this stage.



No. 3305



No. 3306.



No. 3515.

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

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 $2\frac{3}{4}$ in. and in the vertical 1 in. This type of stage is supplied the Nos. 22 and 29 London microscopes and to the models of the angular and combined binocular and monocular microscope which have plain square stages. 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 Nos. 29 H, 1342, 1388, 3876, 3877, 3192, 3193 ... ... £12 0 0

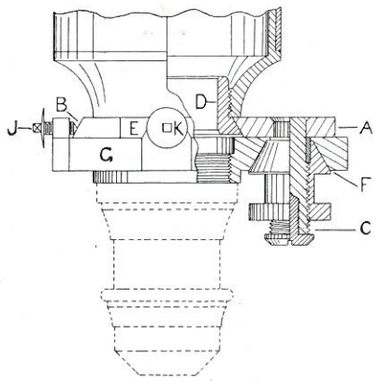
This stage is of the circular pattern with complete rotating motion. It is also fitted with adjusting screws for centring. The edge is divided in degrees. The horizontal motion has a travel of 3 in. and a vertical motion a travel of 1 in. Both these motions are actuated by milled heads. The rack employed is very finely cut giving an exceedingly delicate and smooth motion. Scales and verniers are fitted for finding or making measurements. The arms which hold the slide in position are adjustable so that a slide of any length up to 4 inches can be accommodated. When this stage is fitted to existing microscopes, the standard substage apparatus must be slightly increased in length to allow for the extra thickness.

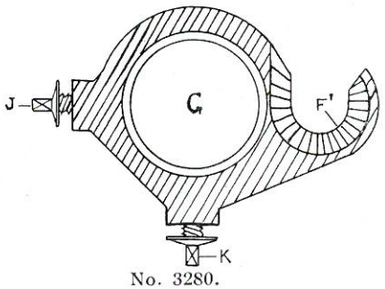
No. 3418. **Diamond object marker** £2 15 0

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 3418

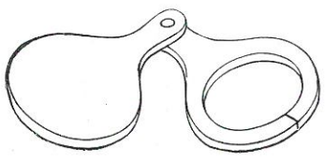




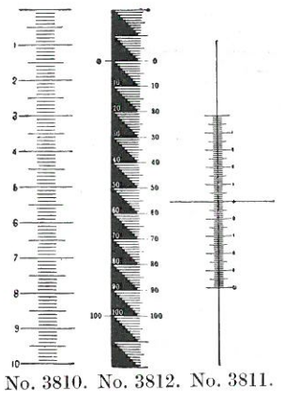
No. 3280.



No. 3301.



No. 3257



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

No. 3280. **Sloan object glass changer,** including adapter, key and 2 fittings £1 17 6

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

No. 3282. **Case** to hold 3 fittings with object glasses attached 0 11 6

This apparatus is for the rapid changing of object glasses and provides for the individual centration of each object glass.

The apparatus consists of an adapter (A) which screws on to the nosepiece of the microscope and is held firmly in position by a screwed ring (D). The screwed ring is provided with a slot which a halfpenny will fit and by which it can be tightened up. The adapter is bevelled on one side (B) and has on the side at right angles a flat edge (E) and opposite B has a clamp screw (C) with a bevelled nut (F).

A fitting (G) is provided for each object glass. Each fitting has a bevelled projection (F') which fits over the bevelled nut (F) and also two adjustable screws (J) (K) one of which impinges upon the bevelled surface (B) and the other upon the flat surface (E). The clamping of the bevelled nut (F) securely fixes the fitting with its object glass into the adapter. The two adjustable screws (J) (K) at right angles to each other, adjust the position which the fitting takes up in the adapter, so that each fitting with its object glass can be accurately centred. The method of carrying out the adjustment for centration is to set up the microscope before placing the adapter into the nosepiece, and with one of the object glasses, to set an object accurately in the centre of the field preferably by means of an eyepiece with cross lines. Then attach the adapter (A) and a fitting with the same object glass. The object then forms an index by means of which all other object glasses in their respective fittings can be adjusted by means of the screws (J) and (K) so that they are all uniform and an object in the centre of the field with one will occupy the same position when any of the other object glasses are used upon the microscope.

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. 3257. **Eyeshade,** to shield the unemployed eye from light and enable it to remain open during observation 0 2 0

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

No. 3278. **Stage micrometer** on 3×1 slide, 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

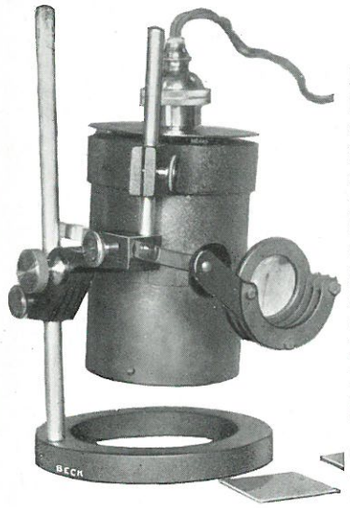
No. 3810. **Eyepiece micrometer,** scale 10 m/m., divided into 100 parts 0 10 6

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

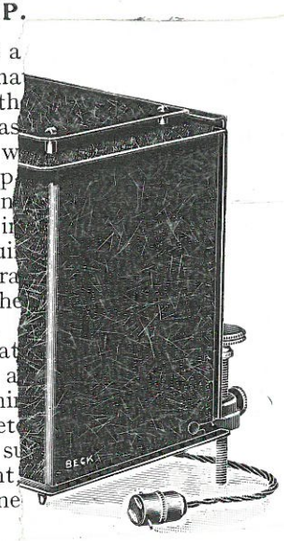
No. 3265. **Glass plate,** ruled with cross lines 0 5 0

No. 3279. **Glass plate** ruled in squares, ¼ m/m., ½ m/m., or 1 m/m. 0 10 6



No. 3332

BECK ELECTRIC LAMP.



This lamp has been designed so as to provide a light source for all classes of microscopic illumina heavy circular base with an upright upon which th a vertical direction and upon which it also tips so as axis of the light. Both adjustments are provided w of the raising and lowering adjustment, the lamp position between 3 in. and 9 in. above the table. An for the accurate alignment of the light source i condenser can be focussed and clamped in the requi is made for the accommodation of an iris diaphra 2 in. square. The complete adjustments render th with all methods of microscopic illumination. Pointolite lamp can be employed as the illuminat is strongly recommended for high power work, a ground illumination. It is a very satisfactory illumi being a sphere of tungsten about 1/10 in. diamet descent, has extreme intensity. This lamp is su direct current, or 150 c.p. for alternating current junction with a fixed resistance so that it is ne voltage of the electric supply when ordering.

No. 3303. **Beck electric lamp,** with condenser, ground and green glasses and 60 watt opal lamp £6 10 0

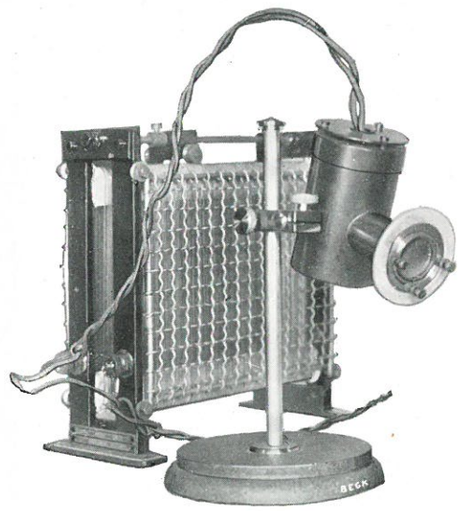
No. 3332. **Beck electric lamp,** with condenser, ground and green glasses, 100 c.p. Pointolite lamp, and fixed resistance 10 17 6

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 15 0

BECK INTENSITY MICROSCOPE LAMP.



No. 3344.

The illuminant is of great intrinsic brilliancy and is suitable for all microscopic work, including dark ground illumination. It is run from the ordinary lighting supply for direct current by means of a variable resistance or on alternating current with the use of a transformer. Where electric supply is not available, accumulators or batteries of 12 volts can be employed. The lamp is contained in a tubular housing and is provided with a focussing adjustment for the condensing lens. The lamp housing is mounted on a firm base, and can be adjusted for height and tilted to any angle, each adjustment being provided with a clamp. A ground and signal green glass are supplied with each outfit, also flex and connector to fit the standard sized bayonet lampholder.

When ordering we require to have full details of the electric supply available.

No. 3344. **Beck Intensity lamp,** on stand with condenser, one ground and one green glass, with resistance £5 2 6

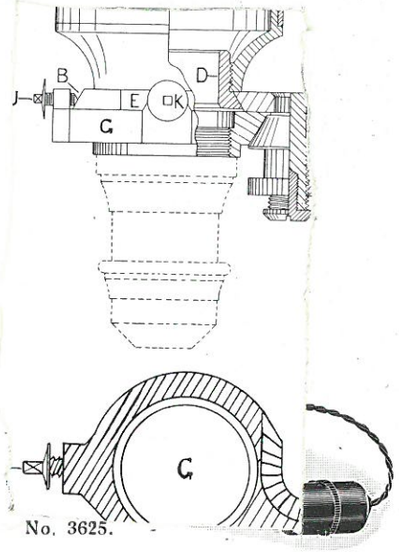
No. 3344T. **Beck Intensity lamp,** on stand with condenser, one ground and one green glass, with transformer (specify current available when ordering) 4 15 0

No. 3344B. **Beck Intensity lamp,** to work from accumulators on 12 volt current 3 7 6

No. 3344A. Iris diaphragm to Nos. 3344, 3344B and 3344T 1 5 0

No. 3344D. Spare bulbs ... ... each 0 4 6

No. 3682. Achromatic and aplanatic condenser in place of ordinary condenser, extra 0 15 0



No. 3625.

BECK SIMPLEX MICROSCOPE LAMP.

This lamp is suitable for general microscopic work, with the exception of dark ground illumination. The casing is strongly made and well ventilated, finished in crystalline enamel. The light source is a 60 watt opal 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.

No. 3625. Beck Simplex microscope lamp ... £0 18 6

No. 3626. Spare screens, ruby, red, orange, green, blue-green, blue ... ... each 0 2 0

BECK CANISTER LAMP.

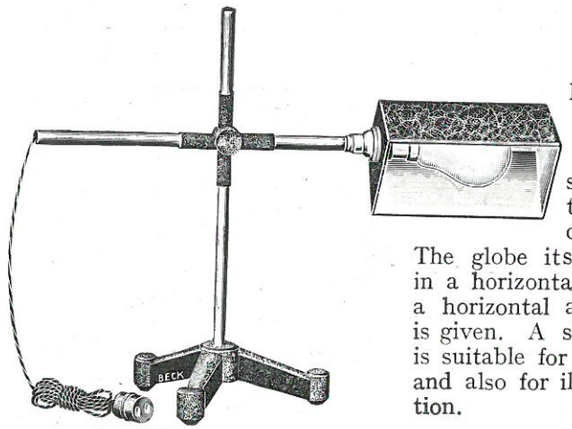
This lamp is of solid construction and has an iris diaphragm fitted together with a cell in which a colour filter can be placed. The light source is a 60 watt opal globe.

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.

No. 3086. **Beck Canister lamp,** with opal globe, iris diaphragm and green glass £2 10 0



No. 3086.

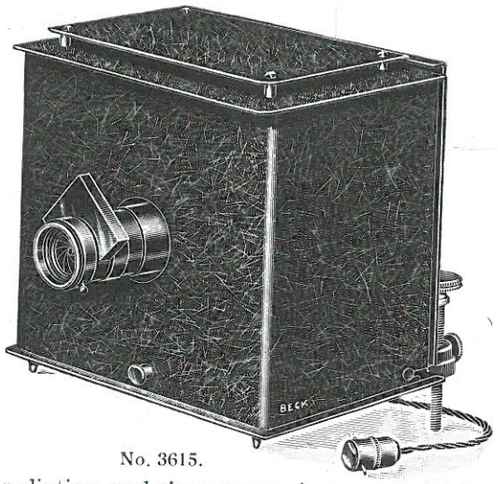


No. 3336A

No. 3336A. **Beck Reflex lamp,** with 60 watt opal 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 shade shields direct light from the eyes. It is suitable for both transparent and opaque illumination and also for illuminating trays, dishes, etc., during dissection.

QUARTZ MERCURY VAPOUR LAMP.



No. 3615.

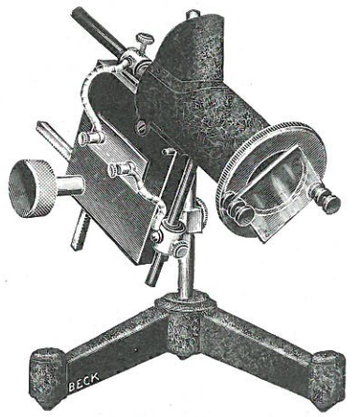
This lamp consists of a K.B.B. atmospheric type quartz mercury vapour burner, in a convenient housing for use as a microscope illuminant. It has a condenser which can be focussed, an iris diaphragm and screen holder. The condenser is made in glass or quartz. The back plate of the housing can be removed so that the lamp can readily be employed for other purposes. The lamp can be operated from a direct current house supply with a suitable resistance, or from alternating current with a rectifier or motor generator.

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 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.

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**, complete ... ... £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. 3620. **Quartz condenser** ... ... 1 10 0¶
No. 3327. **Didymium glass screen** ... ... 3 0 0¶

CORNEX MICROSCOPE ARC LAMP.



No. 3636.

This lamp is specially suited for photography, high power dark ground illumination or for work where very deep colour filters are employed. It is supplied either with hand or clockwork feed. This latter moves the carbons at the approximate speed at which they burn away, although a slight hand adjustment may be necessary to compensate for an irregular burning of the carbons. The lamp can be operated at 5 to 10 amps.

A condensing lens is provided by means of which the light may be made parallel or convergent.

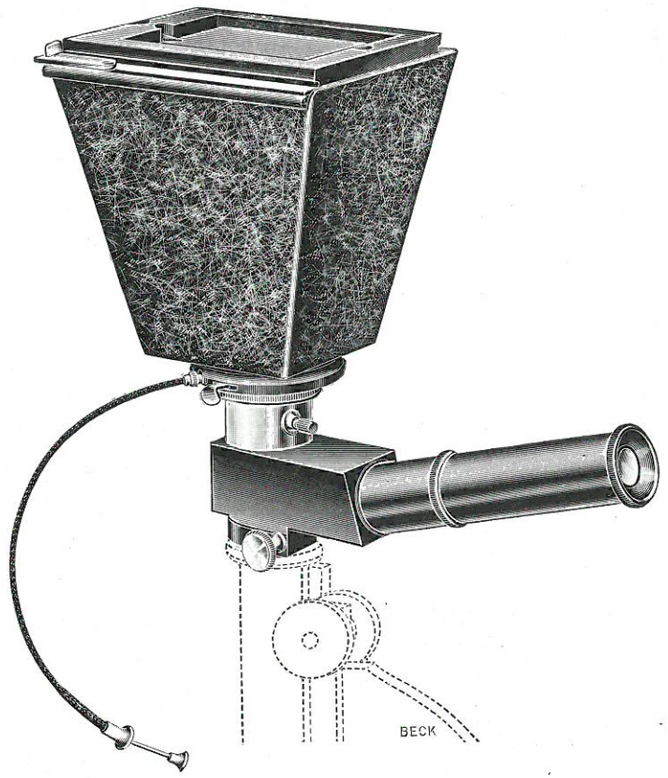
A quartz condenser can be supplied in place of the usual one to pass ultra-violet light. It may be used in conjunction with suitable screens or a monochromator and forms a suitable illuminant for fluorescent microscopy.

No. 3635. Cornex arc lamp with clockwork feed £7 15 0
No. 3636. Cornex arc lamp with hand feed ... 4 10 0
No. 3643. Quartz condenser in place of glass condenser 0 10 6
No. 3637. Adjustable resistance (specify main supply when ordering) 5 12 6

Carbons supplied at current marked prices.

Photomigraphic Cameras.

EYEPIECE CAMERA WITH VIEWING ATTACHMENT.



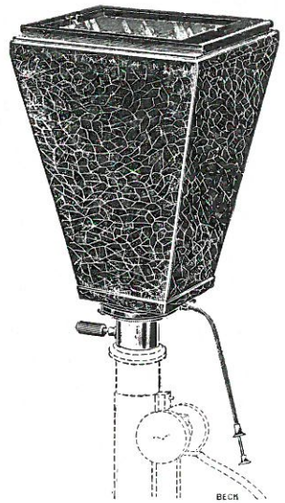
No. 3657. **Eyepiece camera** with observing tube, shutter and three single metal plateholders £12 12 0

No. 3658. **Extra single metal plateholders** ... ... each 0 3 0

This camera fits in the drawtube of the microscope and is so constructed that the object to be photographed is seen through the observing tube up to and during exposure. By means of the observing eyepiece the position of the object in the field and its correct focus are accurately set, and the exposure then made by means of an antinous release fitted to the timed shutter. The plate carried by the camera is $3\frac{1}{2}$ in. $\times$ $2\frac{1}{2}$ in., and the size of the picture given is a circle of $2\frac{1}{4}$ in. diameter.

The upper portion of the camera, i.e., the tapered box and shutter, can be removed from the lower part with its observing tube, and this lower portion forms a double demonstration eyepiece enabling two workers to observe simultaneously, one with the side eyepiece and one by means of the eyepiece directly over the tube of the microscope. A pointer is fitted for indicating any special object in the field. The eyepieces have separate focussing motions for bringing this pointer sharply in focus. These motions can also be used for individually setting the eyepieces, so that an object is in focus both in the observing eyepiece and on the plate of the camera. A ground glass screen is provided, so that this setting may be checked if it becomes necessary.

The apparatus fits the standard size drawtube and has a clamp to ensure its rigidity.



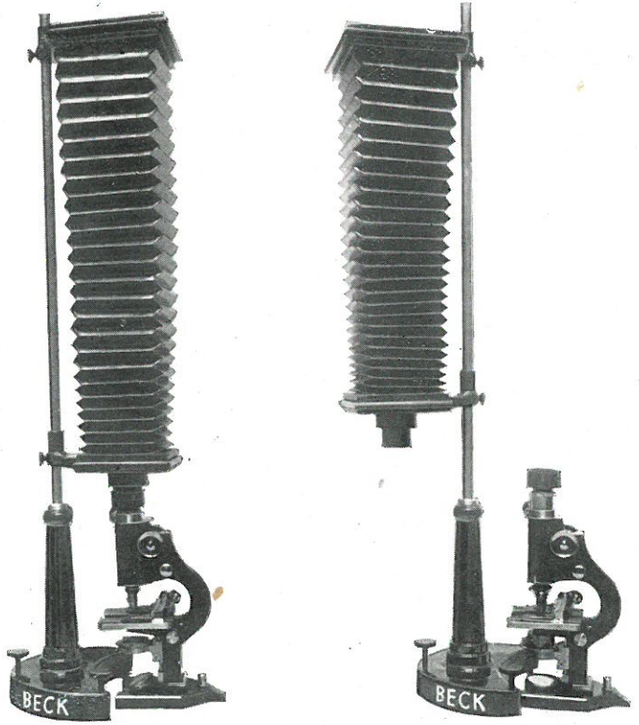
No. 3654

No. 3654. **Eyepiece camera,** complete with three single metal plateholders £3 3 0

No. 3655. Extra single metal plateholders ... ... each 0 3 6

This camera is for use over the eyepiece of the microscope and consists of a tapered box, $6\frac{3}{4}$ 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 drawtube of the microscope. The adapter is provided with a clamping screw to ensure the camera being 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 $\frac{1}{4}$-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.

BECK VERTICAL PHOTOMICROGRAPHIC CAMERA.



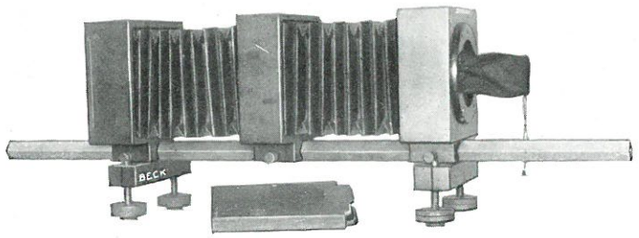
No. 3650

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 $\frac{1}{4}$-plates. The front of the camera carries an exposing shutter and also has a light tight connector for attachment to the microscope.

No. 3650. **Vertical photomicrographic camera,** complete with one double book form slide ... £20 0 0

No. 3651. Extra double book form slides with carriers for $\frac{1}{4}$-plates £1 4 0

No. 3340. **Beck photomicrographic camera,** complete with three single metal plate holders, ¼-plate, 3¼ in. × 4¼ in. size £8 8 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 or single metal plate holders, the frame at the other end carries a flexible bag to attach to the microscope. By means of the levelling screws, the centres of the camera can be adjusted at any height from 5¾ in. to 7¼ in.

No. 3340B. As No. 3340 but with reversing back to camera and exposing shutter ... £9 19 6

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

This camera is in design similar to the No. 3340 but made for a larger plate. It 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 a bench, into which the levelling screws fit.

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. object glass screw thread.

No. 2994 40 m/m focal length £6 15 0

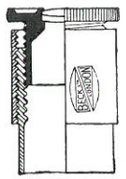
No. 2995 50 „ „ „ 6 15 0

No. 2996 75 „ „ „ 6 15 0



No. 2994.

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



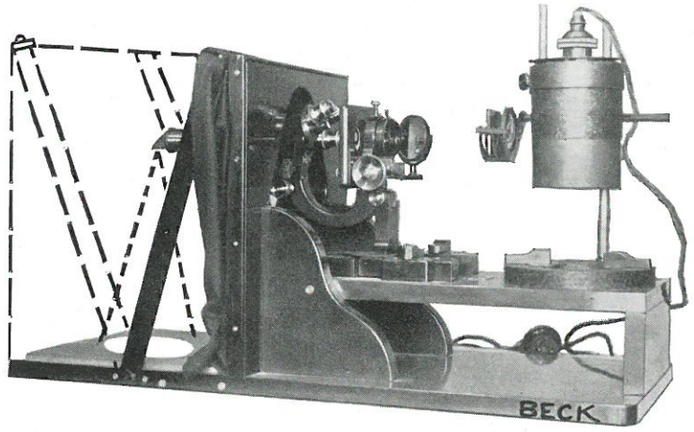
No. 3343

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.

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 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 or transformer 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

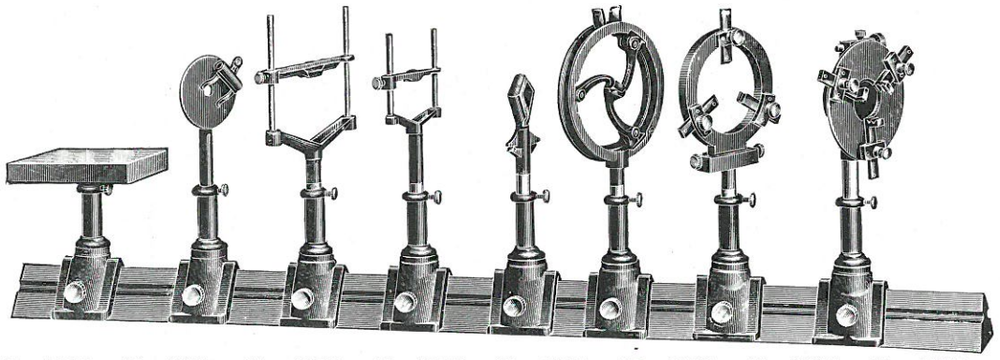
No. 3662. Right angle prism only 1 10 0

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.	⅔ in. Object glass, 16 m/m.	0 16 6	
No. 3234A.	⅙ in. Object glass, 4 m/m.	2 17 6	
No. 3251.	1/12 in. Object glass, 2 m/m., oil immersion	3 18 6	
No. 760.	Cedar oil bottle, with dipper, ground on cap and supply of oil	0 2 0	
No. 3285.	Abbe condenser and iris diaphragm	2 10 0	
No. 3301	Triple nosepiece	1 10 0	
			£38 14 6

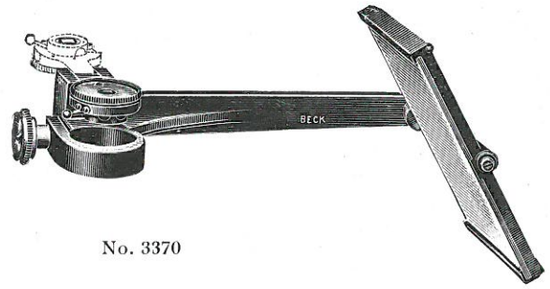
Optical Benches and Fittings. ¶



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

No. 3900.	½ metre Optical bench	£1	4 0
No. 3901.	1 metre Optical bench	2	2 0
No. 3902.	1½ metre Optical bench	5	10 0
No. 3903.	2 metre Optical bench	6	12 0
No. 3904.	Saddle stand with base 30mm. long, with stem 30mm. high	0	15 0
No. 3905.	Saddle stand with base 30mm. long, with stem 60mm. high	0	15 0
No. 3906.	Saddle stand with base 30mm. long, with stem 90mm. high	0	15 0
No. 3907.	Saddle stand with base 60mm. long, with stem 30mm. high	0	15 0
No. 3908.	Saddle stand with base 60mm. long, with stem 60mm. high	0	15 6
No. 3909.	Saddle stand with base 60mm. long, with stem 90mm. high	0	15 6
No. 3910.	Saddle stand with base 90mm. long, with stem 30mm. high	1	0 0
No. 3911.	Saddle stand with base 90mm. long, with stem 60mm. high	1	0 0
No. 3912.	Saddle stand with base 90mm. long, with stem 90mm. high	1	0 0
No. 3913.	Saddle pins, 170mm. long	0	3 0
No. 3914.	Table stand	0	11 0
No. 3915.	Wood blocks to steady bench for table use (9″ × 2″ × 2″) ... ... pair	0	5 0
No. 3916.	Table	0	9 6
No. 3917.	Stage plate with rotary movement	1	2 0
No. 3918.	Lens holder, sliding grip maximum 10cm.	0	16 6
No. 3919.	Lens holder, sliding grip maximum 5cm.	0	14 0
No. 3920.	Lens holder, spring grip maximum 5cm.	1	2 0
No. 3921.	Lens holder, spring grip maximum 7·5 cm.	2	0 0
No. 3922.	Lens holder with independent centring adjustment and cross traverse movement, maximum 7cm.	2	18 0
No. 3923.	Lens holder with independent centring adjustment and rotary vertical movement, maximum 7cm.	3	10 0
No. 3924.	Centring point	0	3 0
No. 3925.	Metal cross line diaphragm	0	14 0
No. 3926.	Rotary stops—⅛, ¼, ½, ¾, 15/16	1	2 0
No. 3927.	Iris diaphragm, 4cm. approx.	1	13 0
No. 3928.	Water tank	1	13 0
No. 3929.	V support	0	19 0
No. 3930.	Microscope objective screwed flange	0	14 0
No. 3931.	Microscope objective screwed flange with screw adjustment for centring ...	2	4 0
No. 3932.	Glass screen holder	0	16 6
No. 3933.	Single optical slit	2	9 6
No. 3934.	Electric lamp holder	0	14 0
No. 3935.	Projection lamp in metal body (100 watt)	2	5 0

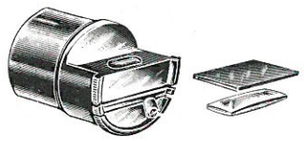
Camera Lucidas.



No. 3370

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

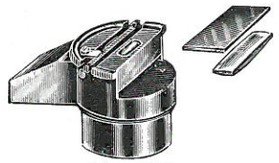
This apparatus is made for the production of correct drawings of images seen through the microscope. It consists of a prism mounted to fit over the eyepiece of the microscope and a large mirror placed a few inches from it. The prism is silvered but has a small clear aperture in its centre. The paper 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. 3368. **Beck horizontal camera lucida** £1 17 6

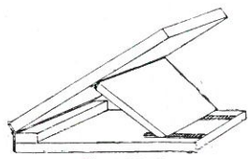
This again gives an image of the paper by means of a prism, but it is constructed for use with the microscope placed in a horizontal position. The image of the paper is reflected into the eye by a half silvered surface on the prism and the object is at the same time viewed through this half silvered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



No. 3369.

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.

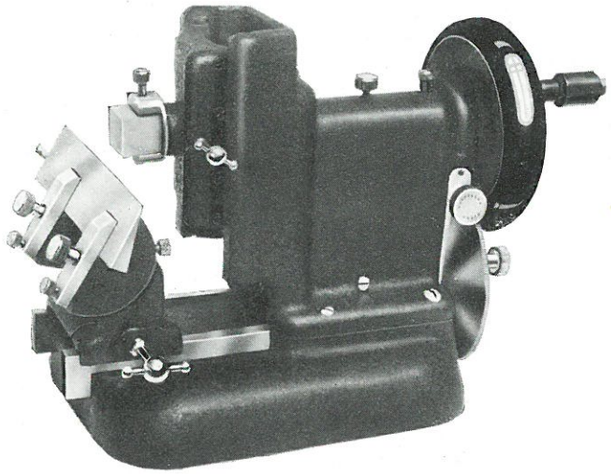


No. 3375.

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

Microtomes.

AUTOMATIC ROTARY MICROTOME.



No. 3880.

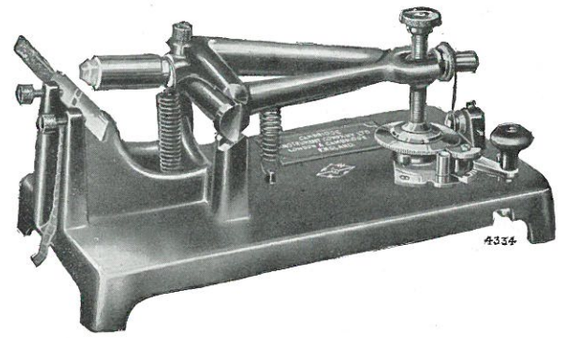
This instrument is of very rigid design; it can be very quickly set up to cut a perfectly uniform series of sections at the highest possible speed. The object holder consists of a clamp with universal adjustment for the angle of face around a point coincident with the surface of a block of material of the average thickness, so that there is no lateral displacement when orientating. The clamp is adapted to take standard wood blocks 19mm. × 19mm. × 12mm. 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, 2·5μ, 5μ, 7·5μ, 10μ, 12·5μ, and 15μ. 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 chromium plated.

No. 3880.	Automatic Rotary microtome	£21	0	0
No. 3881.	Knife 10cm. blade	1	5	0
No. 3883.	Knife handle	0	10	6
No. 3884.	Wood blocks ... ... per dozen	0	2	0

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

Various 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.

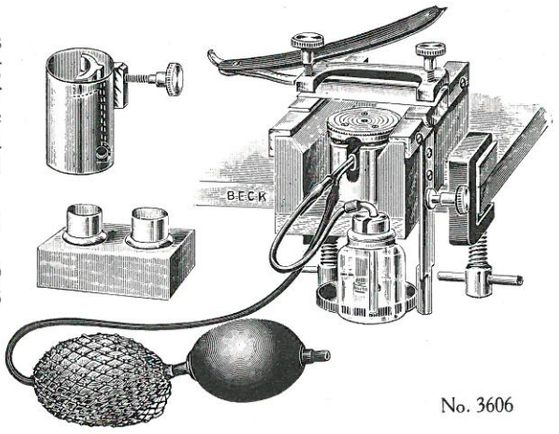
The simple pattern orientating object holder consists of a brass tube with a cup-shaped end. A brass hemisphere fits in this end and can be clamped in any position. The hemisphere is filled with paraffin wax on which the object is stuck.

No. 3890.	Cambridge Rocking microtome complete with simple object holder, simple orientating object holder and knife	£7	12	0¶
No. 3892.	Orientating object holder, simple pattern	0	7	6¶
No. 3893.	Object holder for wood blocks	0	16	6¶
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 a razor along these rails. The microtome is clamped to the table by two clamps.

No. 3605.	For embedding only ...	£3	2	6
No. 3606.	For embedding and freezing	4	0	0
No. 3607.	Thickness register ...	0	8	6



No. 3606



No. 3602

No. 3602.	**Hand microtome**, constructed of solid brass 1½ in. diameter with well ⅝in. 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

Light Filters.

Beck Colour Filters.

These filters are of dyed gelatine cemented between glass plates, and comprise the following colours: red, orange, green, blue-green, blue and purple. They are suitable for both visual and photographic work.

No. 3346. Beck colour filters, set of six, 2 in. × 2 in., in cardboard case £1 5 0
No. 3347. Single filters, 2 in. × 2 in., in any of the specified colours... ... ... 0 4 6

Wratten & Wainwright "M" Filters.

A series of filters suitable for visual observation or photography. They are of gelatine mounted between glass plates, the range of colours being: orange red, green, blue-violet, purple, orange, pure red, strong yellow, blue and pale yellow.

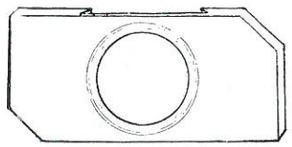
No. 3333. Wratten & Wainwright's "M" filters set of nine, 2 in. × 2 in., in cardboard box ... ... £3 7 6¶
No. 3333A. As No. 3333, but of 1⅜ in. or 1 3/16 in. dia. ... ... 2 5 0¶

Chance-Parsons Colour Filters.

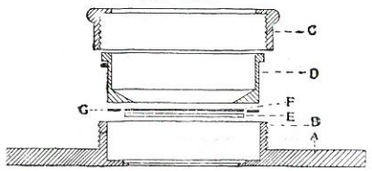
This series of filters are of coloured glass. They have the advantage over gelatine filters, in that they will withstand heat. They are made to a thickness of 2½-3 m/m. A complete range of colours, neutral, orthochromatic and ultra-violet filters is available as follows:

No. 1 Ruby, No. 2 Red, No. 3 Deep Orange, No. 4 Light Orange, No. 5 Green, No. 6 Blue-green No. 7 Blue, No. 8 Purple, No. 9 Daylight, No. 10, Dark Neutral, light transmission 7·3%, No. 11, Light Neutral, light transmission 23·1%, No. 12, Dark Orthochromatic, No. 13, Light Orthochromatic. No. 14, Ultra-violet, isolating wavelengths of 3000 to 4000 A.U.

No. 2186. Chance-Parsons filters, 2 in. × 2 in., all colours 1—13 .. .. each £0 3 0
No. 2187. Chance-Parsons filters, 2 in. × 2 in., all colours 1—13, worked .. each 0 5 0
No. 2188. Chance-Parsons filters, 2 in. × 2 in., No. 14 .. .. each 0 10 0
No. 2189. Chance-Parsons filters, 2 in. × 2 in., No. 14, worked .. .. each 0 17 6
No. 2190. Chance-Parsons filters, 1 3/16 in. or 1⅜ in. dia., all colours 1—13 ... each 0 2 6
No. 2191. Chance-Parsons filters, 1 3/16 in. or 1⅜ in. dia., all colours 1—13, worked each 0 4 6
No. 2192. Chance-Parsons filters, 1 3/16 in. or 1⅜ in. dia., No. 14 ... ... each 0 6 6
No. 2193. Chance-Parsons filters, 1 3/16 in. or 1⅜ in. dia., No. 14, worked ... each 0 10 6



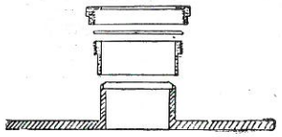
No. 3397



No. 3326



No. 3413.



No. 3420.

Apparatus for Holding Specimens.

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 on to the plain or mechanical stages. It 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

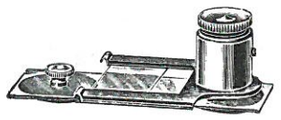
No. 3326. **Barnard compressor** for use with high power illuminators. This compressor holds the cover glass and a circular plate of either ½ m/m or 1 m/m thickness firmly in contact ... 1 17 6

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

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

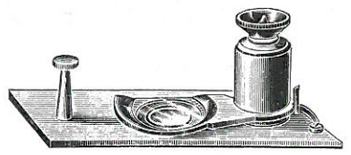
No. 3414. **Trough,** on 3×1½ slide 0 2 6

No. 3420. **Live box.** This consists of a 3×1 ebonite slide with a metal tube, 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



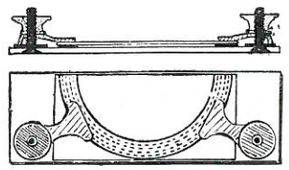
No. 3421.

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 between the cover glass and 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.

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 cover glass is cemented to the brass arm ... 1 1 0



No. 3416.

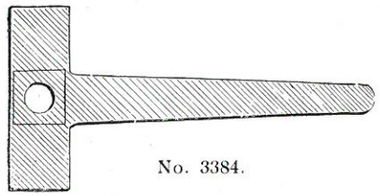
No. 3321. **Rousellet's live box.** This is similar in construction to No. 3420 but the glass plate is level with the stage and it is therefore suitable for use with substage apparatus 0 17 6

No. 3416. **Beck glass trough,** consisting of a 3×1 glass slide which has two clips and clamping screws. By means of these, thick or thin cover glasses 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. 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

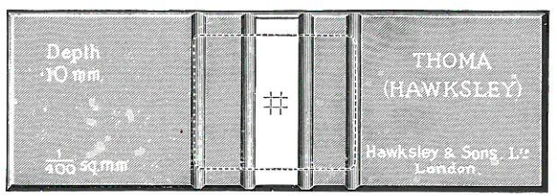


No. 3384.

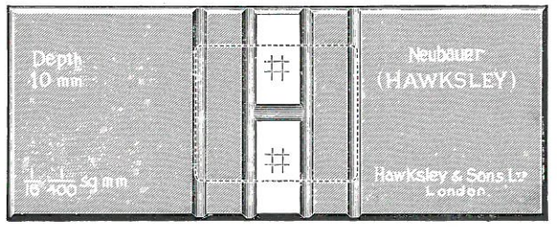
No. 3384. **Simple warm stage** 0 7 6

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 supply of cover glasses 3 15 0



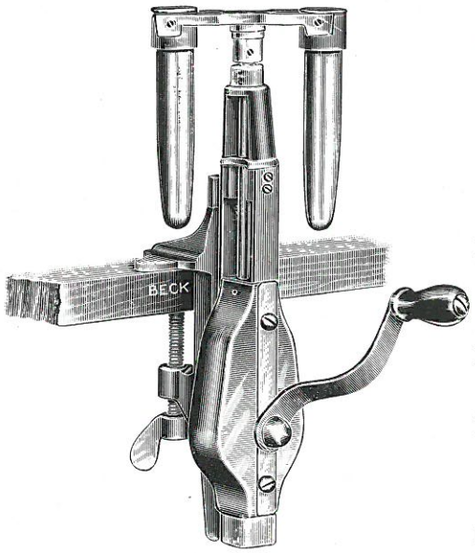
No. 3325a.



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 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.

Centrifuges.



No. 3610.

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

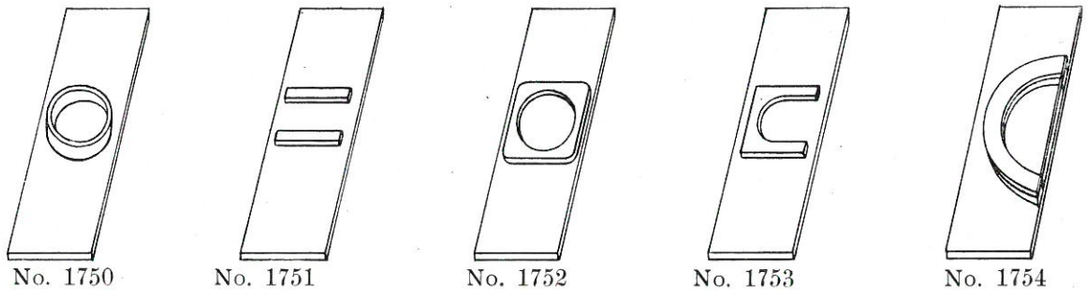
No. 3611. **As above,** but with four buckets and tubes 2 10 0

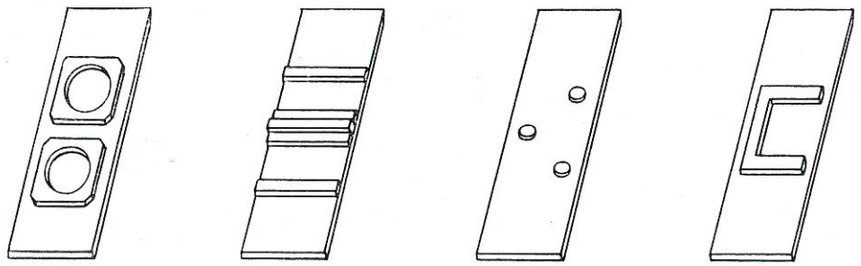
No. 3612. Extra tubes, graduated each 0 2 0

No. 3613. Extra tubes, plain per doz. 0 5 0

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

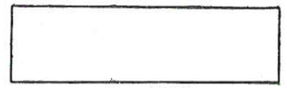
Fused Microscope Cells


No. 1750 No. 1751 No. 1752 No. 1753 No. 1754

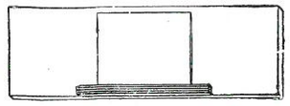

No. 1755 No. 1756 No. 1757 No. 1758

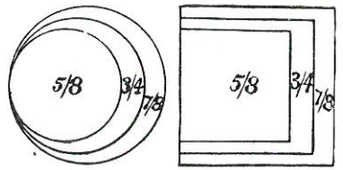
This series of cells are invaluable for microscopic work. They can be used as moist chambers, hanging drop slides, comparison slides, separators and for containing pond life and other fluids. No cement is used in their manufacture the glasses being fused together. They will therefore withstand the action of normal heat and acids for sterilizing purposes. When ordering please specify by number the particular pattern required.

No. 1750/8. Fused microscope cells ... ... each £0 3 6


No. 3828


No. 3405


No. 3406



No. 3390/5

No. 3828. **Glass slides,** 3×1, extra thin, white per gross £0 5 9

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 9 6

No. 3833. **Ditto**, 3×1½, extra thin, half white per gross 0 8 0

No. 3834. **Ditto**, thin, half white ... ... per gross 0 7 3

No. 3835. **Ditto**, ordinary, half white ... per gross 0 6 0

No. 3399. **Glass slides,** 3×1, ½ m/m thick, for dark ground illumination ... ... per gross 0 8 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 5 3

No. 3392. **Cover glasses,** No. 2, average thickness ·008, circular ... ... per oz. 0 4 6

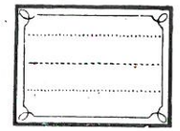
No. 3393. **Ditto,** square or rectangular ... per oz. 0 3 9

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. 3410.


No. 525.

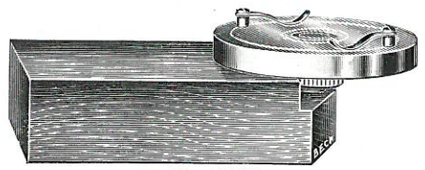
No. 3406. **Glass slide** with ledge 0 1 0

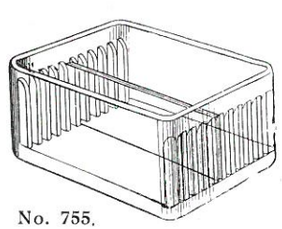
No. 3409. **Cells, metal, circular** ... ... per 100 0 6 0

No. 3410. **Cells, glass** ... ... per doz. 0 5 0

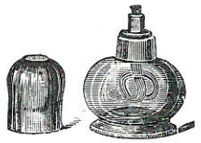
No. 525. **Labels** for naming objects ... per 100 0 0 6

No. 3388. **Micrometer screw gauge,** for measuring thickness of cover glass, slides, etc. ... ... 0 12 6¶


No. 3386.


No. 755.


No. 624.


No. 508.

No. 3386. **Turntable,** constructed on ball bearing principle giving a perfectly even motion £1 1 0

No. 755. **Glass staining dish** with cover, with racks to carry 10 3×1 slides 0 3 0

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

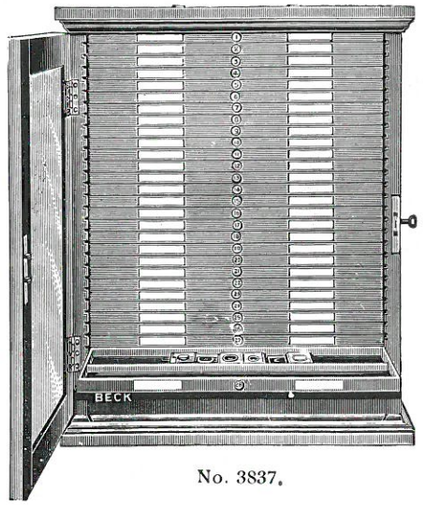
No. 612. **Watch glasses,** flat bottom ... ... 50 m/m dia. per doz. 0 2 6

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 12 6

No. 760. **Cedar oil bottle,** with rod and ground on cap 0 2 0

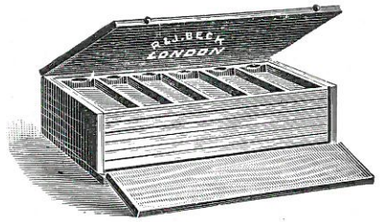
Object Cabinets.



No. 3837.

These cabinets are well made in seasoned pine, oak or mahogany and of excellent workmanship, special care being given to the fitting of the drawers to ensure of them being easily slid in and out. They are fitted with glass doors which have lock and key.

Capacity	No.	Pine	No.	Oak	No.	Mahogany
500	3838	£4 17 6	3839	£5 10 0	3846	£6 0 0
1000	3840	6 10 0	3843	7 2 6	3847	8 0 0
2000	3841	10 10 0	3844	12 0 0	3848	13 15 0
3000	3842	15 0 0	3845	16 0 0	3849	19 10 0



No. 3491.

No. 3490. **Cabinet** of polished pine, to hold 3 doz. £0 5 6

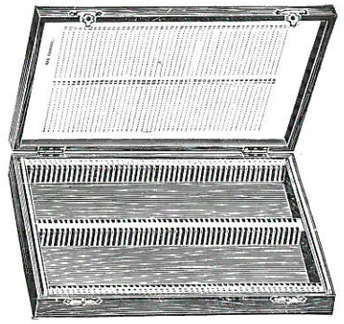
No. 3491. To hold 6 doz. 0 7 0

No. 3492. To hold 12 doz. 0 12 6

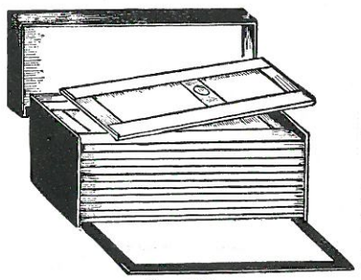
Cabinet of rack type, well constructed throughout in wood, index provided in lid.

No. 635. To hold 50 slides £0 3 0

No. 636. To hold 100 slides 0 4 0



No. 636.



No. 711.

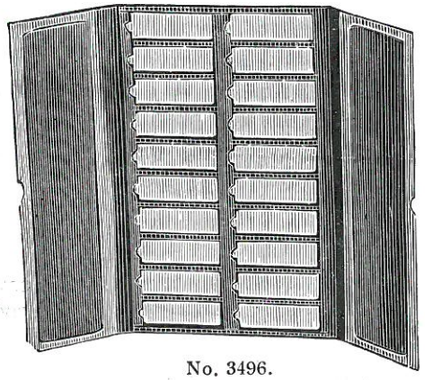
Cardboard slide boxes, leatherette covered, drop front and trays with hinged flaps.

No. 710. To hold 54 slides £0 2 6

No. 711. To hold 108 slides 0 3 3

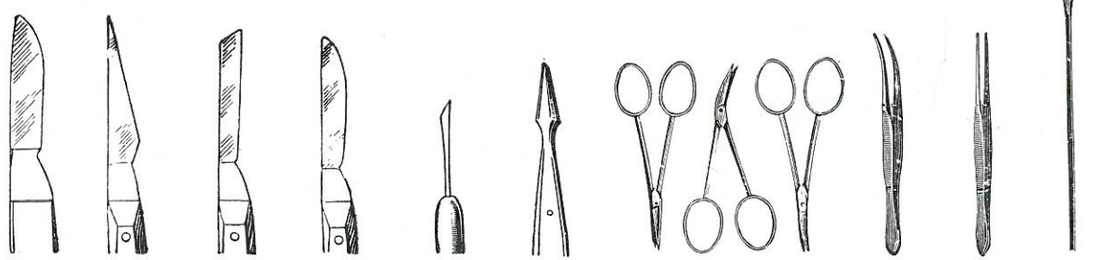
No. 712. To hold 144 slides 0 4 3

No. 3496A. **Cardboard trays,** to hold 20 slides, with folding covers, fitted with fasteners £0 1 3



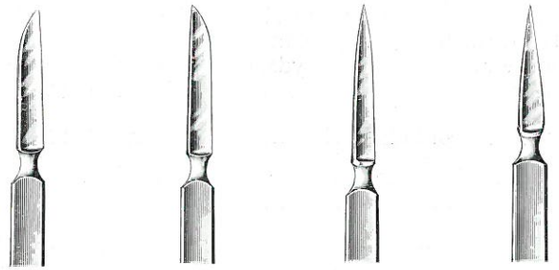
No. 3496.

Dissecting Instruments.



3850 3852 3853 3854 3863 3861 3440 3438 3437 3446A. 3860 3448

No. 3850.	Scalpels, all metal handles, sizes of blades 1¼″, 1⅜″, 1½″, 1⅝″, 1⅞″ 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 1¼″	„	0	1	9
No. 3853.	Scalpel, ebony handle, size of blade 1¼″	„	0	1	9
No. 3854.	Scalpel, ebony handle, size of blade, 1¼″	„	0	1	9
No. 3856.	Scissors, straight, 5½″	„	0	2	6
No. 3857.	Scissors, straight, 5″	„	0	2	0
No. 3440.	Scissors, straight, 4½″	„	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	2	6
No. 3858.	Forceps, straight, 5″, blunt points	„	0	1	6
No. 3859.	Forceps, straight, 5″, fine points and steady pin	„	0	2	0
No. 3860.	Forceps, straight, 4″, fine points and steady pin	„	0	2	0
No. 3861.	Forceps, straight, ½″, 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.	Platinum loops in metal handles	„	0	5	0
No. 3443.	Chain hooks	per set	0	3	0
No. 3865.	Bone-cutting forceps, 5½″	each	0	8	6
No. 3431.	Blow-pipe with stilette	„	0	1	0
No. 3432.	Razor, hollow-ground one side, flat other side	„	0	2	9
No. 3423.	Razor, slightly hollow-ground each side	„	0	3	6
No. 3424.	Razor, fully hollow-ground, best quality	„	0	7	6
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

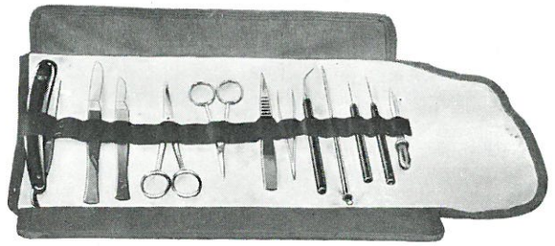


No 2682 No. 2683 No. 2684 No. 2685

Nos. 2682/5. A series of scalpels specially prepared for very fine dissecting. The blades are of four different patterns as illustrations, these illustrations being exact size. In ordering please specify the particular catalogue number of blade required.

Nos. 2682/5 Scalpels ... each £0 2 9

Dissecting Sets.

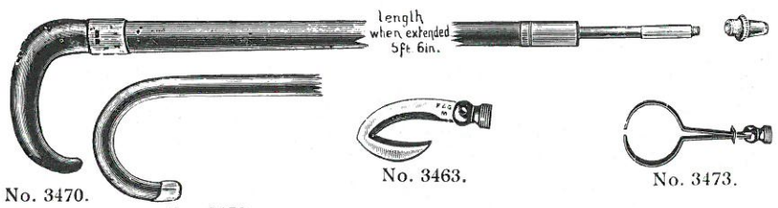


No. 3428

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. 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

Collecting Apparatus.



No. 3470.

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″ ... ... £1 7 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 0¶

No. 3472. **Clip,** for holding bottles, etc. ... ... 0 2 6¶

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

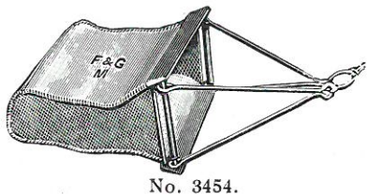
No. 3468. ,, ,, 2″×⅝″ ... ... ,, 0 1 6

No. 3469. ,, ,, 2″×⅜″ ... ... ,, 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. 3454.

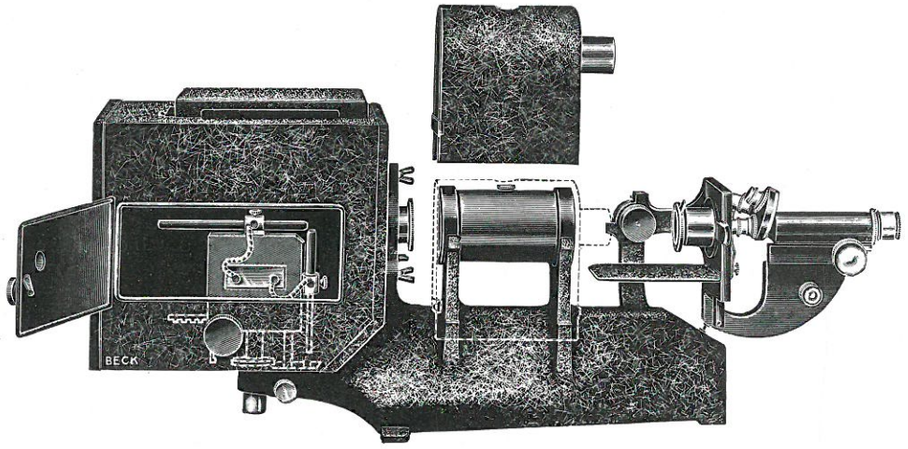
No. 3453. **Ditto,** made of bolting silk ... ... 1 17 6¶

No. 3454. **Dredge,** for bottom sea collecting, with canvas and net bag, 12″ ... ... 1 1 0¶

No. 3456. **Ditto,** 18″ ... ... 1 7 6¶

The University Micro-Projector.

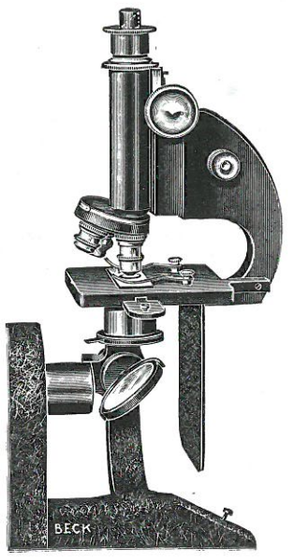
For micro-projection on a sufficiently large scale for class purposes, including work with high powers, a very rigid construction is essential and a powerful source of light must be employed to enable a critically defined and brilliant picture to be shown. If an apparatus is employed consisting of a separate microscope and illuminating apparatus, it is practically impossible to keep the various parts in continuous adjustment, and to be convenient and satisfactory in use such an apparatus should be made in a complete unit to ensure its stability.



No. 4954.

The general design of this projector can be seen from the illustration—and it will be seen that the whole of the parts are carried on a heavy casting which gives it the necessary solidity. The illuminant is an arc lamp which is enclosed in a well ventilated lamp-house with a large door on one side to allow of access to the arc lamp. The light is concentrated by means of a condenser fitted to the front of the lamp-house and is then passed through a cooling trough to the substage condenser on the microscope. This condenser consists of an optical system for use with low powers, and above it, fitting in a slide in the stage, is a second optical system which, when slid into position above the low power condenser, renders it suitable for high powers. An iris diaphragm and a focussing adjustment are provided to the condenser. From this condenser the light is passed through the specimen and through the microscope object glass and eyepiece and projected on to the screen.

The microscope itself has all necessary adjustments including coarse and fine focussing adjustments. Standard object glasses and eyepieces are used. The object glasses can be fitted into a double or triple revolving nosepiece. The microscope is hinged so that it can be used either horizontal or vertical. For ordinary objects it is used in its horizontal position, but where objects in fluids are being examined, it is placed in its vertical position. A mirror is then fitted below the



stage which reflects the light through the microscope and a prism is fitted over the eyepiece to project the picture forward upon the screen. Adjustment is given to the arc lamp for its accurate centring. The arc lamp is rated at 5-10 amps. and in No. 4954 is hand fed, independent adjustments being provided to each carbon. This considerably simplifies the working of the lamp, as due to the variation of the rate of burning of individual carbons, it is often required to make adjustment to one carbon only. In No. 4956 the lamp is of the same pattern with the addition to a clockwork feed which moves the carbons at approximately the rate at which they burn. In No. 4957 the arc lamp is of the same rating and is magnetically controlled.

Special attention has been given to the question of the fading of stains, and to overcome this one window of the cooling trough consists of a special glass which cuts out the rays of light which are responsible for this fading.

The University Micro-Projector.

No. 4954.	University microprojector with hand feed arc lamp and duplex substage condenser	£38 17 6
No. 4956.	Clockwork feed for lamp on No. 4954	3 5 0
No. 4957.	As No. 4954, but with magnetically controlled automatic arc lamp 5-10 amps. for direct current	52 0 0
No. 4955.	Mirror and prism for using microscope vertically	2 2 0
No. 3637.	Adjustable resistance (specify mains supply when ordering)	5 12 6

Carbons supplied at current market prices.

The University Micro-Projector.

Outfit No. 4954B. University microprojector with duplex substage condenser, No. 4955 mirror and prism for using microscope vertical, and with No. 4956 clockwork feed to arc lamp £44 4 6

No. 3301.	Triple nosepiece	1 10 0
No. 3230.	1½ in. Object glass, 32 m/m.	2 0 6
No. 3231.	⅔ in. Object glass, 16 m/m.	1 5 6
No. 3234.	⅙ in. Object glass, 4 m/m.	3 10 6
No. 3260.	2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10)	1 4 0
		£53 15 0

Outfit No. 4957A. University microprojector with automatic arc lamp and duplex substage condenser £52 0 0

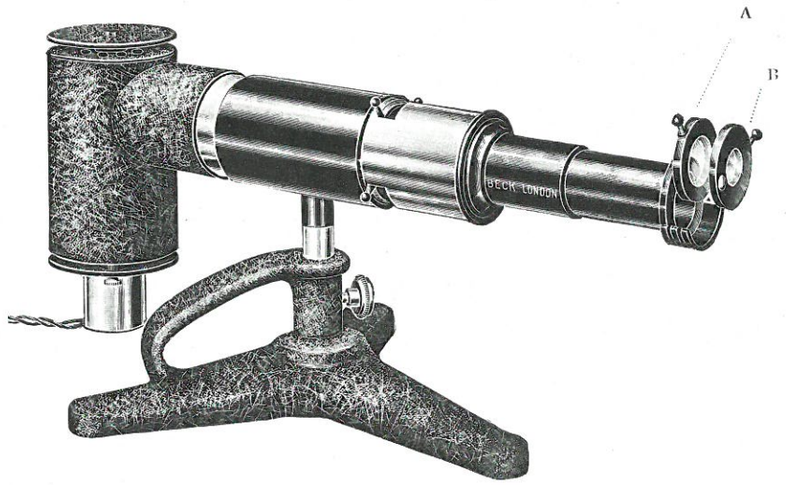
No. 3300.	Double nosepiece	1 1 0
No. 3231.	⅔ in. Object glass, 16 m/m.	1 5 6
No. 3234.	⅙ in. Object glass, 4 m/m.	3 10 6
No. 3260.	Eyepiece, 42 m/m. (×6)	0 12 0
		£58 9 0

Outfit No. 4957B. University microprojector with automatic arc lamp, duplex substage condenser and mirror and prism for using microscope vertical £54 2 0

No. 3301.	Triple nosepiece	1 10 0
No. 3230.	1½ in. Object glass, 32 m/m.	2 0 6
No. 3231.	⅔ in. Object glass, 16 m/m.	1 5 6
No. 3234.	⅙ in. Object glass, 4 m/m.	3 10 6
No. 3260.	2 Eyepieces, 42 m/m. (×6) and 25 m/m. (×10)	1 4 0
		£63 12 6

Resistances and carbons, as page 108.

School Micro Projector.



The school micro projector is a simple and self-contained apparatus suitable for use in schools and teaching establishments, and capable of showing pictures up to 4 ft. 6 in. There is a minimum amount of adjustment required for its use, as once the apparatus has been set up and connected to the supply, all that has to be done is the necessary focussing of the specimen upon the screen.

The instrument is soundly constructed throughout. The base is heavy and rigid with handle for lifting. On to it is fitted the main tube of the projector with adjustment for raising, lowering and rotating. The projector has a projection lens and two supplementary lenses of different powers. Thus four magnifications are provided. The lowest is obtained with the projection lens only, the second and third with the supplementary lenses A and B and the fourth by using the two supplementary lenses together. The following table gives the magnification and circle of illumination working at a distance of 10 feet from the screen :—

	Magnification	Circle of illumination
Projection lens only	100	2 ft. 6 in.
Projection lens and supplementary lens A	150	3 ft. 6 in.
Projection lens and supplementary lens B	200	3 ft. 9 in.
Projection lens and supplementary lenses A and B	275	4 ft. 6in.

The specimen is held in a spring stage. The lamp is contained in a well ventilated housing and has adjustments for its centration. A smooth and accurate focussing motion is fitted.

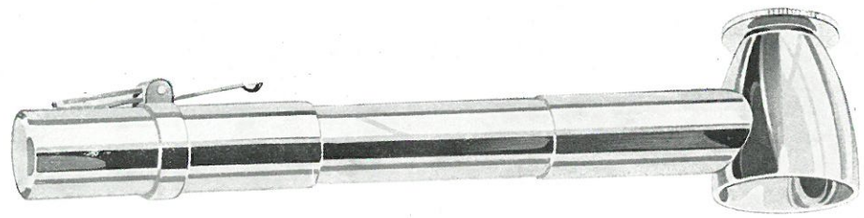
The lamp is either a 12 volt 48 watt projection lamp or a 50 volt 200 watt. The latter gives a very intense illumination and as, in projection, the best results are obtained with the greatest intensity of light, it is this type we most strongly recommend.

		£ s. d.
No. 2612.	Micro projector with 48 watt lamp	11 11 0
No. 2612A.	Micro projector with 200 watt lamp	13 16 6
No. 2606.	Cooling trough. This can be supplied to either No. 2612 or No. 2612A, and we recommend it to be supplied in the first instance, otherwise if ordered subsequently the projector must be returned to us for the necessary fitting	2 0 0
No. 2614.	Projector lamp 48 watt for replacements	0 4 6
No. 2614A.	Projector lamp 200 watt for replacements	1 1 0
No. 2613.	Resistance, adjustable, for voltages 100—250 direct current	2 10 0
No. 2616.	Transformer for use on alternating current, voltages from 200—250, 50 periods, output 12 volt, 4 amps. (for No. 2612)	3 15 0
No. 2617.	Transformer as No. 2616 for use on voltages 100 to 120, 50 periods ...	3 15 0
No. 2618.	Transformer for use on alternating current, voltages from 200—250, 50 periods, output 50 volt, 4 amps. (for No. 2612A)	3 15 0
No. 2619.	Transformer as No. 2618 for use in voltages 100 to 120, 50 periods ...	3 15 0

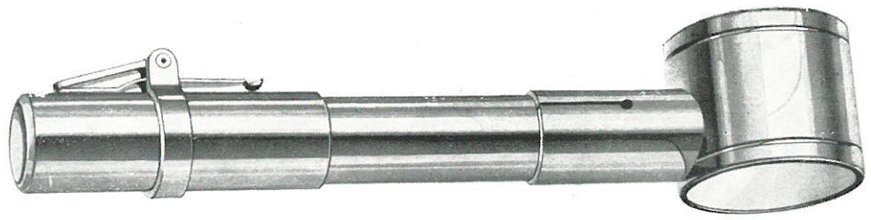
Illuminating Magnifiers

LUMINEX and LUMAG

(Registered Design No. 771009.)



No. 3726.



No. 3737.

The Beck illuminating magnifiers have uses far too numerous to detail. For the examination of any type of surface, small cavities, bores, chart and map reading, they are unequalled. The light is self-contained in the magnifier so that the object being examined is brilliantly illuminated, every detail being visible. No matter how inaccessible an object may be, it can always be observed under ideal conditions of lighting.

The Lumag models are manufactured in magnifying powers of ×3 and ×5 with respective fields of view $1\frac{1}{4}$″ and 2″. These particular models are the most satisfactory for map and chart reading, examination of documents, entomology, or any purpose where a high power is not necessary.

In the Luminex series the magnifying powers are ×10, ×15 and ×20. Two models of the ×10 are available, one being of fixed focus, focussing the object just below the rim of the reflector, the other having a focussing adjustment to the lens, which enables the magnifier to be focussed when rested on an object. This focussing adjustment is always fitted to the ×15 and ×20 models. The optical properties of all models produce a field of view free from aberrations.



For those who wish to carry out measurements, the models ×10 and ×15 can be supplied with a graduated scale, which is seen superimposed upon the object being viewed. The focussing adjustment provided to the lens brings both the scale and object into accurate focus. The following types of scale, as illustrated on page 112, are available :—

$\frac{1}{2}$ in. straight scale divided into 10ths, 50ths and 200ths of an inch.

10 mm. straight scale divided into 100 divisions, i.e., 1/10th of a millimetre.

Squares over the whole field in either $\frac{1}{4}$, $\frac{1}{2}$ or 1 mm.

Both the Lumag and Luminex magnifiers are supplied for pocket use or running direct from mains supply, alternating current only. In the former type, the handle is a substantially made electric torch which uses standard lamps and batteries. The torch has a finger switch for operating the lighting intermittently, or if desired to keep the light on for a long period, there is fitted to the switch a lever arrangement for keeping it continually in the one position. The form running direct



from the mains has a small transformer which plugs in direct to the mains point, so that there is no possibility of this being in the way of the user. The pocket models are supplied in leather cases.

In all models daylight lamps can be supplied if required, and should be specified when ordering.

No. 3736.	**Lumag magnifier,** ×3, in case							£0	14	6
No. 3737.	**Lumag magnifier,** ×5, in case							0	15	6
No. 3725.	**Luminex magnifier,** ×10, fixed focus, in case							0	17	6
No. 3726.	**Luminex magnifier,** ×10, adjustable focus, in case							1	1	0
No. 3731.	**Luminex magnifier,** ×15, adjustable focus, in case							1	5	0
No. 3732.	**Luminex magnifier,** ×20, adjustable focus, in case							2	2	0
No. 3727.	**Luminex magnifier,** ×10 scale model, with one scale, in case							2	3	6
No. 3723.	**Luminex magnifier,** ×15 scale model, with one scale, in case							2	7	6
No. 3736MM.	**Lumag magnifier,** ×3, complete with transformer for running from A.C. mains							1	11	6
No. 3737MM.	**Lumag magnifier,** ×5, complete with transformer for running from A.C. mains ... ⋮							1	12	6
No. 3725MM.	**Luminex magnifier,** ×10, fixed focus, complete with transformer for running from A.C. mains							1	14	6
No. 3726MM.	**Luminex magnifier,** ×10, adjustable focus, complete with transformer for running from A.C. mains							1	17	6
No. 3731MM.	**Luminex magnifier,** ×15, adjustable focus, complete with transformer for running from A.C. mains							2	2	0
No. 3732MM.	**Luminex magnifier,** ×20, adjustable focus, complete with transformer for running from A.C. mains							2	18	6
No. 3727MM.	**Luminex magnifier,** ×10, scale model, with one scale, complete with transformer for running from A.C. mains							3	0	0
No. 3723MM.	**Luminex magnifier,** ×15, scale model, with one scale, complete with transformer for running from A.C. mains							3	5	0
No. 3728.	**Extra scales** for Nos. 3727, 3723, 3727MM and 3723MM							0	17	6

Replacement for Luminex and Lumag Magnifiers.

No. 3729.	**Lamps**								each	£0	0	3
No. 3729A.	**Daylight lamps**								each	0	0	6
No. 3730.	**Battery**								each	0	0	4

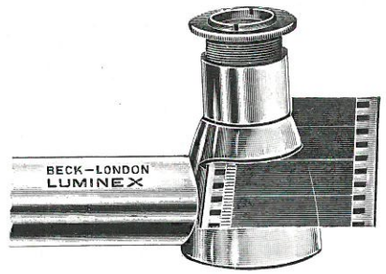


No. 3733.

LUMINEX MICROSCOPE.

The illumination in this is similar to that of the Luminex magnifier. It has a compound microscope giving a magnifying power of ×40 and graduated scale in the eyepiece reading to 1/1000th inch or 1/50th m/m.

No. 3733.	Luminex microscope in case	£4	10	0
No 3733MM.	Luminex microscope complete with transformer for running with A.C. mains	5	12	6

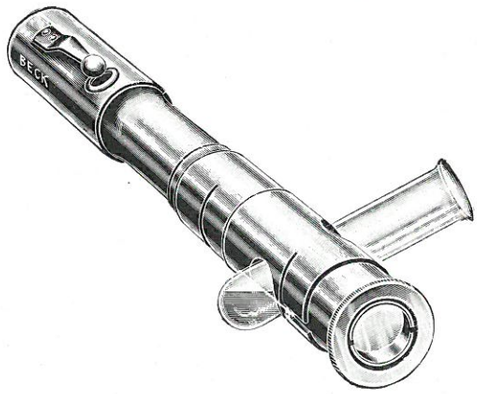


No. 3734.

FILM MEASURING LUMINEX.

This instrument has been specially designed for use with a transparent object such as cinematograph film and enables measurements of frequencies on sound-tracks, size of perforations, etc., to be readily made. It can be supplied to read in $\frac{1}{10}$ m/m. or $\frac{1}{200}$ in. (Specify scale required when ordering).

No. 3734.	Film-measuring Luminex, ×10 in case with spare battery and bulb	£3	3	0
No. 3734MM.	Film measuring Luminex, ×10 complete with transformer for running with A.C. mains	4	5	0



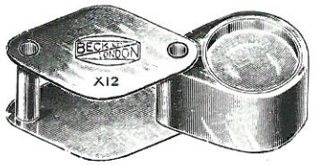
No. 3735.

KAHN TEST MAGNIFIER.

In the use of the Kahn test, the observation of the degree of flocculation is difficult and this magnifier has been designed in conjunction with Dr. A. G. Signy to enable such observations to be made with ease. The test tube can be rotated and the flocculation examined on the inside of the tube either by daylight or by the self contained illumination. The magnifying lens has a focussing adjustment. The instrument is supplied in a case with spare battery and lamp, except if supplied for running from A.C. mains.

No. 3735.	Kahn test magnifier ...	£1	10	0
No. 3735MM.	Kahn test magnifier complete with transformer for running with A.C. mains	2	2	6

Achromatic pocket magnifiers.



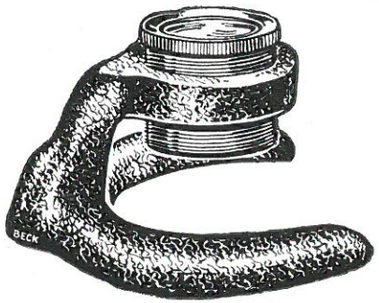
No. 3172.



No. 3174.

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 leather cases.

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

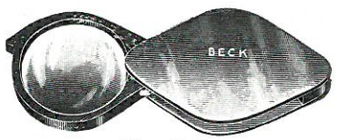


No. 3700

Workshop magnifier.

This magnifier is made in two powers, ×5 and ×10, and is mounted into a substantial fitting with foot, and screw focussing motion 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. 3137

Planoscopic Magnifier.

This consists of a corrected combination of lenses giving a flat field The magnification is ×5 and the field of view 1¼ in The frame carrying the lenses is of vulcanite, the sides of the shield, metal nickel plated.

No. 3137. Planoscopic magnifier £0 5 0



No. 3161.

Two and Three Lens Combinations

The mountings of these magnifiers are of vulcanite and the lenses of good quality. The magnifying powers can be varied by using the lens combinations singly or together.

No. 3161. Three lens combination in vulcanite, with ⅞ in., ¾ in., and ⅝ in. diameter lenses ... £0 3 0

No. 3163. Three lens combination in vulcanite, with 1 in., ⅞ in., and ¾ in. diameter lenses ... 0 4 0

No. 3165. Two lens combination in vulcanite, with ⅞ in., and ¾ in. diameter lenses 0 2 3

No. 3166. Ditto, with 1 in. and ⅞ in. diameter lenses ... 0 3 3

Magnifiers.

Single Lens Magnifiers.

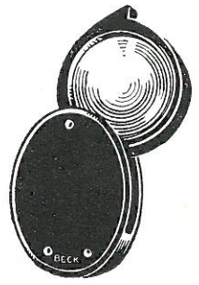


No. 3125.

Nos 3125 and 3126. These magnifiers have powers of ×3 and ×5 respectively, the diameter of field of view in each instance being 1¼ in. The frame carrying the lens is of vulcanite, the side of the shield, metal nickel plated.

No. 3125. Single lens magnifier, ×3 ... ... £0 2 0

No. 3126. Single lens magnifier, ×5 ... ... 0 2 6



No. 3167.

Nos. 3167-70. The mountings of this series are of vulcanite throughout.

No. 3167. Single lens magnifier, ⅞ in. diameter ... £0 1 3

No. 3168. Ditto, 1 in. diameter 0 1 6

No. 3169. Ditto, 1¼ in. diameter 0 2 6

No. 3170. Ditto, 1½ in. diameter 0 3 9

No. 3148.

No 3148. 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 supplied in chamois leather bag.

No. 3148. Single lens magnifier £0 6 6

No. 9149. An extremely useful magnifier for the reading of scale or examining objects situated in places where the hands cannot be readily introduced. The length of the handle is 3½ 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.

No. 3149 Single lens magnifier £0 7 6



No. 4564.

Watchmakers' Eyeglass.

No. 4564. In vulcanite mount ... £0 1 6

No. 4564A. In aluminium mount ... 0 2 0

Engravers' Glass.

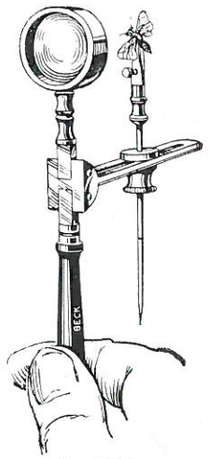
No. 3705. In vulcanite mount, lens 1½in. daimeter £0 6 0

No. 3705A. In vulcanite mount, lens 2 in. diameter 0 8 6



No. 3705.

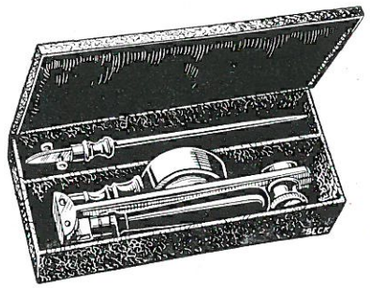
Magnifiers.



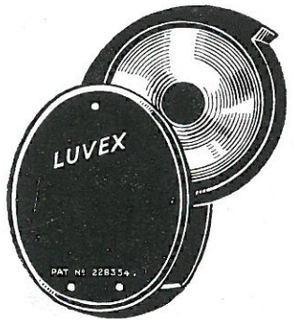
No 3703.

Entomological magnifier.

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 lens type.



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



No. 3145.

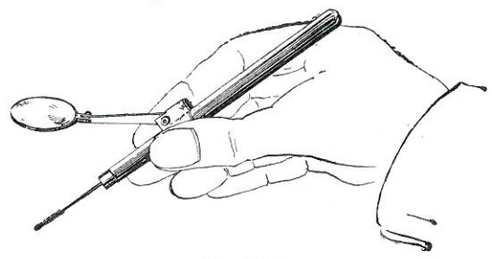
Luvex illuminating magnifier.

The Luvex magnifier consists of a lens surrounded by a mirror which concentrates a reflected light on the object under examination. The brilliant illumination thus produced greatly facilitates examination. It is particularly suited for use with objects having cavities as a direct beam of light can be directed into the cavity and a clear view obtained.

No. 3145. ×5 in vulcanite mount £0 8 6
No. 3146. ×10 ... ... 0 5 6

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.

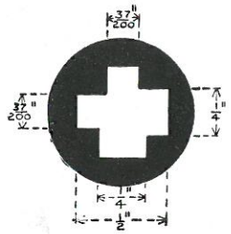

No. 3378.

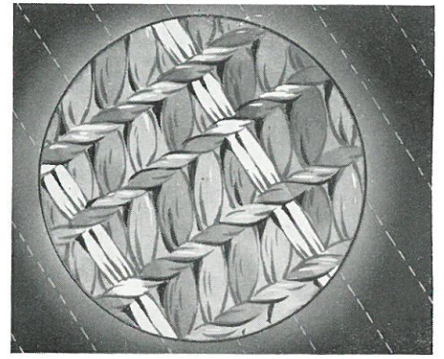
No. 3378. Focostat lens complete with dissecting needle... ... £0 10 6
No. 3378A. Ditto with mapping pen... 0 10 6
No. 3378B. Ditto with two scalpels ... 0 16 6

Linen Provers.

Luminex linen prover.

This is an adaptation of the Luminex magnifier described on page 111, the addition of a suitable aperture plate to this magnifier makes an ideal linen or thread counter. If threads in a dark material are to be counted, the brilliant illumination thrown upon it makes it a very much easier matter to count the threads than in the case of an ordinary linen prover.





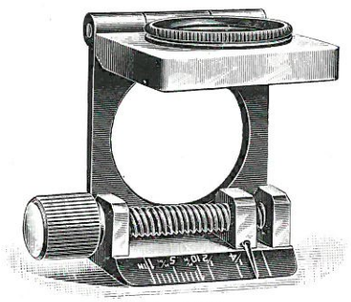
The aperture plate is made in two forms : one has three dimensions, $\frac{1}{2}$ in., $\frac{1}{4}$ in., and $\frac{37}{200}$ in., the other, two dimensions $\frac{1}{2}$ in. and $\frac{1}{4}$ in. Especial care has been taken in its manufacture to ensure the accuracy of these dimensions.

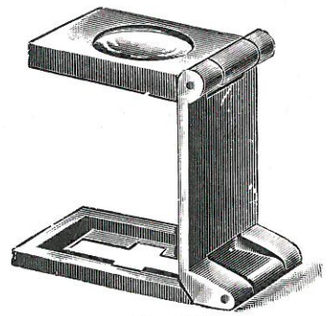
The magnifying power is ×10.

A hole is provided in the side of the reflector by means of which a needle can be introduced to facilitate counting.

No. 3724. Luminex linen prover, ×10, complete with lamp and battery ... £1 10 0
No. 3724MM. Luminex linen prover, ×10, complete with transformer for running from A.C. mains 2 12 6

Linen provers.

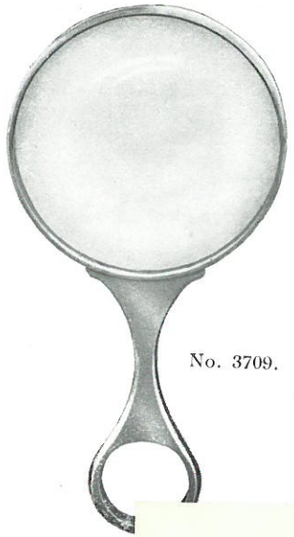

No. 3717


No. 2938

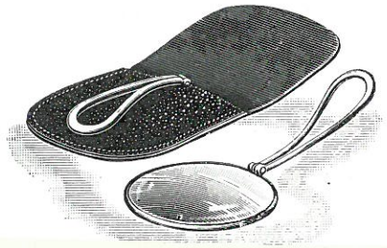
These convenient magnifiers enable the threads in material to be readily counted. They are made with a large variety of apertures to meet the requirements for different materials. No. 3717 is a universal model with a pointer which traverses over the field by means of a screw actuated by milled head. The scale is calibrated to give readings of 1 in., $\frac{1}{2}$ in., $\frac{1}{4}$in., 10 mm. and 5 mm. In all models the greatest care is exercised to ensure accurate sizes.

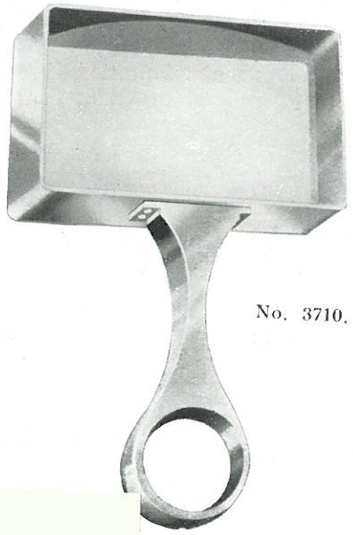
No. 2931. 1 in. × $\frac{1}{2}$ in. × $\frac{1}{4}$ in. brass mount £0 10 0
No. 2932. Ditto, nickel mount 0 11 6
No. 2933. 1 in. × $\frac{1}{2}$ in. × $\frac{1}{4}$ in. × $\frac{37}{200}$ in. brass mount 0 10 6
No. 2934. Ditto, nickel mount 0 11 9
No. 2935. $\frac{1}{2}$ in. × $\frac{1}{4}$ in. × $\frac{37}{200}$ in. brass mount 0 9 6
No. 2936. Ditto, nickel mount 0 10 3
No. 2937. 1 in. × 1 in. brass mount 0 14 6
No. 2938. Ditto, nickel mount 0 16 0
No. 3717. Adjustable model, complete in case 1 15 0

Reading Glasses.



No. 3709.





No. 3710.

No. 3707. Reading glasses, revised prices.

2½ in.	3 in.	3½ in.	4 in.
3/3	4/3	5/3	7/6

4 in.
5/9

				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.

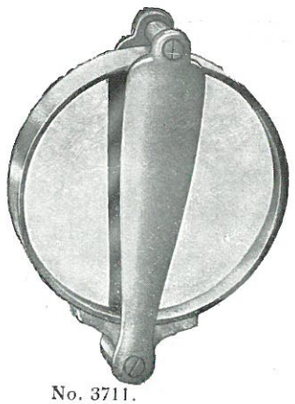
Size of lens	3 in. × 2 in.	3½ in. × 2¼ in.	4 in. × 2½ in.
	16/-	19/-	£1 4 0

No. 3719. Reducing glass in solid aluminium mounts as No. 3709.

Diameter of lens ...	2½ in.	3 in.	3¼ in.
	£1 7 0	£1 10 0	£1 13 0

No. 3714. **Pocket reading glass** with folding handle. The diameter of the lens is 2 inches and each glass is supplied in leatherette case. £0 5 9

Nos. 3709 and 3710. The glasses can also be supplied with imitation tortoiseshell and mother-of-pearl handles. Prices on application.



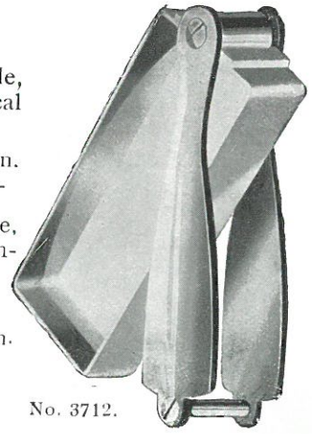
No. 3711.

No. 3711. Reading glass with folding handle, solid aluminium mounts, spherical lenses.

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

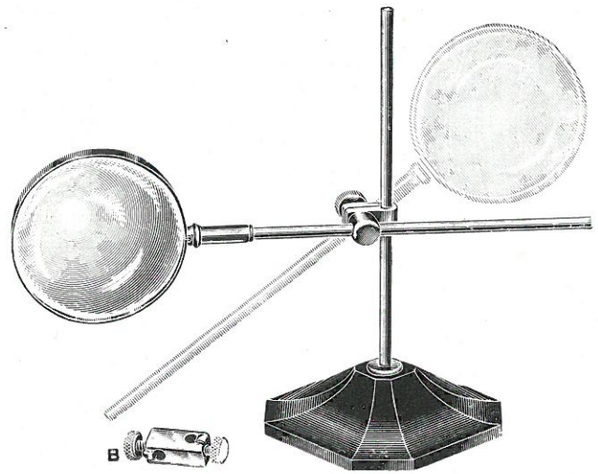
No. 3712. Reading glass, rectangular shape, bicylindrical lenses, solid aluminium mount with folding handle.

Size of lens	3in. × 2in.	3½in. × 2¼in.	4in. × 2½in.
	18/6	£1 3 0	£1 8 0



No. 3712.

Adjustable Reading Glass.



This reading glass is provided with adjustments which enable it to be used in varying positions and at varying heights. Both the vertical and horizontal supports are 9 in. in length which allows of a good range of adjustment. The base is of solid metal ensuring rigidity in use. Two models are available, one having a universal joint, the other being provided with a two-screw block fitting (B). The universal joint enables the magnifier to be used at any angle, the fitting (B) gives movements in either horizontal or vertical directions. The diameter of the lens is 4 in.

In addition to ordinary use for reading, there are many other uses to which this type of reader is suitable such as dissecting, engraving, etching, miniature painting and various industrial purposes.

No. 0000.	Adjustable Reading glass with universal base	£1 17 6
No. 0000.	Adjustable Reading glass with two screw block fitting (B)	1 17 6

STAINS. ¶

Carbol fuchsin (Zeihl Neelsen's stain)	„	25 mls.	1/0		
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„ „ (aqueous) ...	„	25 „	1/0		
Fuchsin (saturated alcoholic) ...	„	25 „	3/0		
Gentian violet (Stirling)	„	25 „	1/3		
Gibbe's double stain	„	25 „	2/6		
Gram's iodine	„	100 „	1/0		
Grenacher's borax carmine (aqueous)	„	25 „	1/0		
Hæmalum	„	25 „	1/0		
Hæmatoxylin, Delafield's	„	25 „	1/0		
„ Ehrlich's	„	25 „	1/6		
Jenner's stain	„	25 „	3/0		
Leishman's stain (Wright's modification)...	per 25 cc.		3/0		
Methyl green	„	25 mls.	1/0		
Methylene blue (aqueous)	„	25 „	1/0		
„ „ Loffler's	„	25 „	1/0		
Methyl violet	„	25 „	1/0		
Neisser's stain A	„	25 „	1/0		
„ „ B	„	25 „	1/0		
Neutral red	„	25 „	1/0		
Picric acid (aqueous)	„	100 „	1/0		
„ „ in 70% alcohol	„	100 „	1/3		
Picro-carmine ammonia	„	25 „	1/0		
Scarlet red (alcoholic)	„	25 „	1/9		
Safranin (aqueous)	„	25 „	1/0		
Schulze's solution	„	25 „	1/0		

MOUNTING MATERIALS, ETC. ¶

Asphalt varnish	per 25 g.		0/10		
Canada balsam (filtered) ...	„	25 „	1/6		
„ „ (dried)	„	25 „	2/0		
„ „ (in benzol)	„	25 „	1/6		
„ „ (in xylol)	„	25 „	1/6		
Dammar varnish	„	25 „	1/3		
Deane's medium	„	25 „	0/10		
Glycerine jelly	„	25 „	0/10		
Gold size	per 25 g.		0/10		
Hollis glue	„	25 „	1/0		
Marine glue	„	25 „	1/0		
Zinc cement	„	25 „	1/0		
Sira immersion oil Refr. index 1.52	„	bottle	2/6		
Oil of cedar wood	„	25 cc.	1/6		
„ „ cloves	„	25 „	1/9		
Osmic acid 1%	„	25 „	7/-		
Xylol	„	100 cc.	1/6		

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

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For the lubrication of instruments we use three grades of greases which we prepare specially to suit the particular part in relation to the work it is required to do. The grades are as follows :—

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B—Heavy : for lubricating fitting screws to give a smooth working motion.
C—Light : for lubricating enclosed slides and similar small fittings which work slowly.

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Theory and Practise

BY

Conrad Beck, C.B.E.

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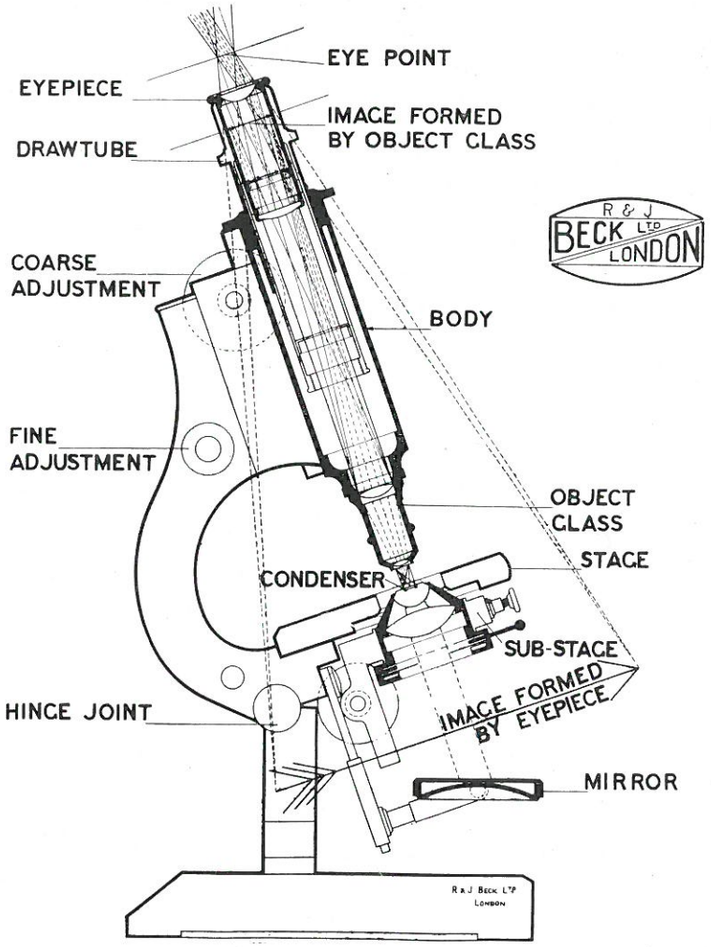

Magnification and Field of View

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
¼	8	115	·038	200	·028	285	·025
⅙	4	285	·015	490	·010	690	·009
⅛ N.A. .25	3	380	·012	650	·009	950	·008
1/12 N.A. .30	2	530	·007	900	·005	1275	·0045

Facsimile of Wall Chart 30 in. × 20 in. giving a sectional drawing of the microscope with a trace of the rays passing through the instrument. We shall be pleased to send a copy of this, post free, to any institution to whom it would be of service.

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