MICROSCOPES

AND THEIR

ACCESSORIES

Parts 1 & 2.

W. WATSON & SONS, LTD.
LONDON

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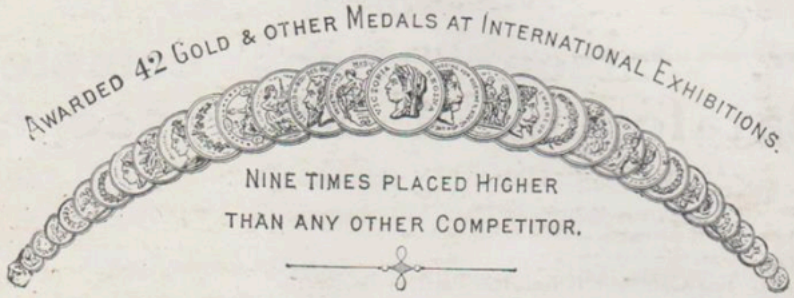

CATALOGUE OF

MICROSCOPES

. . . and Accessories.

Combining PARTS 1 & 2.

MANUFACTURED AND SUPPLIED BY

W. WATSON & SONS, LTD.

OPTICIANS

To H. M. Government. The Admiralty, War Office, Royal Air Force, India Office, Colonial and many Foreign Governments.

ESTABLISHED 1837.

Head Offices and Show Rooms: 313, High Holborn, LONDON, W.C.1. ENGLAND.

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This Catalogue combines PARTS 1 and 2

OF

W. Watson & Sons' complete Catalogue of Microscopes.

FOR INDEX SEE PAGE 140.

The Catalogue is issued in Parts as follows:—

PART 3. Microscopic Objects.

PART 4. Metallurgical Petrological and Mineralogical Microscopes and Accessories.

PART 5. Photo-Micrographic Cameras and Accessories.

BOOKLETS:—

6a. The Choice of a Microscope.

7b. The Book of the Watson Microscope.

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Some details regarding

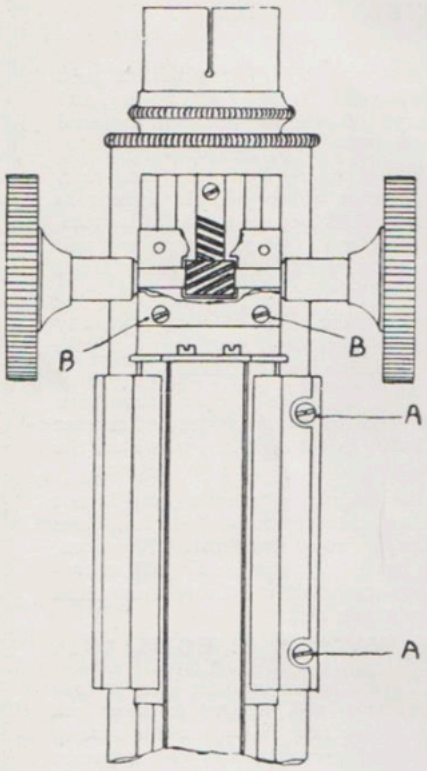
WATSON'S MICROSCOPE STANDS

The coarse and fine adjustments for focussing.

The Watson Microscopes have always borne a high reputation for the permanent accurate working of the mechanical movements and they have long been acknowledged as the best that are made.

THE COARSE ADJUSTMENT.

This is a diagonal rack and spiral pinion, as shown below. With this construction the teeth successively engage with the pinion, and thus an exquisitely-smooth movement, with an absence of loss or backlash is secured. A plate or box covers the pinion and its stems, and is attached by four screws; by regulating the latter a most perfectly graduated pressure between rack and pinion can be applied as desired. Many valuable commendations have been expressed of this feature of our stands. The late Rev. W. H. Dallinger in the eighth edition of "The Microscope and its Revelations" (Carpenter) says:



The arrangement of Rack and Pinion, and Fine Adjustment dovetailed fitting with Adjusting Screws A.

"From practical use, we can speak of the delicacy of this focussing adjustment with which we have with ease used powers up to $^1/_8$ in., and often have used it with a $^1/_{12}$ in. objective."

Mr. Andrew Pringle, in his "Practical Photo-Micrography," in referring to one of our Instruments states: *"It is one of the two Microscopes with which we can work comfortably, using a $^1/_8$ in. objective and the* coarse movement *only."*

The "Journal of the Royal Microscopical Society," February, 1893, page 95, says: *"The essential part of a microscope is the springing of the dovetail grooves. . . In Watson's Microscopes we have two spring slides, one for the coarse adjustment and one for the fine. The moment either movement exhibits the slightest sign of wear, the slack can be immediately taken up by tightening the screws. There is no reason, therefore, why in years to come this instrument should not work as well as it does to-day."*

It is thirty years since this was written; the principle has stood the test of time in the Watson Microscopes, and those who know, would have none other.

THE FINE ADJUSTMENT.

This is constructed in two designs, both on the Lever principle, one working horizontally, the other vertically. In both, the apparent and the real movements correspond when the milled head is turned.

The Horizontal Lever.

As will be seen from Figure 1 the lever in this pattern is set horizontally. It has been made by us for the **past thirty years,** and it is at the present day generally admitted to be the most accurate, reliable and scientific in principle, of any now in use. It combines simplicity of construction with great delicacy of action, will not deteriorate with use, and is suitable for objectives of the highest power and aperture.

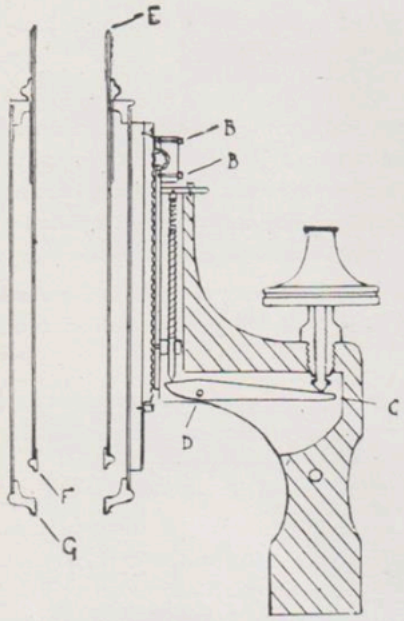


Fig. 1. Section of Limb of Edinburgh Student's Microscope, showing construction of Watson's Standard Fine Adjustment, etc.

B—Screws holding pinion plate in contact with rack of Coarse Adjustment. C—Lever. D—Fulcrum of Lever of Fine Adjustment. E—Eyepiece fitting at top of draw-tube. F—Universal objective thread at lower end of draw-tube. G—Objective thread at nosepiece end of body.

The principle of its construction is shown in Fig. 1. The whole body of the instrument is supported on the shorter end of a lever " C " contained in the limb of the stand. The long end rests against the point of a micrometer screw, which is actuated by a milled head. The spiral spring merely keeps the body pressed closely against the lever, and is a necessary part of all similar movements. It will be observed that the fulcrum " D " is as close as possible to the body, thus minimizing the actual weight to be raised, by increasing the ratio between the two ends of the lever. Thus, in the Edinburgh Student's microscope, the arm on one side is $\frac{3}{8}$ in. long, and on the other side $1\frac{3}{4}$ in. The weight of the body to be lifted is 17 ozs. Therefore, the actual resistance amounts only to $3\frac{9}{14}$ ozs. If the objective touch the cover glass, the slight pressure exerted by this weight is not sufficient to break the cover glass, and thus it combines the additional merit of a **Safety Fine Adjustment.**

Also, the rate of movement is reduced in the same ratio, and a very slow motion is communicated by this system. As an instance, the movement imparted by one complete turn of the milled head in the Edinburgh Student's Instrument is 1/300 of an inch, and as it is sensitive to a fractional part of a turn, a precision and fineness is obtained which is unequalled for high-power work. Both the lever itself and the bearing points are of polished hardened steel; wear is thus reduced to a minimum. The length of the dove-tailed bearing in which the body moves is about $2\frac{1}{2}$ inches.

THE FINE ADJUSTMENT—Continued.

The principal advantages of this fine adjustment are :—it is very strongly constructed and cannot easily become deranged ; the distance between eyepiece and objective remains constant ; the milled head can be controlled by either hand ; the head can be conveniently geared to the focussing rod of a Photo-Micro Camera ; the fingers cannot be pinched, as there is no external fitting on a pillar ; the whole movement can be easily adjusted by the worker himself, by means of the spring-fitted slides. This latter is an advantage of especial interest to microscopists abroad, as it obviates the necessity for returning an instrument to the manufacturers for adjustment. " The Book of the Watson Microscope " gives full directions on this point.

The Vertical Lever

Shown in Fig. 2 is the method adopted in the Fine Adjustments of the "Service," the "Research," and other Instruments in this catalogue.

It is similar in action and has the advantages associated with our horizontal lever already described, but the lever is placed vertically instead of horizontally. For many purposes the controlling milled head at the side of the limb is preferred by some workers, but it has hitherto been associated with a more or less complicated mechanism which must rapidly deteriorate.

This is not the case with our lever form, the very simplicity of which is a recommendation. There are no cogs, cams or anything likely to become defective or easily worn out.

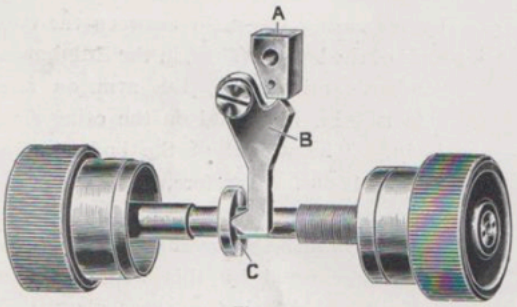


Fig. 2.

The action of the Fine Adjustment. B—The Lever. A—The Block which is attached to the Fine Adjustment Slide. C—The Travelling Wheel that imparts the movement, actuated by the screw on the right, which is revolved by the milled heads. The reverse movement is assisted by a spring.

It is exquisitely sensitive to the least turn of the milled heads, and the weight of the body and the rate of movement are alike minimized by the disproportion in the arms of the lever, so that no injury is likely to occur if the objective is brought in contact with the cover glass by its means.

A complete rotation of the milled head moves the body 1/125 m. (·22 m/m.), but it is sensitive to less than 1/100th of a turn, so that the reading may be less than ·001 m/m.

The worker always knows whether the body is ascending or descending ; the apparent and real movements when the milled head is turned being identical.

The great advantages of our Fine Adjustments are

SIMPLICITY, EFFICIENCY,
PERMANENT WORKING QUALITY.

MECHANICAL STAGES.

The interchangeable system which has been adopted in the manufacture of our Microscopes, enables us to offer a wide choice in the type of **Mechanical Stage** that is most suitable for the work in view. Mechanical Stages can be roughly divided into two classes :—

(1) The Built-in or Solid Stage, in which the top plate moves entirely, carrying the object with it, and which is built as an integral part of the Microscope.

(2) The Attachable type of Mechanical Stage, which can be removed or fitted at will, in which the object slip is gripped between two points, and carried over the top plate of the Stage.

THE BUILT-IN OR SOLID STAGE.

This has found favour wherever it has been used, and gives comfort and accuracy in working which are not obtainable with any other pattern. The amateur always selects this model, and a vast number of laboratory workers have found it indispensable.

The fact that this Stage is built as a part of the Microscope, imparts a solidity to the working parts which is not obtained with an Attachable Mechanical Stage, although the latter has been greatly improved in recent years.

Watson's Standard Mechanical Stage.—This Stage is supplied to the "H" Edinburgh Student's and "Royal" Microscopes and with suitable baseplate, for the Van Heurck Microscope. In our opinion no type of stage is superior to this for continuous usage ; it has proved itself to be the most reliable of all patterns.

The Stage surface is in full view, Fig. 3, and the manner in which the movements are effected will be plainly seen. The horizontal travel to the Stage is made by the rotation of the **stationary** milled head F, that is, it does not move with the traversing plates of the Stage. The plate E is connected with the long screw operated by the milled head F, and the screw is supported by a slotted collar, which gives adjustment for wear. To give the smoothest possible motion, the screw has a ball fitting (A) : in this is a groove, which acts as a receptacle for foreign matter. The little plate B fits over the ball, and is so attached that no internal shake takes place. C is the adjusting screw for regulating the pressure of the pinion upon the rack in the vertical movement of the Stage. The Verniers D, Fig .3, which can be used for measuring or for "finding" objects, are an extra costing, 30/-.

The planed fittings of the Stage have slots through which screws pass at FF and GG (Fig. 4), so that any wear in the plates can be immediately taken up.

The advantages of this stage are manifold, and at once occur to the experienced worker.

The size of the top plate is 3¾ in. square. The ranges of movement are, horizontal 1½ in., vertical 1 in.

The sliding bar is an extra, costing **£1 10 0** ; it can, if desired, be entirely removed, the upper surface of the stage is then left quite free.

If desired the whole mechanical stage can be racked off and a plain plate substituted for culture or staining work. Extra for plain plate, **£1 10 0.**

THE RESEARCH STAGE.

In general construction this Stage is similar to the Standard. It, however, offers the advantage that both the controlling milled heads work on the same centre. The horizontal traverse is 1¾ in. and the vertical 1 in. It is an excellent type of stage and is shown fitted to the "Research" Microscope on page 37.

MECHANICAL STAGES.

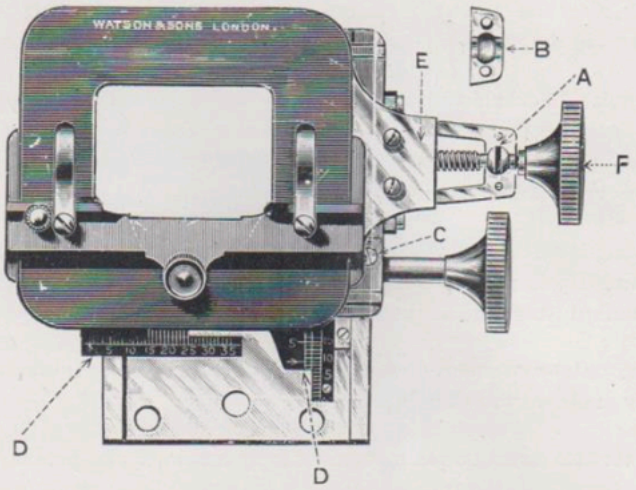


Fig 3. Surface view of the Watson Standard Stage showing liding-bar, scales and verniers, and method of fitting stationary milled head.

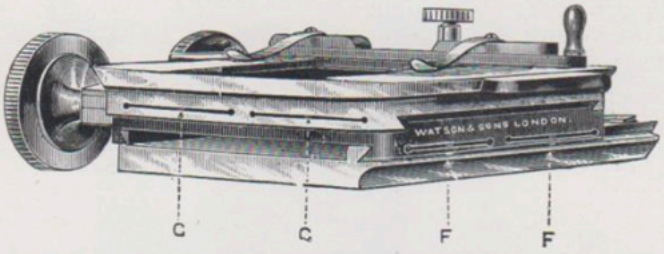


Fig. 4. Corner view of Standard Stage to show system of springing.

See description on previous page.

The methods used in the above Stages, which give a lifetime of working efficiency, are adopted in other mechanical stages of our make.

THE ATTACHABLE MECHANICAL STAGE.

The following Mechanical Stages can be fitted to any Microscope included on pages 19 to 31 that has a plain Stage :—

The "Service" and "Alpha" Stages are attached to the plain Stage by means of rods which, after the removal of the ordinary spring clips for holding the object, fit these apertures in the Stage, and are held tightly by gripping screws from beneath.

The "Service" Mechanical Stage is designed to give the efficiency of a solid built-in Mechanical Stage in the attachable form. It has proved in working to be more effective than any other existing type, and at the same time it can be repeatedly fitted or removed without trouble.

The fitting is as rigid as when the Stage is built as part of the Microscope, and there is no liability to rock, because the flat surface of the Stage and the underplate of the Mechanical Stage are in perfect contact.

The horizontal movement gives a traverse of 50 mms., and is effected by means of a specially made worm and hobbed rack.

In the vertical direction the movement is by rackwork and pinion.

The Object, when in position on the "Service" Mechanical Stage, permits the use of any Objective within the range of its traverse.

The Object is held in position against a plate on the left-hand side by a spring clip, the extremity of which has upon it a small rotating wheel "B." To remove or insert an Object, it is only necessary to press the part "A," on releasing which, a small coil spring causes the wheel "B" to clip the Object Slide. The top lens of the Condenser is not touched by the stage plates. The Stage is fitted with scales and Verniers reading to 1/10 mm.

Code Word.	No.			Price. £ s. d.
Mab.	A3000.	...	(see Fig. 5)	9 5 0

THE "ALPHA" SKELETON ATTACHABLE MECHANICAL STAGE. (Fig. 7.)

This special pattern of Attachable Mechanical Stage is cheaper to make than that previously described. The fittings and movements are of the most accurate description, and a travel of 55 mm. in the horizontal, and 25 mm. in the vertical, is given. The scales to the movements are read by verniers to 1/10th m/m.

Code Word.	No.			Price. £ s. d.
Macar.	A3001	...	(see Fig. 7)	7 0 0

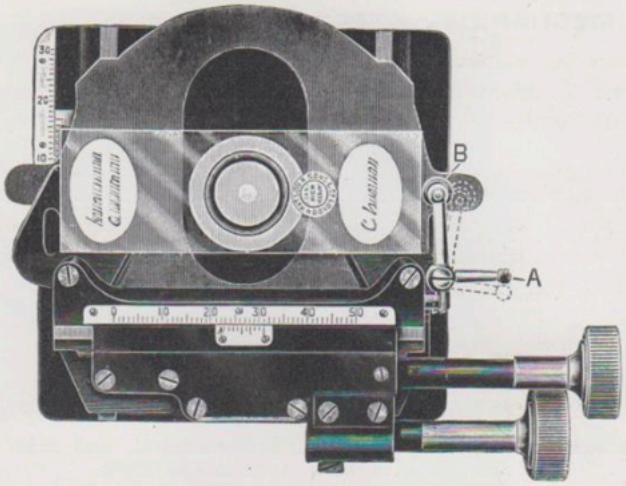


Fig. 5. The "Service" Mechanical Stage.

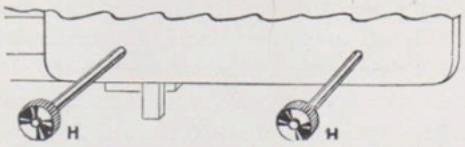


Fig. 6. The attaching studs and screws of the "Service" and "Alpha" Stages.

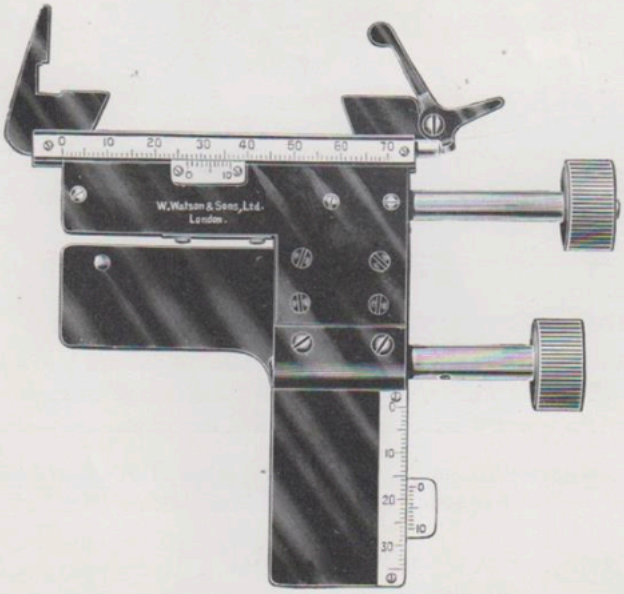


Fig: 7. The "Alpha" Attachable Mechanical Stage.

"BETA" MECHANICAL STAGE (Fig. 10).

This Stage has a different pattern of attachment from that in previously described Stages. To some workers it may appeal as a means of more ready adaptation. Further, it can be fitted to a large variety of Stages, other than those of our own make.

The horizontal movement is 75 mm., and the vertical 50 mm., sliding clips at each end allow of any size of slip being used, and increased range of movement can be secured when required by its means. Divisions to the movements read by verniers to 1/10th m/m.

Code Word.	No.			
Macu'e.	A3002	Price	£7	0 0

MURRAY'S LONG RANGE ATTACHABLE STAGE (Fig. 11).

For the examination of Serial Brain, Entomological, and other sections over an area of 115 m/m × 85 m/m.

This Stage was devised by Dr. Murray, of the Imperial Cancer Research Laboratories, for work in which a Mechanical Stage having a long range of movement was a desideratum. It is different from other stages of a similar character, particularly in its great stability and rigid method of attachment to the plain stage. In use it has been found advantageous in every way and it is strongly recommended to those workers who need such a stage. The horizontal traverse is 115 m/m. and the vertical 85 m/m. inches.

Code Word.	No.			
Mader.	A3012.	Price	£9	5 0

The Mechanical Stages are made in several different patterns so as to give workers as wide a range of choice as possible. Each is described and illustrated in conjunction with the various models, but in several instances the Stage is applicable to a different style of microscope—thus it may be desired to fit the "H" Edinburgh Student's Stand with a "Research" Stage; we therefore quote the cost of substituting other stages, where the interchanging can be effected, in the price lists of the various Instruments.

CONCENTRIC ROTATING STAGE (Fig. 12).

This Stage rotates concentrically and is supplied in place of the ordinary square Stage, as fitted to the Praxis, Fram and "F" Edinburgh Student's and Service Microscopes. It is about 4 inches in diameter and has an ebonite surface.

Code Word.	No.			
Madrep.	A3008.	The extra cost of this Stage in place of the ordinary square pattern is	£2	0 0
		Extras.		
Magna.	A3010.	Divisions to rotation reading by verniers to 5 minutes	2	5 0

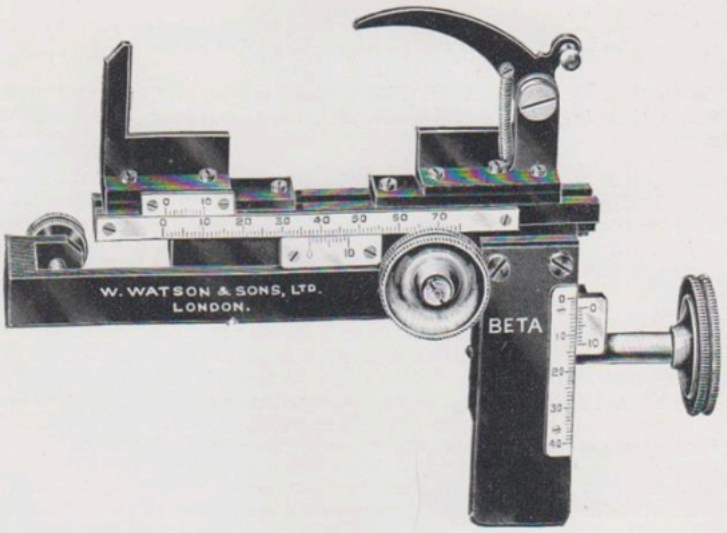


Fig. 10.

THE "BETA" ATTACHABLE MECHANICAL STAGE.

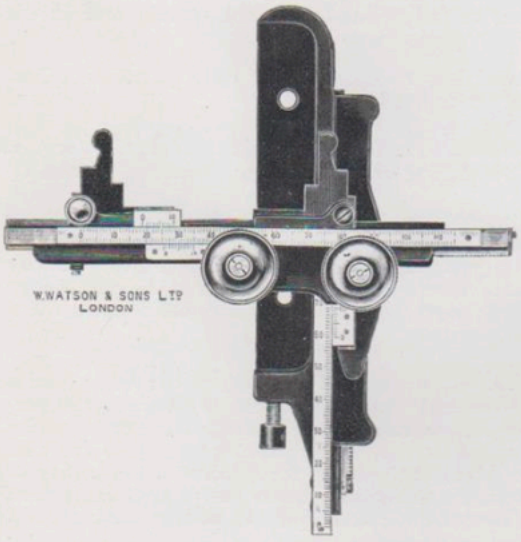


Fig. 11.

MURRAY'S LONG-RANGE ATTACHABLE MECHANICAL STAGE.

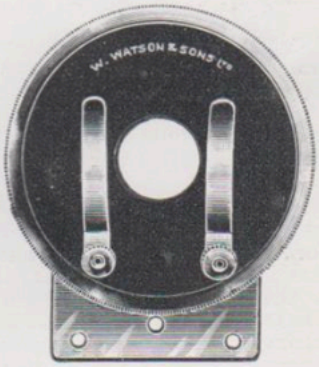


Fig. 12.

CONCENTRIC ROTATING STAGE.

For other Attachable Mechanical Stages, see page 42.

All of the foregoing stages can be fitted to Microscopes by other makers, plus a charge if special adaptation is necessary.

CONDENSER CARRIERS.

Condenser Carriers on Students' Microscopes are usually mounted on a pivotal joint, so that they may be turned aside with the Condenser from the optical axis when not in use.

From motives of economy in manufacture, these Condenser Carriers have hitherto, in Students' Microscopes, been attached to the under side of the Stage itself. This perhaps was not very objectionable when low and medium powers were used, but it has become so much the rule to do an increasing amount of work with the $^{1}/_{12}$ in. Oil Immersion Objective, that some change in this practice became desirable.

We have therefore reconstructed several of our Microscopes so that the limb is continued beneath the Stage. This extension is machined precisely, on the interchangeable system and holes are drilled in its surface for screws, enabling either of the fittings, Figs. 15 to 17, on page 17, to be attached by the user. This will be further understood by reference to Fig. 20, page 18, in which the holes D D in the limb extension are shown in connection with a " Service " Microscope.

Only those who have worked with this system of mounting a Condenser can realize what an added comfort and saving of time is obtained as a result.

A moment's reflection on the part of those who have used Microscopes having the Condenser Carrier hung from the underside of the Stage, will lead them to realize the inconvenience of the arrangement. It is manifestly impossible to focus a Condenser so mounted without torsion on the Stage, causing the Object to momentarily go in and out of focus. This is entirely obviated by the system used in the " WATSON " Microscopes.

The above will be better understood by reference to the three patterns of Condenser Carriers which are illustrated on page 17.

The Plain Underfitting.—This is shown in Fig. 15, and is the simplest form of Condenser Carrier, consisting of a tube fitting in which the Condenser is placed.

The Spiral Focussing Screw Underfitting, Fig. 16, is mounted in a strongly framed bracket which carries the focussing screw whereby the Condenser is moved to and from the Object so as to obtain precise adjustment. The stability given by the attachment of the solid bracket or frame to the limb extension of the microscope gives a greatly enhanced value to this movement, and its convenience makes it a desirable addition to a Student's Microscope.

The Compound Substage, Fig. 17.—The principle of fitting is the same in this as in the other fittings described above, but the focussing of the Condenser is performed with a fine rackwork and pinion. The tube in which the Condenser is carried has centring screws so that the Condenser may be adjusted precisely to the axis of the Objective that is in use. The increasing use and recognition of the utility of the fine Achromatic and Oil Immersion Condensers renders this a very important fitting. It is an essential with the Immersion Paraboloid and similar dark ground apparatus used in the examination of Spirochætæ, etc.

Note.—If a microcopist begins with a plain underfitting or a Spiral Screw focussing underfitting he can at any subsequent time exchange it for either of the other fittings and attach it himself.

All the above Condenser Carriers can be turned out of the optic axis when the Condenser is not in use, and a very effective device is fitted for releasing and engaging the Carriers when this is done.

CONDENSER CARRIERS.

Fig. 15.

Plain understage carrier for condenser, arranged to turn aside. E—Fitting holes through which screws pass to D, in Fig. 20.

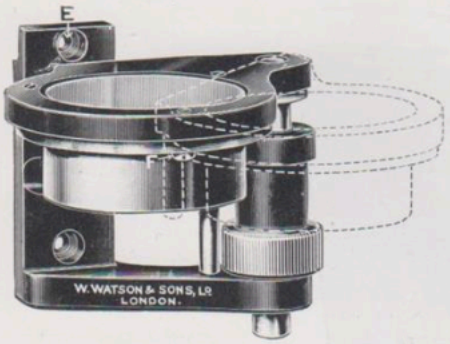


Fig. 16.

New pattern spiral screw focussing underfitting, very solid and perfect in action.

E Fitting holes through which screws pass to D, in Fig. 20

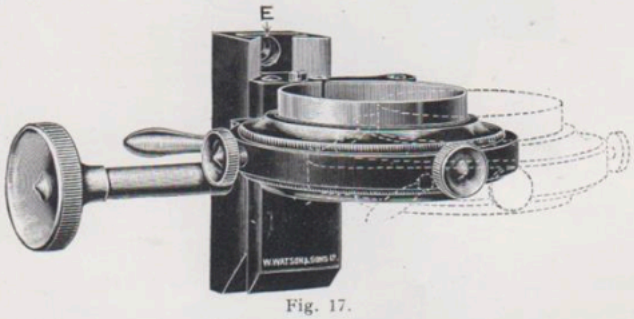


Fig. 17.

Compound substage, with screws to centre and rackwork to focus.
E Fitting holes through which screws pass to D, in Fig. 20.

For other substages and underfittings, see page 43.

HANDLES TO MICROSCOPES.

The shape of the Limb in all our Microscopes renders the so-called handle unnecessary. Most of such handles do not accommodate more than two fingers and are quite unsuitable for carrying an instrument. Our Fine Adjustments cannot pinch the fingers, and the limb is so suitably shaped as to make it a natural and convenient part to lift by.

THE FOOT.

The Foot is always designed to give the rigidity that is so necessary, no matter at what angle of inclination the instrument may be set for working, while bulk and weight have also been considered.

WATSON'S MICROSCOPES.

To show the method of attaching Carriers for Condensers to the extension of the limb below the stage.

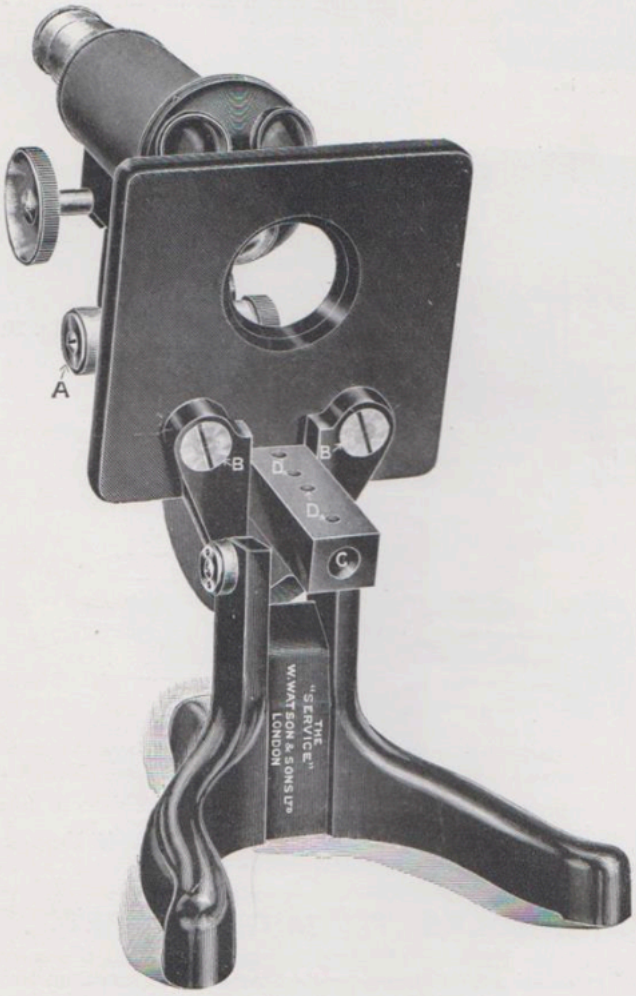


Fig. 20.

The above is the **"Service" Microscope;** the same method is used in the **"Edinburgh" Student's Microscopes.**

A—Fine adjustment, milled head.
B—Stage supports cast in one piece with the limb.
C—Mirror-stem fitting.
D—Screw holes in solid limb continuation, to which carriers for condensers, etc., are fitted.

THE "KIMA" MICROSCOPE

Designed especially for the use of Students.

This Microscope complies with the specification of the British Science Guild, excepting that the fine adjustment milled heads are not on the sides of the limb.

This Instrument is similar in general design to the "Service" Microscope, but is of somewhat smaller size.

Though low in price, the Watson quality is maintained, and it is strongly recommended as a thoroughly reliable and efficient Student's Microscope.

SPECIFICATION.

The Coarse Adjustment is by spiral rack and pinion of Watson's standard quality.

The Fine Adjustment is of Watson's standard horizontal lever pattern (see page 7), the one which has been used in their Microscopes with such great success for over 30 years, and the best obtainable. It is in every way suitable for work with highest power Objectives. One complete turn of the milled head imparts a motion of 1/200 inch—about ·125 mm.

The Body Length is such that when a revolving Nosepiece is in position, the overall measurement is 155 mm., so that Objectives corrected for the short tube length will work satisfactorily. No Draw Tube is included, but may be supplied if required, at an extra cost of 8s. 6d.

The Stage, which measures $3\frac{1}{2}'' \times 3\frac{3}{4}''$ is completely covered with Ebonite, and the distance from the front of the limb to the centre of the Stage is 3 inches. It will carry a 6-in. Petri dish.

The Limb is so curved as to form a convenient handle for carrying.

The Foot is of the modified Continental form, with an inclinable joint, and is so well proportioned that no matter at what angle of inclination the Instrument may be set for working, it is perfectly rigid.

Mirrors.—Plane and concave are fitted.

All the fittings are of the Royal Microscopical Society's Universal size, the Eyepieces being of the Student's diameter.

The whole instrument is made by machinery, to exact sizes, for interchangeable purposes.

The Objectives.—Special "Kima" Objectives are included with this Microscope. They are identical with those of our parachromatic series, and are of guaranteed performance. By reducing the numerical apertures slightly a simpler method of making and mounting is made possible and the cost is correspondingly less.

The No. 3 Objective is $\frac{2}{3}$ in. (·21 N.A.) and the No. 6 is $\frac{1}{6}$ in. (·65 N.A.).

Parachromatic Objectives can be supplied of full numerical aperture if preferred, see note, page 20.

PRICE LIST OF
WATSON'S "KIMA" MICROSCOPE.

A Fitted Case is included with the Sets specified below, but if not required, a reduction of **22/6** will be made from the Set.

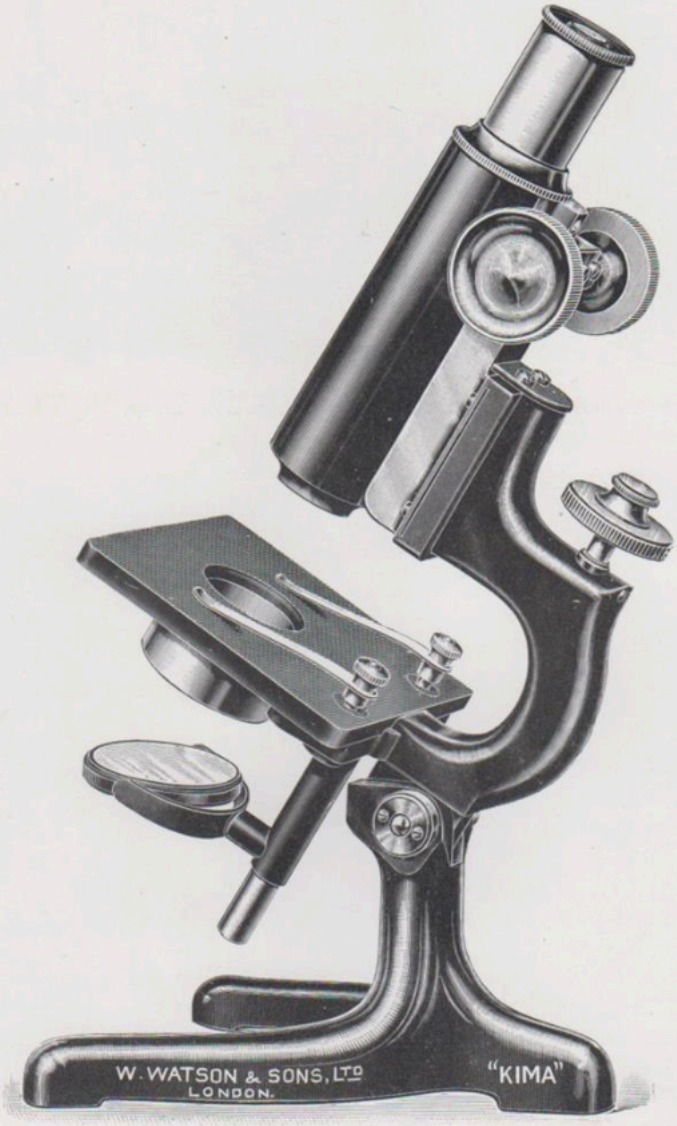
Code Word.	No.		£ s. d.
Kale.	A 3015	Stand with Parachromatic Objectives $\frac{2}{3}$ in. and $\frac{1}{6}$ in. (·65 N.A.) One Eyepiece (No. 1, 2, 3, or 4)	11 10 0
Kalid.	A 3016	Stand with Parachromatic Objectives $\frac{2}{3}$ in. and $\frac{1}{6}$ in. (·65 N.A.) One Eyepiece (No. 1, 2, 3, or 4). Iris Diaphragm to fit Understage fitting	12 5 0
Keel.	A 3017	Stand with Abbe model Illuminator, Iris Diaphragm No. 3151. Parachromatic Objectives $\frac{2}{3}$ in. and $\frac{1}{6}$ in. (·65 N.A.) Two Eyepieces (Nos. 1, 2, 3, or 4). Double Nosepiece ...	14 12 6
Keg.	A 3108	Stand with Spiral Screw Underfitting No. 3108. Parachromatic Objectives $\frac{2}{3}$ in. and $\frac{1}{6}$ in. (·65 N.A.) Abbe Illuminator, with Iris Diaphragm No. 3151. Two Eyepieces (Nos. 1, 2, 3, or 4). Triple Nosepiece	16 0 0
Kepo.	A 3019	Stand with Spiral Screw Underfitting No. 3108. Parachromatic Objectives $\frac{2}{3}$ in. and $\frac{1}{6}$ in. (·65 N.A.) and "Utility" $\frac{1}{12}$ in. Oil Immersion. Abbe Illuminator with Iris Diaphragm No. 3151. Two Eyepieces (Nos. 1, 2, 3, or 4). Triple Nosepiece	21 0 0
Kepla.	A 3020	$\frac{1}{12}$ in. "Versalic" instead of $\frac{1}{12}$ in. "Utility," extra to set A 3019	2 10 0

EXTRAS.

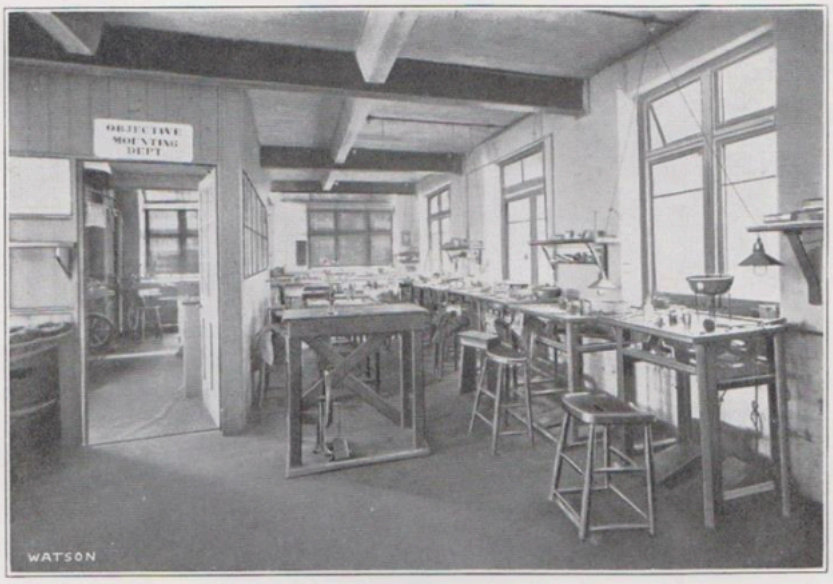
Kest.		Draw Tube...	0 8 6
Kola.	A 3108	Spiral Focussing Screw Underfitting	1 2 6
Kune.	A 3107	Compound Substage	3 17 6

THE "KIMA" MICROSCOPE.

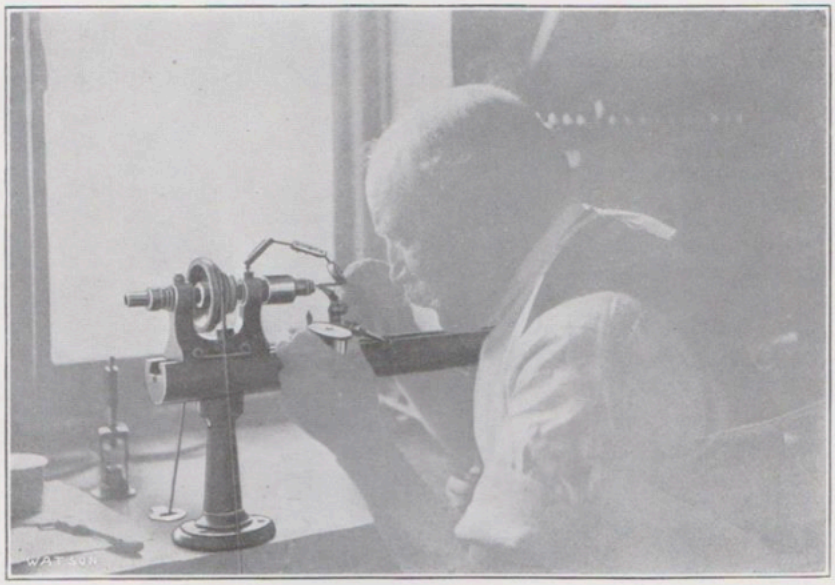
Height 10 inches.



W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.



The Interior of Watson's Micro-Objective Shop, High Barnet.



Mounting and Centring a $\frac{1}{12}$-inch Immersion Lens, Watson's Works, High Barnet.

THE "PRAXIS" MICROSCOPE.

For prices see page 24.

This stand is constructed differently from the other microscopes described in this list. The working parts generally are of our standard patterns, with sprung fittings and screws for adjustment of wear and tear, as described on pages 6 and 7, but the frame of the instrument has been modified so as to place upon the market a stand with all the desirable British features, for those who prefer the original Continental pattern.

The principles followed are briefly: the foot and pillar are cast in one piece, the stage and limb are strongly united. The upper and lower parts are connected by a strong axial joint, the result being an instrument very firmly and solidly-framed, and free from any suspicion of spring or vibration in its parts. These stands are highly recommended where the microscope is liable to rough usage, laboratory use, students' use and travelling.

The "Praxis" is eminently suited for those medical practitioners who, for everyday work, need a simple stand without costly mechanical refinements.

It is very portable, being compact and light in build. All the parts are of (R.M.S.) Standard size, and the horseshoe foot will support the microscope steadily in any position.

SPECIFICATION.

The body length, with a revolving nosepiece in position, is 160 m/m. (6 in.); but increased length is obtained with the draw tube which carries Eyepieces of the Standard Continental, or Student's size.

Coarse and Fine Adjustments of our Standard patterns, as described on pages 6 and 7. The latter being effected by the horizontal lever.

The Fittings for Condenser, etc., turn aside from the optical axis.

The Mirrors are plane and concave.

The Stage, Ebonite covered, is 3½ inches square, and gives ample room for Petri's dishes, etc., the distance from the front of the limb to the centre of the Stage being 2¼ inches.

The Instrument is inclinable to the horizontal.

PRICES OF
THE "PRAXIS" MICROSCOPE.

Code Word.	No.		Prices. £ s. d
Maix.	A 3042.	Microscope as described, Stand only with plain underfitting tube	8 10 0
Maixis.	A 3043.	Microscope as described, Stand only with Spiral Screw Underfitting No. A 3018	9 12 6
Maixsub.	A 3044.	Microscope as described, Stand only with Compound Substage No. A 3017	12 7 6
Maixcas.	A 3045.	Mahogany Case	1 4 9

COMPLETE SETS.

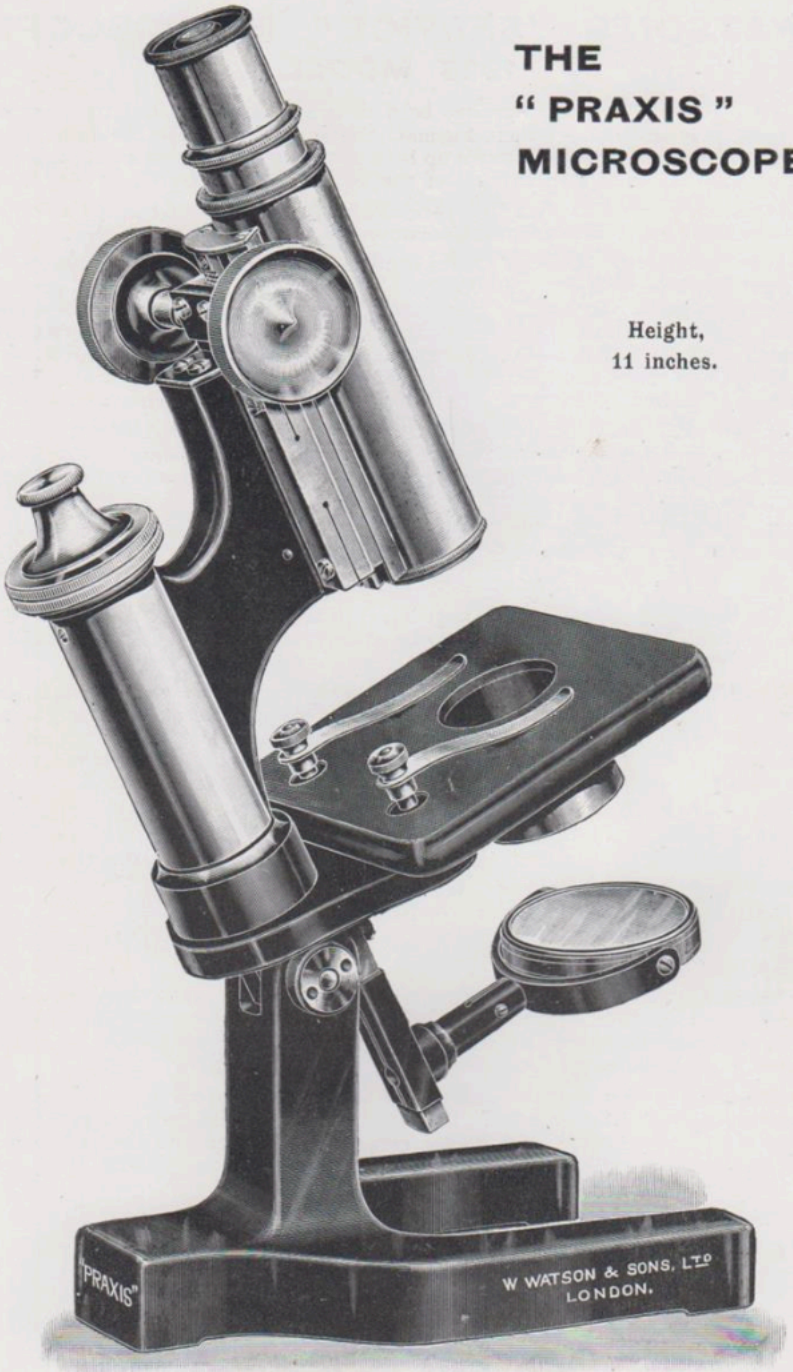
Malar.	A 3046.	"Praxis" Stand and Mahogany Case 2 Objectives, $\frac{2}{3}$ in. and $\frac{1}{6}$ in., Parachromatic series. 1 Eyepiece (No. 1, 2, 3 or 4)	14 14 0
Maled.	A 3047.	"Praxis" Stand and Case Spiral Focussing Screw Underfitting Abbe Model Illuminator, with Iris Diaphragm, No. 3151 2 Parachromatic Objectives, $\frac{2}{3}$ in. and $\frac{1}{6}$ in., ·80 N.A. 2 Eyepieces (Nos. 1, 2, 3 or 4) Double Nosepiece	19 17 0
Malfo.	A 3048.	"Praxis" Stand and Case Spiral Focussing Screw, underfitting Abbe Model Illuminator, with Iris Diaphragm, No. 3151 3 Objectives, Parachromatic series:— $\frac{2}{3}$ in., $\frac{1}{6}$ in., ·80 N.A. $\frac{1}{12}$ in. "Versalic" Oil Immersion 2 Eyepieces (Nos. 1, 2, 3 or 4) Triple Nosepiece, dust-proof pattern	27 9 6
Malgro.		**Objectives Nos. 3 and 6,** as supplied with the "Kima" Microscope can be included with the above sets at a reduction in cost of	1 5 0

EXTRAS.

Malich.	A 3049.	Attachable Mechanical Stage, see pages 13 & 15 ..	7 0 0
Mallet.	A 3051.	Iris Diaphragm to fit in understage carrier ..	15 0
Malow.	A 3052.	Simplified Abbe Condenser with Iris Diaphragm, so arranged that Condenser can be removed and Iris Diaphragm used independently, No. A 3154	1 10 0

THE "PRAXIS" MICROSCOPE.

Height,
11 inches.



W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.

WATSON'S "SERVICE" MICROSCOPE.
1923 MODEL.

The "Service" Microscope has been designed and produced to interpret in the most practical and efficient manner, the specification for the most suitable Microscope for students' use, drawn up by a committee composed of representative men of science, under the auspices of the British Science Guild.

It not only complies with the specification, but offers many added advantages which make it the best Student's Microscope of the day.

It is of somewhat larger size than is usual for a Student's Microscope, but this has been provided with a special object. The instrument is designed to give a lifetime of working service, and if purchased in the first place in its plainest form, for the general purposes of a student, it can subsequently be converted into a complete Research Instrument by the addition of interchangeable parts, such as the Mechanical Stage and Compound Substage. A smaller Microscope does not afford the freedom of manipulation that is desirable in the circumstances.

In the 1923 Model the shape of the limb has been altered slightly, and the fitings for the Fine Adjustment bearings cast solid with the limb. The bearings for both the Fine and Coarse Adjustments are provided with screws, which enable wear and tear to be adjusted for by the user.

More than 2,400 "Service" Microscopes have been sold to workers in all parts of the world, and the demand is constant and increasing.

The following is a specification of the "Service" Microscope:—

The Stand, as will be seen on page 27, is of the modified Continental type, but made in such solid proportions as to be steady at whatever angle of inclination the body may be placed.

The Limb is so shaped as to form a convenient grip for lifting the whole instrument. At its lower part it is continued to form a very firm support to the stage, and then downwards so as to receive on its face the understage fittings and compound substage which carries the Abbe or other condenser, and understage apparatus. This will be better understood from the illustrations on pages 17 and 18.

An important feature is associated with this construction of limb. The hitherto prevailing method of suspending the condenser carrier from the underside of the stage is abolished, and in this instrument such carriers are fixed to the extension of the limb, as described on page 16.

The Coarse Adjustment is by spiral rack and pinion.

The Fine Adjustment is of the vertical lever type with lateral milled heads, as described on page 8.

The Body is fitted with a draw tube to receive Eyepieces of the Standard Student's diameter, and the total length of the body when the draw tube is closed is such that with a revolving Nosepiece in position, an Objective corrected for 160 m/m. (about 6 in.) will work satisfactorily.

The Stage is 4½ in. square, having ebonite moulded upon its surface to render it permanent and perfectly plane. It is provided with plain spring clips for holding the object. The distance between the centre of the stage and the portion of the limb that is on a level with it is more than 3 in., so allowing ample room for the use of a 6-in. Petri Dish.

The fittings throughout are of the Standard R.M.S. gauge.

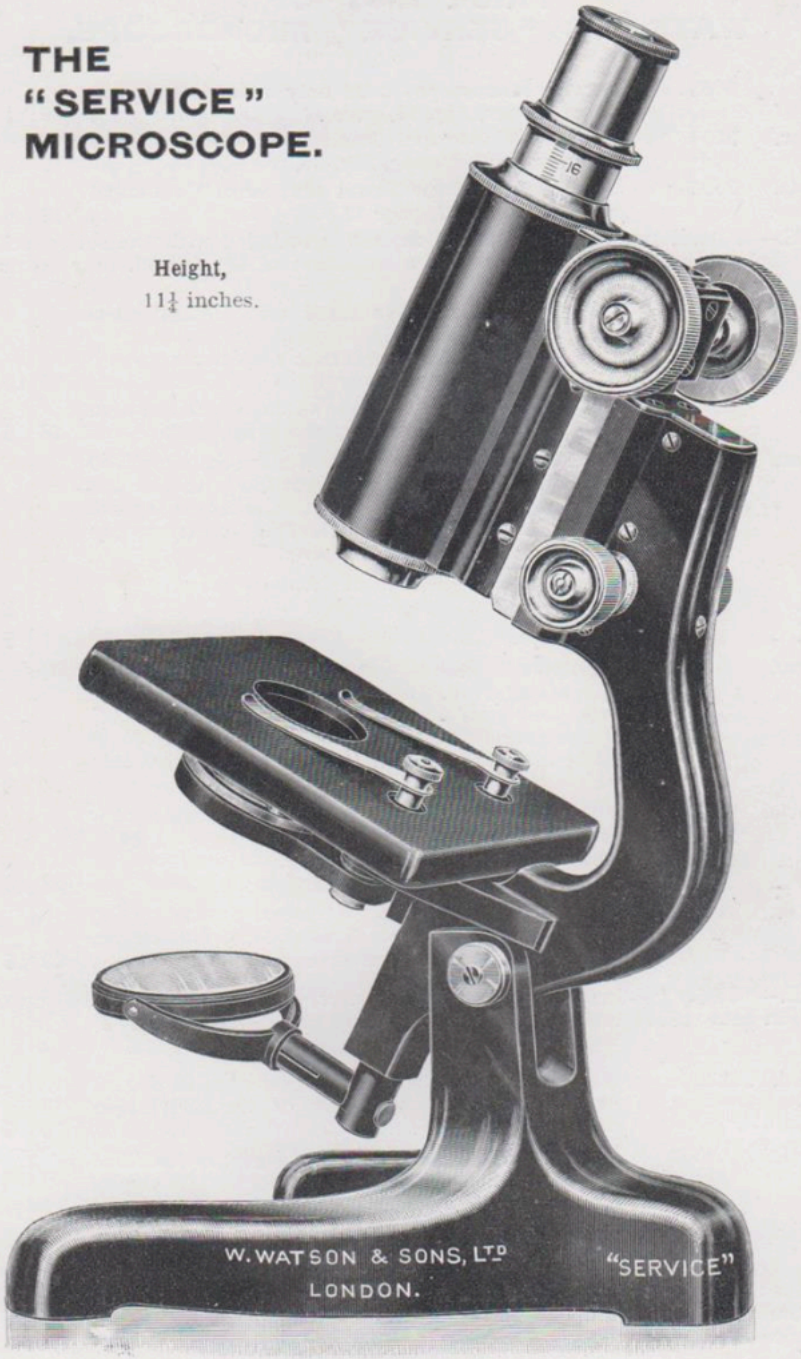
For prices see page 28.

"SERVICE" BOOKLET.

A Booklet is published giving interesting information regarding the construction of the "Service" Microscope. It will be sent post-free on application.

THE "SERVICE" MICROSCOPE.

Height,
11¾ inches.



W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.

PRICE LIST OF WATSON'S "SERVICE" MICROSCOPE.

Code Word.	No.		Price. £ s. d.
Malp.	3053	Service Microscope Stand only with plain understage Carrier, Fig. 15, page 17	9 1 6
Malper.	3054	Service Microscope Stand with Spiral Screw focussing underfitting, Fig. 16, page 17	10 11 6
Malpas.	3055	Service Microscope Stand only with Compound Substage, Fig. 17, page 17	13 0 0

NOTE.—**A fitted mahogany** or **walnut cabinet** is **included** with the sets specified below, but if it is not required a deduction of **£1 4s. 9d.** may be made from the price of the set.

Mamsey.	A3056.	**"Service" Microscope Stand** with Plain Understage Carrier (Fig. 15) ⅔ in. and ⅙ in. Parachromatic Objectives 1 Eyepiece (No. 1, 2, 3 or 4)	15 10 0
Malt.	A 3057.	Set 3056, with the addition of an Iris Diaphragm to fit the Understage Carrier	16 5 0
Malver.	A 3058.	Set 3056, with the addition of a special simplified Condenser to work in conjunction with the Iris Diaphragm in Set 3057. The Condenser Optical part is removable, so that the Iris Diaphragm can be used independently if desired	17 0 0
		Nosepieces for either of the above Sets :	
Mula.		Double	1 2 6
Mion.		Triple	1 5 0
Mamon.	A 3063.	**"Service" Stand** with Spiral Screw Underfitting (Fig. 16) ⅔ in. and ⅙ in. Parachromatic Objectives 2 Eyepieces (Nos. 1, 2, 3 or 4) Abbe Illuminator with Iris Diaphragm No. 3151 Triple Nosepiece	20 0 0
Manacle.	A 3064.	**"Service" Stand** with Spiral Focussing Screw Underfitting (Fig. 16) with Objectives, etc., as in Set 3063 with the addition of : $\frac{1}{12}$ in. "Versalic" Oil Immersion Objective ...	27 10 0
Manage.	A 3065.	**"Service" Stand** with Compound Substage (Fig. 17), having rackwork to focus and screws to centre, and complete accessories as in Set 3064	29 15 0

NOTE.—**"Utility"** $\frac{1}{12}$ inch Oil Immersion Objective 1·20 (price **£5**) can be supplied in sets A3064 and A3065 at a reduction in price of **£2 10 0**

EXTRAS.

Mandal.	A3066.	**Mechanical Stage** as described on page 12, Fig. 5, may be included with any of the above Sets at an extra cost of	9 5 0
Manful.	A3067.	**Skeleton Attachable Mechanical Stage,** as described on pages 12 and 14, may be included in any of the above Sets at an extra cost of	7 0 0
Manger.	A3068.	**Pointer** to No. 2 Eyepiece	2 6

Packing and carriage charged extra.

Special Mahogany or Teak Cabinets with Screwed Joints and Fittings, suitable for Foreign, Colonial and Tropical Use are supplied at a cost of **20/0** beyond the prices shown above.

THE EDINBURGH STUDENT'S SERIES OF MICROSCOPES.

Pages 30 to 35,
and The "Research" Microscope, page 36.

GENERAL SPECIFICATION.

The **body** is of large diameter—1½ in.—and the draw-tube usually supplied carries Eyepieces of the Students' size.

The **foot**, of tripod form, is rigid and efficient. We always advocate the tripod pattern, where extreme portability has not to be considered. It is altogether superior to other patterns. Its spread is 7 inches.

The **stage** is of large size, being 3½ in. square, and is conveniently arranged for Petri's dishes, etc.

The **substage** fitting, whether simple or compound, may be swung out of the optical axis when desired, and is attached to the extension of the limb beneath the stage as described on pages 16 and 17.

The **fine adjustment** is of our horizontal lever pattern. One revolution of the milled head moves the body one three-hundredth of an inch. The action is sensitive to one-hundredth of a turn of the milled head, thus giving a motion of one thirty-thousandth of an inch to the objective.

Each instrument has **plane and concave mirrors**.

All fittings are of R.M.S. Standard gauge, and all bearings sprung with compensating screws.

The "H" Edinburgh Student's Microscope has enjoyed great popularity for many years. No other first-class Microscope embodies so many advantages at so moderate a price.

THE EDINBURGH STUDENT'S MICROSCOPE.

STAND "F."

See description page 29.

This Microscope is mounted on a rigid Tripod foot, and is one of the most serviceable high-class Stands for the purpose of the Amateur or Professional. The general description is given on page 29.

The ease of manipulation, the proportioning of parts, and the excellence of the working, combine to make it a great favourite with all those who desire comfort and accuracy. We always recommend it as the best Instrument obtainable at a moderate price, and worthy to receive additions as occasion may necessitate, a mechanical stage or compound substage being easily fitted. The stage is covered with ebonite.

Code Word.	No.		Price. £ s. d.
Mangle.	A 3072.	Microscope, as described, Stand only	14 15 0
Manier.	A 3073.	Mahogany Case	2 10 0

COMPLETE SETS

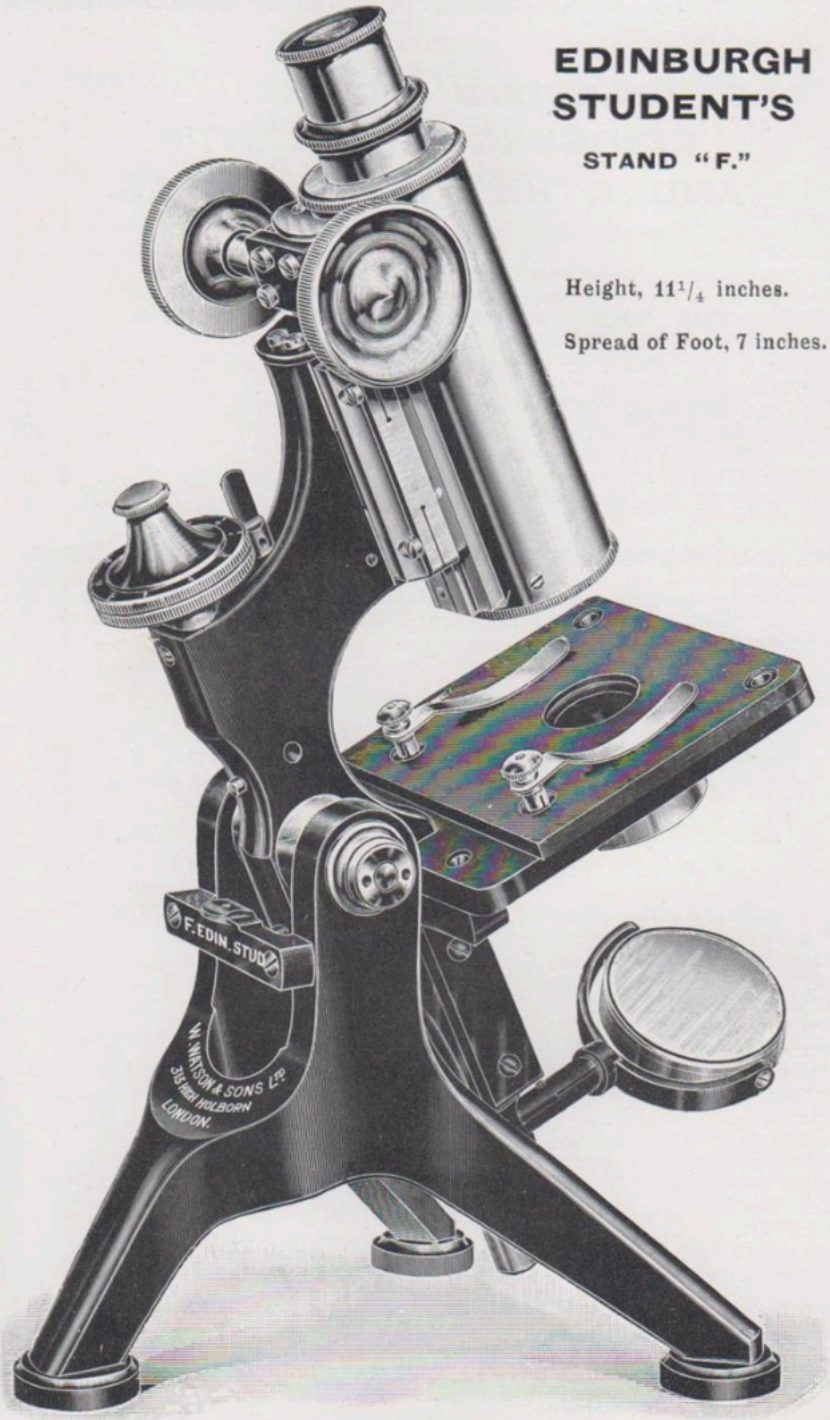
Manik.	A 3074.	Edinburgh Student's Stand "F" in Mahogany Case 2 Objectives—Parachromatic Series: $\frac{2}{3}$ in. and $\frac{1}{6}$ in. ·80 N.A. 1 Eyepiece (No. 1, 2, 3 or 4)	22 12 6
Manna.	A 3075.	Edinburgh Student's Stand "F" in Mahogany Case Spiral Screw Focussing Underfitting (Fig. 16) Abbe Model Illuminator, with Iris Diaphragm, No. 3151 2 Objectives—Parachromatic Series: $\frac{2}{3}$ in. $\frac{1}{6}$ in. ·80 N.A. 2 Eyepieces No. 1, 2, 3, or 4 Double Nosepiece	28 0 0
Manse.	A 3076.	Edinburgh Student's Stand "F" in Mahogany Case Compound Rack-focussing Substage with Centring Screws (Fig. 17) Abbe Model Illuminator with Iris Diaphragm No. 3151 3 Objectives—Parachromatic Series: $\frac{2}{3}$ in. $\frac{1}{6}$ in. ·80 N.A. $\frac{1}{12}$ "Versalic" Oil Immersion 2 Eyepieces Nos. 1, 2, 3 or 4 Triple Nosepiece, dust-proof pattern	38 0 0

EXTRAS

Mantel.	A 3077.	Attachable Mechanical Stage, pages 12 to 14 ..	7 0 0

EDINBURGH STUDENT'S

STAND "F."



Height, $11^{1}/_{4}$ inches.

Spread of Foot, 7 inches.

EXTRAS FOR THE EDINBURGH STUDENT'S AND OTHER MICROSCOPES.

FOR THE "H." EDINBURGH STUDENT'S

	£	s.	d.
Divisions to movements of mechanical stage, reading by verniers to $^1/_{10}$ m/m	1	10	0
Ruled Glass Measuring Disc for Eyepieces or use with above		7	6
Studs to stage, for use when divisions are fitted (These are not needed if a sliding bar is included.)		10	0
Fine adjustment to substage	3	0	0
Clamp Screw to centring movement of substage		5	0

FOR ALL MICROSCOPES WITHOUT MECHANICAL STAGE.

Concentric Rotating Stage in place of plain Stage, as described page 14	2	0	0
Attachable Mechanical Stage, No. 3001 or 3002	7	0	0
Sliding Bar to Stage	1	10	0

FOR ALL MODELS.

Parachromatic or Universal Achromatic Condenser (1·0 N.A.), specially suitable for Photo-Micrography, Nos. 3135 and 3136 and 3143-4. Price with Iris Diaphragm ... For understage, **£6 10 0**; For substage	7	0	0

Either of these may be taken in place of the Abbe Illuminator, No. 3150 *or* 3151 *included in the sets, at the difference in price.*

Set of Stops for either Achromatic Condenser or Abbe Illuminator, for dark ground and oblique light, in brass box		10	0
Disc of Blue or Yellow Glass, for Abbe Illuminator, each		1	6
½ in. "Parachromatic" Objective, giving very flat field	2	0	0
2-in. ditto Objective	2	5	0
Stage Micrometer, $^1/_{10}$ and $^1/_{100}$ m/m		7	6
Micrometer, to drop into Eyepiece		7	6
Eyepieces, No. 1, 2, 3 or 4, **10/0** each; Nos. 5 and 6, each		17	6
Polariscope, fitted with Selenite	2	5	0
Camera Lucida, Beale's		8	9
Stand Condenser, medium size	1	2	6
Triple Nosepiece, new dust-proof pattern	1	5	0
Double Nosepiece	1	2	6
Milled Head of Fine Adjustment divided to $^1/_{100}$ths (instead of $^1/_{10}$ths) extra		5	0
$^1/_{12}$th in. (2 m/m) Oil Immersion "Holoscopic" Series 1·37 in place of the $^1/_{12}$th in. 1·30 included with the Sets "for Bacteriology," extra	4	10	0

BELL-GLASS COVERS.

For Edinburgh Student's, Fram, Praxis and Bactil Microscopes		17	6
Ditto with ebonized base	1	7	6

THE EDINBURGH STUDENT'S MICROSCOPE.

STAND "H."

REMODELLED WITH MANY IMPROVEMENTS.

This instrument is illustrated on page 35 of this list. It is the most popular model that we make, and as such merits a few words of special description and commendation.

In its general design, this microscope leaves nothing to be desired. It is massive, without being cumbersome, and the arrangements and proportions of its various parts will be found in practice exceedingly convenient. Constructed, as it is, with a perfect-working mechanical stage and substage, and furnished with a graduated draw tube, and the most sensitive of fine and coarse adjustments, this microscope is capable of any class of work. Thus, with one-twelfth inch oil immersion objective and other apparatus, as detailed in Set A3086, it is extensively used in bacteriological work and is unsurpassed for the purpose. Arranged with a projection eyepiece and objectives of high aperture, it will stand the severest test of high-power photo-micrographic work. The range of rackwork to the Coarse Adjustment is sufficient for the use of very low power Objectives, giving a distance between the Stage surface and nosepiece end of body of 3½ inches. It is thus a Microscope that meets the demands of the worker, no matter what they may be, in the most satisfactory manner, and while its many conveniences make it always advantageous and appreciated in the Laboratory, it is no less a favourite with the amateur worker, who will always find it unequalled for ease and satisfaction in working. Further, it offers for its price fuller combined advantages in completeness of design and perfection of workmanship, than any other Microscope.

The late Rev. W. H. Dallinger, LL.D., F.R.S., etc., in his edition of Carpenter's "The Microscope and its Revelations" (Eighth Edition, page 218) says: "One of the finest examples of this class of microscopes at present brought within reach of the average student's means, is that known as the Edinburgh Student's Microscope 'H' by Watson & Sons . . . . . It will be seen that it has the prime requisite, a rigid foundation combined with lightness, and it is also possessed of a well-constructed mechanical stage which is built with the instrument, an advantage over the best 'attachable' stage."

"It is essentially a Student's microscope, and although of so low a price, is not only a specimen of the best workmanship, but is also extremely complete, and represents an advanced type of construction, capable of doing all ordinary and much experimental work."

The "H" Model is in regular use for bacteriological research and general laboratory work.

SPECIFICATION.

The **height** when placed vertically and racked down is 11½ inches.

The **tripod** spread is 7 inches and is quite firm in any position.

The **body** is 1½ in. diameter, and can be supplied with a draw tube to take either student's or large capped eyepieces at the same cost.

The **mechanical stage** is our Standard pattern with compensating screws. The range of horizontal movement has been increased to 1½ in. The milled head controlling the horizontal motion is stationary, and the plates so arranged that the condenser is not fouled at any point of the travel. The surface of the stage has a thin covering of ebonite attached by vulcanizing.

The **substage** has rackwork focussing and centring screws, as described on page 16.

The long range of the coarse adjustment permits of the use of low-power objectives.

The **fittings** throughout are of R.M.S. standard gauge. We can unhesitatingly recommend this microscope as the ideal for all classes of general microscopical work.

PRICES OF THE EDINBURGH STUDENT'S MICROSCOPE.

STAND "H."

A special detailed description of the "H" Model of the Edinburgh Student's Series appears on page 33.

Code Word.	No.		Price. £ s. d.
Manum.	A 3082.	"H" Microscope, Stand only, as figured on page 35	25 0 0
Map.	A 3083.	Mahogany Case.	2 10 0

COMPLETE SETS

Maple.	A 3084.	"H" Microscope Stand and Mahogany Case. $\frac{3}{3}$ in. and $\frac{1}{6}$ in. Objectives, Parachromatic, 1 Eyepiece, Nos. 1, 2, 3 or 4.	32 17 6
Maran.	A. 3085.	"H" Microscope Stand and Mahogany Case. $\frac{3}{3}$ in. and $\frac{1}{6}$ in. Objectives, Parachromatic, 2 Eyepieces Nos. 1, 2, 3 or 4 Abbe Illuminator with Iris Diaphragm No. 3150. Double Nosepiece.	37 10 0
Marble.	A 3086.	"H" Microscope Stand and Mahogany Case. With Objectives, etc., as in Set A 3085, with the addition of $\frac{1}{12}$ in. "Versalic" Oil Immersion Objective and Triple Nosepiece...	45 2 6
		With Holoscopic Objectives—	
Marila.	A 3091	"H" Microscope Stand and Mahogany Case. Holoscopic Objectives. 1 in. 0·30 N.A., $\frac{1}{6}$ in. 0·95 N.A., $\frac{1}{12}$ in. Oil Immersion 1·37 N.A. Two Holoscopic Eyepieces (any power). Universal Parachromatic Condenser. Triple Nosepiece.	65 0 0
		For General and Amateurs' Use—	
Marme.	A 3092	"H" Microscope Stand and Mahogany Case. 2 in., 1 in. and $\frac{1}{6}$ in. Parachromatic Objectives. Two Eyepieces. Universal Condenser and box of Stops. Stand Condenser, Live Cage and Stage Forceps	44 10 0

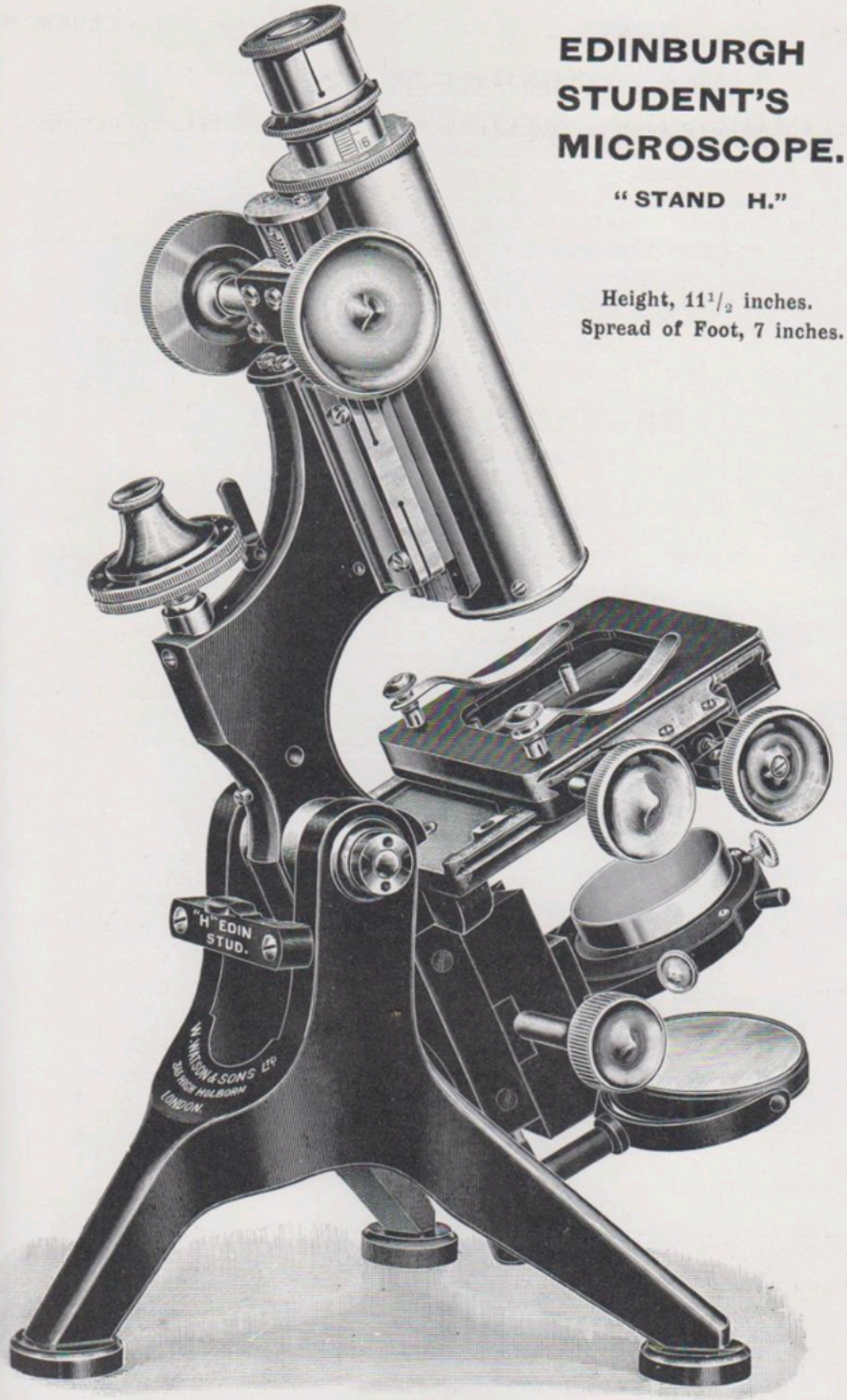
EXTRAS

March.	A 3087.	Sliding Bar to Mechanical Stage.	1 10 0
Marl.	A 3088.	Division to Stage Movements, reading by verniers to $\frac{1}{10}$ m/m.	1 10 0
Marge.	A 3089.	Holoscopic Universal Condenser in Substage Iris Mount No. 3135 in place of Abbe Illuminator	4 0 0
Marigo.	A 3090.	The Research Stage as shown on Instrument, page 37, can be supplied with the "H" Edinburgh Student's Microscope at an extra cost of ..	1 5 0

EDINBURGH STUDENT'S MICROSCOPE.

"STAND H."

Height, $11^1/_2$ inches.
Spread of Foot, 7 inches.



The "RESEARCH."

The general construction of this Microscope is identical with that of our popular "H" Edinburgh Student's Model, and it is of the same proportions, but differs in the following details:—

1. The Stage. A new pattern Stage with a horizontal travel of $1\frac{3}{4}$ in., the controlling milled heads both working on the same axis.

2. The Fine Adjustment is by means of our vertical lever, working from the side of the limb, as described on page 7.

3. A tightening Handle is fitted to the axis joint.

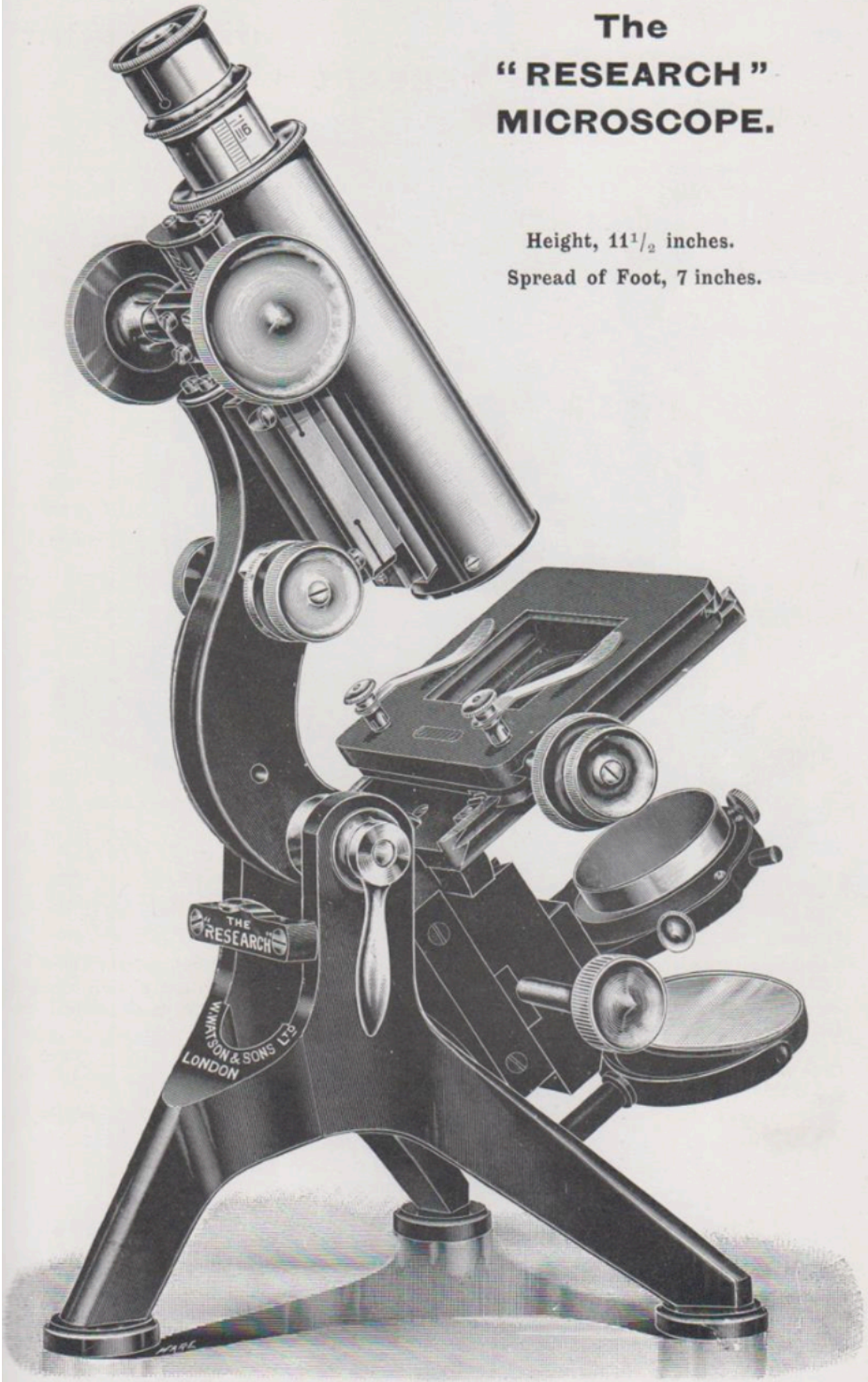
THE "RESEARCH" MICROSCOPE.

As supplied to the British Navy.

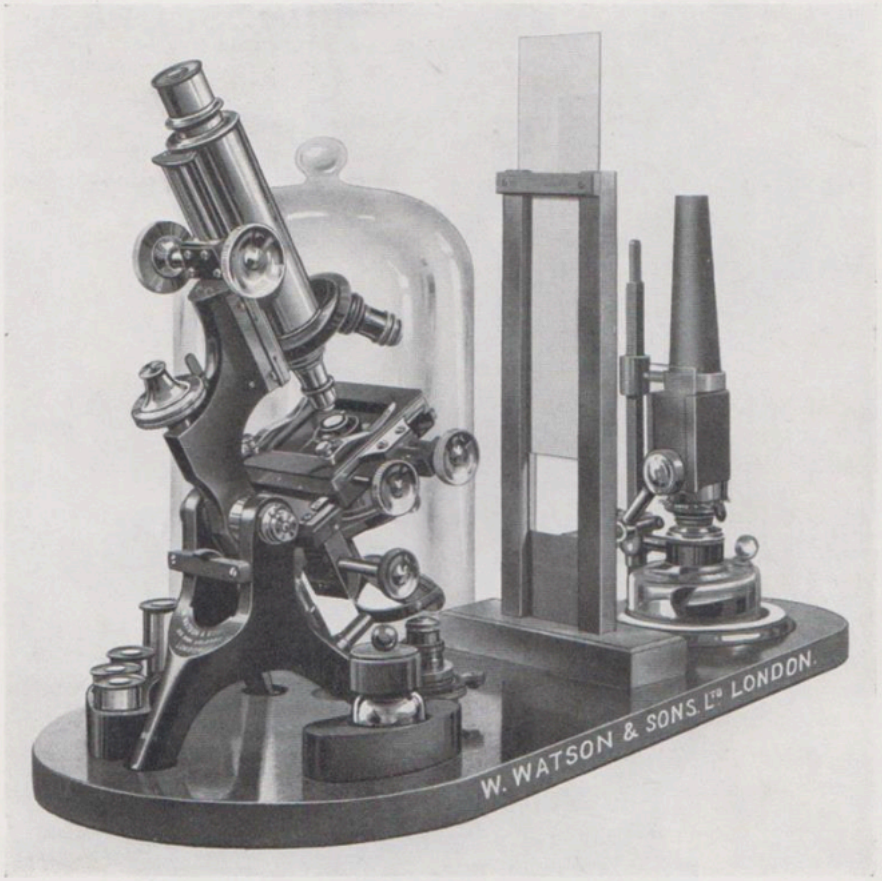
Code Word.	No.		Price. £ s. d.
Marine.	A 3094.	"Research" Microscope Stand only, as figured page 37	27 10 0
Marita.	A 3095.	Mahogany Case for same.	2 10 0
		COMPLETE SETS.	
Marjora.	A 3096.	"Research" Microscope Stand in Mahogany Case. 2 Objectives Parachromatic Series: $\frac{2}{3}$ in. $\frac{1}{6}$ in. ·80 N.A. 1 Eyepiece No. 1, 2, 3 or 4.	35 7 6
Mark.	A 3097.	"Research" Microscope Stand in Mahogany Case. $\frac{2}{3}$ in. and $\frac{1}{6}$ in. Parachromatic Objectives. 2 Eyepieces Nos. 1, 2, 3 or 4. Abbe Model Illuminator in Substage Iris Mount No. 3150. Double Nosepiece.	40 0 0
Marque.	A 3098.	"Research" Microscope Stand in Mahogany Case. With Objectives, etc., as in Set A 3097, with the addition of $\frac{1}{12}$ in. "Versalic" Oil Immersion Objective and triple Nosepiece ...	47 12 6
		With Holoscopic Objectives—	
Marso.	A 3102	Research Microscope Stand and Mahogany Case. 1 in. 0·30 N.A., $\frac{1}{6}$ in. 0·95 N.A., $\frac{1}{12}$ in. Oil Immersion 1·37 N.A. Holoscopic Objectives. Two Holoscopic Eyepieces (any power). Universal or Parachromatic Condenser. Triple Nosepiece	67 10 0
Marsech.	A 3103	Research Microscope and Case, completely fitted as Set A 3092, for General and Amateurs' use	47 0 0
		EXTRAS.	
Marre.	A 3099.	Sliding Bar to Mechanical Stage.	1 10 0
Marrow.	A 3100.	Divisions to movements of Stage, reading by verniers to $\frac{1}{10}$ m/m.	1 10 0
Marsh.	A 3101.	The "Standard" Mechanical Stage as fitted to the "H" Edinburgh Student's Microscope can be supplied with the Research Microscope at a reduction in cost of	1 5 0

The "RESEARCH" MICROSCOPE.

Height, $11^1/_2$ inches.
Spread of Foot, 7 inches.



W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.



The above is an illustration of a conveniently arranged Microscope with equipment ready for immediate use in Consulting-room and Laboratory, as described in Dr. Coles' "Critical Microscopy."

Code Word.	No.		Price. £ s. d.
Magnif.	A3020.	The **Mahogany Board** is fitted to receive Microscope, Lamp and Accessories. Price	3 0 0
Magpie.	A3021.	**Lamp** is similar to our Standard pattern, but is arranged so that the chimney can be turned aside on the pillar when not in use and is fitted with small condensing Lens with adjustments... ...	4 5 0
Mahog.	A3022.	**Bell Glass** to cover Microscope, according to size of Microscope... ... ... from	17 6

THE "BACTIL" MICROSCOPE.

(Re-constructed Model to the specification of the British Science Guild, for a High-Power Research Microscope.)

For Research, the Laboratory and General High-Power Work.

The "Bactil" Microscope is in its general construction the same as the "Service" Microscope, but with the added and very important modification that the instrument is fitted and adjusted by hand in the same manner as our best Research Microscopes; each part is co-ordinated, and the instrument is built up and supplied complete with its mechanical fittings.

It is possible to add the "Service" Mechanical Stage, and a Compound Substage, to a "Service" Microscope, but the result achieved by building the whole at one time as in the "Bactil" Microscope, is a more satisfactory one, and its advantages will be easily recognised.

The Body is of extra large size, 2 in. diameter, as recommended for Research work. It carries a Draw Tube with fittings for standard Students' Eyepieces. Any larger size of Draw Tube and Eyepiece fitting can be supplied if desired, without extra charge.

The Coarse and Fine Adjustments are as described in connection with the "Service" Microscope on page 26. The "Service" Mechanical Stage (see page 13) which is appreciated by all its users, is supplied as a permanent fitting, or to remove when desired. The Condenser Carrier is a Compound Substage (Fig. 17, page 17) with Centring Screws, arranged to be turned aside from the optical axis when desired.

The dove-tailed fittings in which the mechanical movements take place are provided with adjustments by means of slots and screws.

The whole instrument receives most careful and accurate adjustment and ensures that smooth and exquisite working that can be imparted only by the expenditure of unrestricted time on the part of the skilled handiwork of the craftsman.

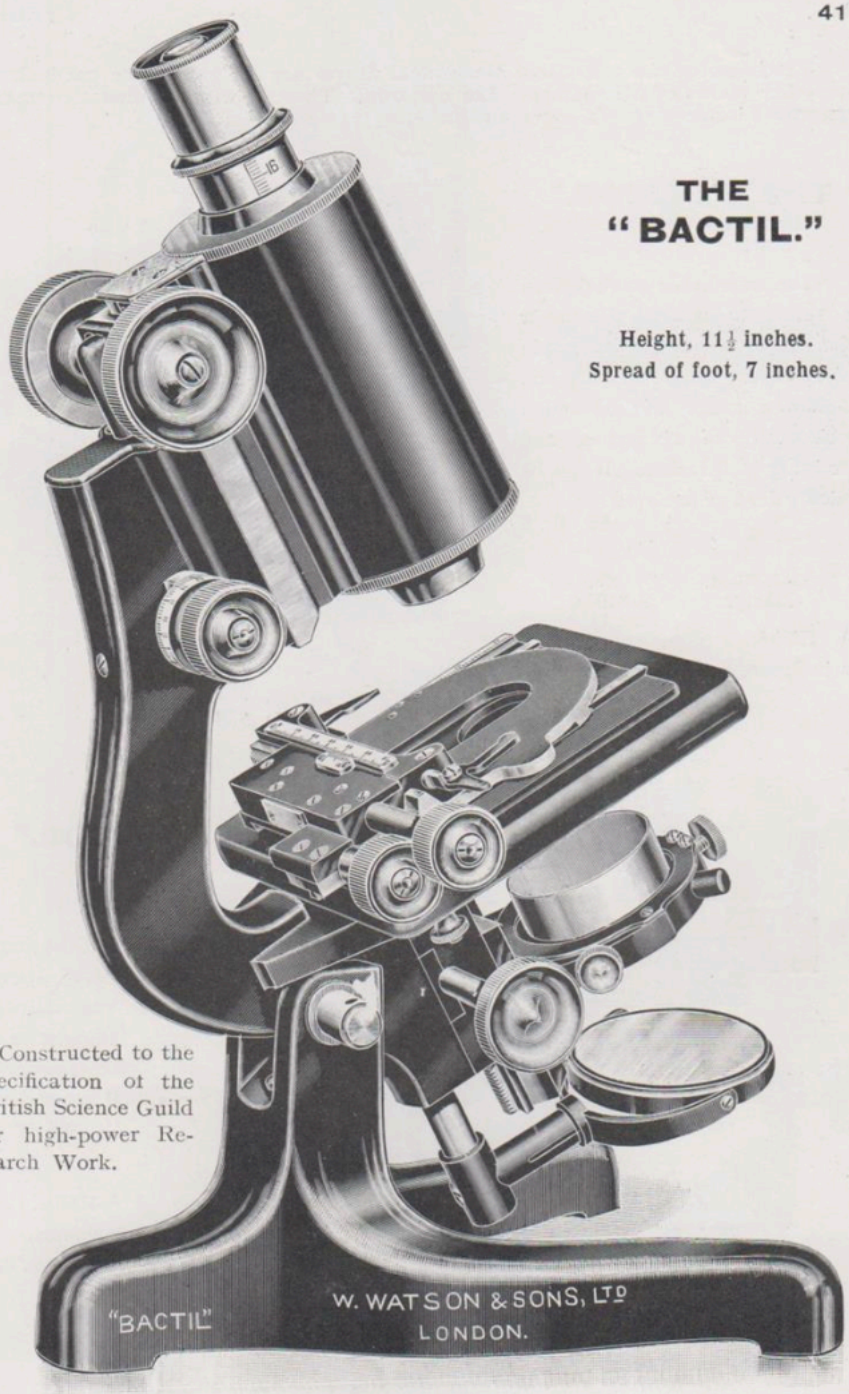
Dr. Murray's Long Range Stage described on page 14 may be supplied in place of the "Service" Mechanical Stage, if desired, at the same price.

PRICE LIST OF THE "BACTIL" MICROSCOPE.

Code Word.	No.		Price. £ s. d.
Merid	B 3272	"Bactil" Microscope Stand only with Mahogany Case	27 10 0
		Complete Sets—	
Merina	B 3273	"Bactil" Microscope and Mahogany Case, two Objectives Parachromatic Series, $^{2}/_{3}$ in. and $^{1}/_{6}$ in. Two Eyepieces, Nos. 1, 2, 3 or 4. Abbe Model Illuminator with Iris Diaphragm No. 3151. Double Nosepiece	36 15 0
Merit	B 3274	"Bactil" Microscope in Mahogany Case, three Objectives $^{2}/_{3}$ in., $^{1}/_{6}$ in. ·80 Parachromatic Series. $^{1}/_{12}$ in. Versalic Oil Immersion. Two Eyepieces, Nos. 1, 2, 3 or 4. Abbe Model Illuminator with Iris Diaphragm, No. 3151. Triple Nosepiece, dust-proof pattern	44 7 6
Merle	B 3275	"Bactil" Microscope Stand in Mahogany Case, three Objectives Holoscopic Series, 16 m/m, 4 m/m, 2 m/m Oil Immersion. Two Holoscopic Eyepieces magnifying 7, 10 or 14. Universal Condenser in understage Iris mount No. 3135. Triple Nosepiece, dust-proof pattern	64 12 6
Merma	B 3276	"Bactil" Microscope Stand and Mahogany Case, three Apochromatic Objectives, 16 m/m, 4 m/m, 2 m/m Oil Immersion. Three Compensating Eyepieces, Magnifying 7, 10 or 14. Parachromatic Condenser, completely mounted No. 3144. Triple Nosepiece, dust-proof pattern	74 0 0
Merri	B 3277	The Universal Condenser No. 3135, can be supplied in place of the Abbe Illuminator in sets 3272 and 3273 at an extra charge of	4 0 0
		Extra—	
Merrika	B 3278	Rackwork draw tube can be supplied in addition to sliding draw tube at an extra cost of...	4 10 0

THE "BACTIL."

Height, 11½ inches.
Spread of foot, 7 inches.



Constructed to the specification of the British Science Guild for high-power Research Work.

W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.

The following two Attachable Mechanical Stages are designed more particularly for other makes of Microscopes than our own. They fit without alteration many patterns of instruments of Continental make.

THE "SENIOR."

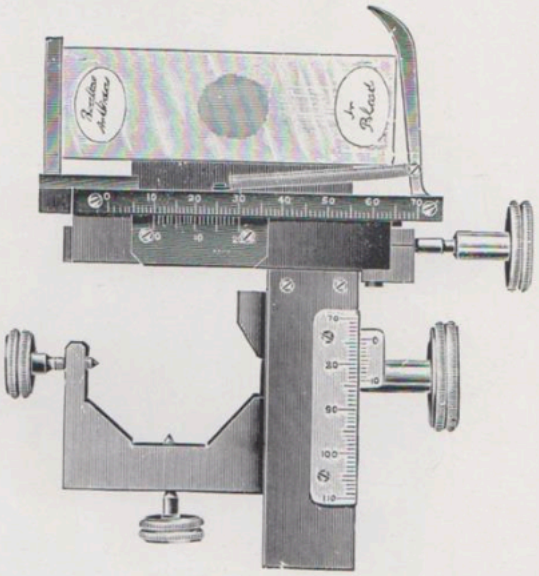
Code Word. Marten — No. A 3105.

The attachable stage figured is suited to a limited number of microscopes only, it fits certain microscopes by other makers. It has a range of movement horizontally of 2¼ inches, and vertically of 1½ inches. It can be quickly fixed or removed.

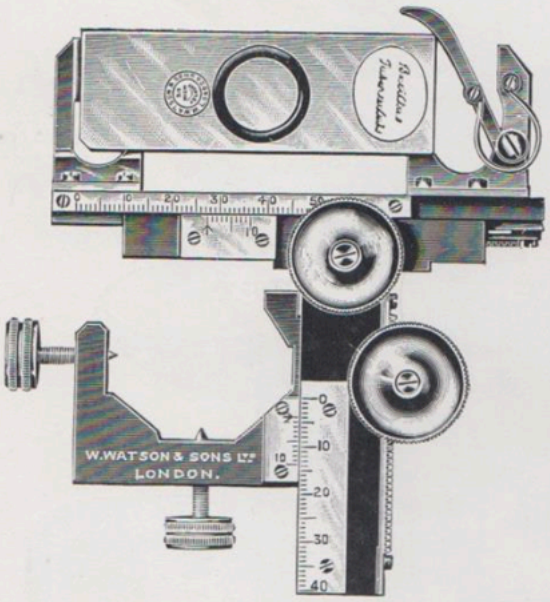
£5 0 0

Code Word. Martyr. — No. A 3105A.

Divisions to movements, as in figure, extra. **12s 6d.**



No. A 3105



No. A 106A.

THE "JUNIOR."

Code Word. Marve. — No. A 3106.

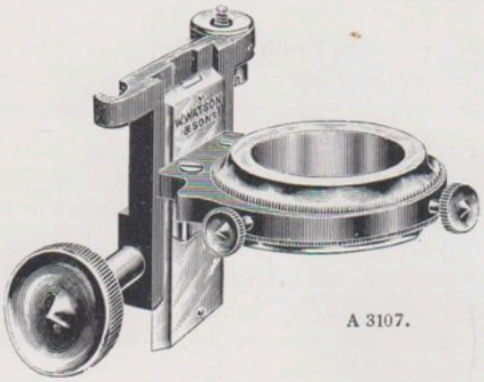
This Stage answers the same purposes as No. A 3105 above, but is of simpler construction. It is thoroughly efficient and can be well recommended. Length of horizontal movement, 2¼ inches. **£4 12 0**

Code Word. Mascu. — No. A 3106A.

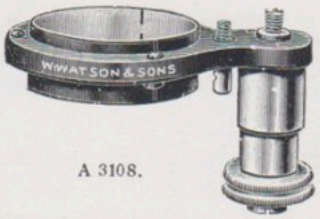
Divisions to movements, as in figure, extra. **12s. 6d.**

For other attachable Mechanical Stages see pages 13 and 15.

COMPOUND SUBSTAGE.



A 3107.



A 3108.

Underfitting with spiral focussing screw.

Code Word	No.		Prices. £ s. d.
Mash.	A 3107.	Illustrates the regular pattern of Compound Substage. It has rack and pinion focussing arrangement, centring screws to enable the light to be set exactly central with any objective, and is mounted on a swing fitting, which allows of the whole apparatus being swung clear of the optical axis if desired. It is fitted by attaching to the underside of the stage of the Instrument	3 17 6

UNDERFITTING WITH SPIRAL FOCUSSING SCREW.

Mason.	A 3108.	This device affords a convenient method of raising and lowering the Condenser which it carries, so as to focus it accurately. When lowered, the fitting with the Condenser turns aside from the optic axis, and is out of the way. It is made in a superior manner, is of the universal size, so will carry any understage Condenser.	1 2 6

A small extra charge may have to be made for fitting the above.

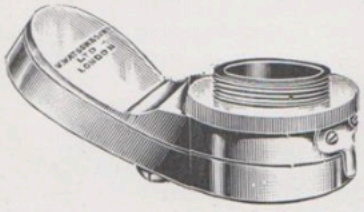
NOSEPIECES OR OBJECTIVE CHANGERS.

These Nosepieces will fit any Microscope, and work with Objectives by all makers. They have the Standard screw thread of the Royal Microscopical Society, which is universal throughout the world.

These Nosepieces have gained wide appreciation for their working qualities, and being made by machinery specially designed for the purpose, their accuracy of centring is unsurpassed; special attention has been bestowed to afford strength for a long life of working usefulness.

It should be noted that when fitted to the microscope, nosepieces should be set centrally with the body, projecting outwards towards the centre of the stage, and to ensure the correct centring of objectives, should always be revolved in **one direction only.**

DOUBLE—FOR TWO OBJECTIVES.



A 3111.

Code Word. Mass. — No. A 3111.

New pattern Nosepiece of extra strong construction, designed for continuous use, completely rotating. Finished either bronzed, lacquered or nickel-plated, as may be preferred. **£1 2 6**

Dust-proof pattern, finished black .. **1 2 6**

TRIPLE—FOR THREE OBJECTIVES.

A 3112.

Code Word. Maste. — No. A 3112.

Dust-proof pattern, as figured. A really efficient form, invaluable for laboratory work.

Finished black **£1 5 0**

CENTRING NOSEPIECE.

Code Word.	No.	
Mastif.	A 3113.	To fit any Microscope. Centres an objective with a concentric rotating stage which has no centring arrangement. Effective and convenient. **£1 10 0**

OBJECTIVES.

Thanks to the efforts of British Optical Glass Manufacturers who have produced the various types necessary for our work, our Objectives are now made from British Optical Glass.

The modern Objective owes its perfection to the wide field for the selection of optical glass which is available and to the computations of formulæ, based on the fullest advantages derivable from those optical glasses.

Time has demonstrated that certain types of glasses cannot be regarded as permanent in character, some of them having exhibited a tendency to decompose. All such, and even those that are suspected of unreliability, have been eliminated from our formulæ. Only hard and durable glasses are employed by us. Should any of our microscope Objectives, at any time, subsequent to 1918, exhibit traces of decomposition in any of the combined lenses, provided no other damage has been done to the Objective, and it has not been subjected to misuse or injury, we will correct such Objectives free of charge.

We are compelled to limit the time to 1918, as supplies of glasses identical with those in use before the war are exhausted, and in the majority of cases individual component lenses cannot be matched.

By the introduction of refined methods of manufacturing, the uniform excellence of the Objectives is always maintained at the high standard that is set for them. Only those who are conversant with the modern possibilities of optical work are aware of the wonderful accuracy and perfection of workmanship that is called for and obtained. The computations provide for constituent lenses of a certain thickness and curvature. These are scrupulously adhered to, the surfaces being tested by means of "proof" plates, which enable differences of less than one hundred-thousandth of an inch to be perceived, and finally when the constituents have been cemented together, they are mounted in the Objective mount with the surfaces at prescribed distances from each other. So faithfully is this work carried out, that the number of Objectives that exhibit defects of manufacture or adjustment when subjected to the regular examination and testing, is very small.

Tube Length. It is very important that an Objective should be used at the tube length for which it is corrected. It is only at this and with the prescribed thickness of Cover Glass between it and the Object that it realizes its possibilities. It is only then that the colour corrections and defining power are at their best.

All our Objectives are corrected for a cover glass ·007 inch (·18 m/m) thick, but we can supply them corrected for any desired tube length or cover glass thickness, by request and without extra charge. It may, however, entail special making, with some short delay in delivery.

Our objectives are made in three series :—

1. Parachromatic.
2. Holoscopic.
3. Apochromatic.

In addition, we make Tank Objectives for observations in water; a series of Low-power Objectives, the "Argus," of simple construction and low numerical aperture, at small cost (see page 51); also low-power lenses for photographic use with the Microscope, without eyepieces, known as **Holostigmats** (see part 5 Photo-Micrographic Apparatus) and the **Versalic $^{1}/_{12}$" Oil Immersion Objective.**

THE CHOICE OF OBJECTIVES.

Even the experienced microscopist is not always clear in his mind regarding the respective merits of Objectives of different series, such as the Apochromatic, the Holoscopic and the Parachromatic.

What is there in an Apochromatic Objective which justifies the expenditure of a sum so much greater than would have to be paid for another efficient Objective of similar power ?

The Apochromatic Objectives are intended for those who require not only the maximum resolving power, but with it the highest perfection of correction of spherical and chromatic aberration that is obtainable. The worker who has once used Apochromatic Objectives, is not easily satisfied with anything less perfect.

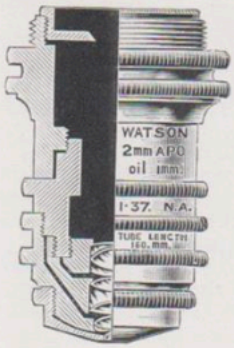
Holoscopic Objectives have the same resolving power as the Apochromatics and are equal in all respects in their corrections, excepting that of colour, but the small residuum is not found to militate against effective working, and in fact is unobservable when coloured objects are under examination.

The modern colour filter practically abolishes residual colour aberrations, and renders objectives of this series equal to the far more expensive Apochromatics.

The Parachromatic series plays a part in microscopical work that is distinct; the resolving power is well proportioned to the magnifying power, so as to place in the hands of the general worker lenses that will be effective, easily used and give undeniably fine definition. The corrections generally are no less good than those of the Holoscopic and Apochromatic, but inasmuch as the greater ease in working is chiefly due to the smaller aperture given to the objectives of this series, they have less resolving power in comparison to their focal length than the Holoscopic and Apochromatic lenses.

Conclusion. So we see that for the finest effects the modern microscopist can produce, the Apochromatic series holds the field. For those who require the maximum resolving power at slightly less expense, the Holoscopic series will be found amply sufficient, while for general work the Parachromatic series meets every requirement. In fact, our experience shows that 90 per cent. of microscopists find these last-named objectives satisfy their needs.

APOCHROMATIC OBJECTIVES.



In Objectives constructed entirely with optical glass, even in those of the finest quality such as the Holoscopic series, there remains one outstanding defect which is inherent in the material used, namely, the so-called secondary Spectrum. This arises from the fact that the distribution of colour in the Spectrum produced by the various optical glasses varies with their density, the red end being relatively too long in glasses of low dispersion, and the blue end too long in glasses of high dispersion, the result being that when such glasses are combined to obtain the best achromatism for the brightest part of the visual Spectrum, both the ends of the Spectrum, namely, the red and violet, are refracted too little or in other words, come to a focus at a greater distance than the middle of the Spectrum ; the chief inconvenience arising from the presence of this secondary Spectrum is that the Objectives cannot be used for photographing in white light on ordinary plates, but will only give satisfactory results if Isochromatic plates and effective colour screens are used. Occasionally the secondary Spectrum also interferes with delicate visual observations because the faint halo of purple light due to it, falsifies the true colour of small detail.

In Microscope Objectives the removal of the secondary Spectrum depends upon the use of fluorite lenses, and the difficulty of procuring optically perfect fluorite has restricted our output in past years; being now in possession of a stock of excellent fluorite, we are making Apochromatic Objectives to standard quality and can give delivery from stock. Special attention is called to the 4 m/m Objective of ·85 N.A. without correction collar as a lens which can be confidently recommended for general use as a high-power dry lens. As is well known, none of the dry lenses of ·95 N.A. that are offered by other makers will bear anything approaching a full aplanatic cone of light, even on Objects like the Abbe Test Plate, though there is no theoretical reason why they should not do so; the reason being that it is absolutely impossible to obtain perfect correction of aberrations in the marginal zone of dry Objectives of such abnormal aperture. It is for this reason that this new lens has been limited to an aperture of ·85, and it will be found that on suitable Objects this Objective will bear practically a full Aplanatic cone of light. All those who know the difficulty of using a correction collar on Objects of unknown structure under a cover glass of unknown thickness, will also agree that the absence of the correction collar is at any rate not a drawback, as it guarantees perfect centring in the new lens, and excludes any fear of this perfection being lost through lost motion in the correction arrangement.

The Apochromatic Objectives we make are equal to the best that have been produced, and in some respects, superior. They all possess in an exceptional degree the high qualities that are associated with this type of objective.

Code Word.	Equivalent Focal Length. Inches.	M/ms.	Initial Power. Image distance 10 inches.	Numerical Aperture.	Price. £ s. d.
Match.	$^2/_3$	16	15 in.	0·30	6 0 0
Mater.	$^1/_3$	8	30 ,,	0·65	8 0 0
Materna.	$^1/_6$	4	60 ,,	0·85	10 0 0
Mathem.	$^1/_{12}$	2	120 ,,	1·37 Oil Immersion.	17 10 0

The above may be supplied corrected for any tube length to order.

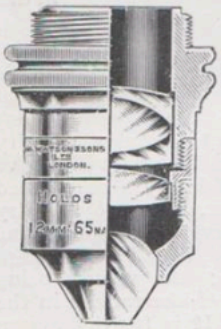
OBJECTIVES.

THE HOLOSCOPIC SERIES.

A reference to the illustration will show that the construction of this series of objectives is not of the usual type, the correction in other than objectives of lower power than 24 m/m. depending largely on a cemented triple combination at the back.

The special factors which have made these objectives famous will be best appreciated from the following considerations.

When dealing with the wide-angled pencils and consequent great angles of incidence which occur in microscope objectives, the usual methods for correcting chromatic and spherical aberration prove inadequate; their shortcomings lead to the presence in objectives, produced by their use, of heavy residuals of aberration, known to microscopists as spherical zones, and as spherical difference of chromatic aberration. The former of these defects leads to the formation of untrustworthy images, because the required phase-relation of the light forming the image is falsified, whilst the chromatic residual prevents the taking of presentable photographs of objects; for it amounts to this: the objective, although tolerably free from spherical aberration for the visually strongest rays, is affected with heavy spherical aberration for other colours, such as those acting most strongly on a photographic plate.



In the Holoscopic Objectives both these defects are minimised; the spherical correction is carried to high perfection by so determining the data that the rays which are geometrically united in the focus arrive there in exactly equal phase and are thus in the relation theoretically demanded, but not hitherto realized in practice. The exceptionally perfect spherical correction attained in this manner has often been noticed by expert workers and renders the Holoscopic Objectives extremely valuable for all delicate observations, for it reduces the possibility of spurious images to a minimum.

Similar perfection has been aimed at in the correction of chromatic aberration, thus rendering the Holoscopic Objectives capable of yielding very excellent photographs of microscopical objects.

It was found necessary to adopt **entirely new types** of Objectives to realize the perfection aimed at, and to produce Objectives equal to the best Apochromatics, except in freedom from secondary colour.

These Objectives have been highly praised by expert workers who have purchased them for their excellent working with deep-power Eyepieces, large solid illuminating Cones, annular and dark-field illumination, and the yielding of exquisite photographic effects.

They meet the needs of the original investigator, and all who would possess the best optical means, in the fullest possible manner.

The numerical aperture stated is the **guaranteed minimum** for each Objective. The Lenses may be trusted to have the magnifying power (within a **small** percentage) corresponding to the equivalent focus given in the list.

All Lenses in this series with the exception of the low-power lenses, as noted below, are under-corrected for chromatic differences of magnification; they should therefore be used in conjunction with our Holoscopic Eyepieces (page 55).

The 2 m/m., which has a guaranteed minimum aperture of 1·37 N.A., is a superb lens and has no equal at anything like the same price. Microscopists requiring the maximum resolving power will find their wishes satisfied with this lens.

Special Note *re* Low Powers. The three Objectives of lower power than 24 m/m., are not under-corrected in the manner that the other Holoscopic Objectives are. They should, therefore, be used either with Huyghenian Eyepieces or Holoscopic Eyepieces with the adjusting tube pushed home.

HOLOSCOPIC OBJECTIVES.

Low Powers. These Objectives are new to the Holos series. Their construction is such that they should be used with either Huyghenian Eyepieces or Holoscopic Eyepieces with the adjusting tube pushed home.

Code Word.	Equivalent Focal Length. Mm.	Equivalent Focal Length. In.	Initial power Diameters calculated for an image distance of 10 inches.	Numerical aperture.	Tube Length.	Prices. £ s. d.
Matin.	75	3	4	0·11	For any tube length	3 0 0
Matrice.	50	2	5	0·17	Do.	3 0 0
Matrim.	35	$1^1/_2$	8	0·19	Do.	3 0 0

Medium and High Powers. From stock for 8 inch (200 $^m/_m$) tube length only.

Matron.	25	1	10	0·30	8″ to 10″	Dry	5 5 0
Matter.	16	$^2/_3$	15	0·40	8″ to 10″	,,	5 5 0
Matock.	12	$^1/_2$	20	0·65	6″ to 10″	,,	6 15 0
Matres.	8	$^1/_3$	30	0·65	6″ to 10″	,,	6 10 0
Mature.	4	$^1/_6$	60	0·95	6″ to 10″	,,	7 10 0
Maudle.	2	$^1/_{12}$	120	1·37	6″ to 10″		12 0 0 Oil Immersion

The above 4 $^m/_m$ Objective can be mounted to give a numerical aperture of ·95 N.A. as heretofore, but the marginal corrections are then incapable of complete correction. The N.A. ·85 will bear a full cone of illumination and is totally effective.

Extract from "Microscopy," by Dr. E. J. Spitta.

> *"Recently, however, the objectives made by Messrs. Watson & Sons under the name of the 'Holoscopic Lenses' from computations by Mr. Conrady, are so perfect that they* DO *admit of much higher eyepiecing than was borne by the older make. For this reason Mr. Conrady has given Holoscopic lenses much higher N.A. than usual, so as to render their performance the more complete."*

And further—

> *"The finest achromatic combination half-inch it has been our lot to examine is that of the Holoscopic Series by Watson & Sons."*

"TANK" OBJECTIVES

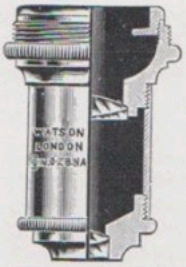
for examination of Objects in Water.

These Objectives are immersed in the water in a tank and are constructed and corrected to work in this manner.

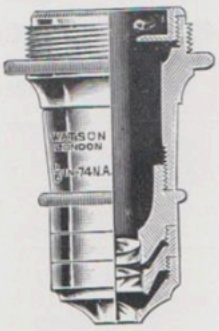
Code Word.	Equivalent Focal Length. Mm.	Equivalent Focal Length. In.		Price.
Maugre.	25	1	For any tube length.	£2 15 0
Maul.	16	$^2/_3$		2 15 0

Objectives.

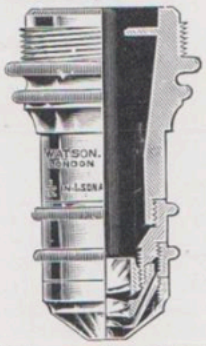
THE PARACHROMATIC SERIES.



Low-power Objective.
2 in. to $^1/_2$ in.



Medium-power Objective.
$^1/_6$ in. to $^1/_8$ in.



Oil Immersion Objective.
$^1/_{12}$ in.

Experience has shown that the objectives of our Parachromatic Series realize all the demands of general work. Among these are to be found not merely the best of their class, but in many instances those possessing unique features which microscopists have not been slow to appreciate.

Low Powers. The low powers, 4″ to $^1/_2$″, are constructed to yield the utmost crispness of definition and flatness of field.

Medium Powers. The medium powers, $^1/_6$″ to $^1/_8$″, are made with a special view to obtaining an unusually long working distance between the front lens of the objective and the object under examination.

The One-Sixth. Our $^1/_6$″ of the Parachromatic Series is now looked upon as the ideal type for an objective of medium power. This is due to the fact that not only is it **semi-Apochromatic**, that is, has corrections resembling in many respects those of the Apochromatic, but has the unusually **long working distance of more than 1 m/m.**

An ample working distance in a lens of this power has long been a desideratum, but it has hitherto been so short that difficulty has been experienced in focussing through the cover-glass of a Hæmacytometer, or any other than a No. 2 (·008 in.) cover glass.

The examination of objects with thick covering glasses with our $\frac{1}{6}$ in. has proved an immense boon to workers. This does not cause the sacrifice of other important qualities, in fact its perfection of correction, both of spherical and chromatic aberration, renders it exceptionally fine in performance. This, allied with its great working distance, makes it superior to any other lens produced at the present time for all who use their Instrument on other than specially-mounted specimens, and it particularly appeals to Students, Laboratory workers, and those who are interested in pond life. Special attention is called to the extract from the proceedings of the Royal Microscopical Society on page 52.

THE NEW "VERSALIC" $^1/_{12}$ INCH has a flatter field than any other first-class Oil Immersion Objective. It has the long working distance from the front lens to the object of ·43 m/m. This is appreciably greater than that of other Oil Immersion Lenses, but it is well within the limits for maintaining oil contact.

The formula is different from ordinary Oil Immersion Objectives, and enables the **front lens to be fixed in a manner which renders it practically immovable.**

For systematic search work, blood examination and counting, this Objective has no equal.

It is computed specially for work on stained subjects.

All Laboratory workers should use Watson's "Versalic" $^1/_{12}$ inch Oil Immersion Objective.

The "Versalic" Objective, though denominated a $^1/_{12}$ inch has been made with the magnifying power of $^1/_{14}$ inch, in accordance with the universal custom that prevails with lenses for bacteriological work.

WATSON & SONS'

PARACHROMATIC OBJECTIVES.

These may be corrected for any desired tube length, but are ordinarily supplied for a tube length of 170 m/metres.

Code Word.	Approximate Focal Length.		Initial power calculated for an image distance of 10 inches (about 250 m/m.)	Numerical aperture.	Price.
	Inches	m/m.	Diams.		£ s. d.
Maund.	4	100	3	0·08	2 5 0
Mausol.	3	75	4	0·09	2 5 0
Mavis.	2	50	6	0·15	2 5 0
Maw.	1 1/2	35	8	0·17	2 5 0
Mawk.	1	25	12	0·21	1 12 6
Maxil.	2/3	16	15	0·28	1 12 6
May.	1/2	12	20	0 34	2 0 0
Maypo.	1/4	6	42	0·68	3 5 0
Mazar.	*1/6	4	Semi-Apochromatic 65	0·80	3 5 0
Meado	1/8	3	83	0 88	3 15 0

* This is the Objective referred to for its unique qualities on pages 50 and 52.

Oil-Immersion.

See note re 1/12th in. on page 50.

Code Word.	Approximate Focus.		Initial power calculated for an image distance of 10 inches (about 250 m/m.)	Numerical aperture.	Price.
	Inch.	m/m.	Diams.		£ s. d.
Meagre.	1/7	3·40	74	0·90	5 15 0
Meal.	Versalic 1/12	1·8	125	1·28	7 10 0
Mealon.	Utility 1/12	1·8	125	1·20	5 0 0

The price includes an oil bottle and supply of oil.

"ARGUS" OBJECTIVES.

These Objectives have a single combination of lenses only, and although not equal in performance to the beautiful double combination lenses of the same powers of our " Parachromatic " series, they give crisp and brilliant definition and are thoroughly serviceable.

		Price. £ s. d.
3 inch	N.A. 0·7	1 2 6
2 inch	N.A. ·11	1 2 6
1½ inch	N.A. ·13	1 2 6

Note.—" Kima " Objectives Nos. 3 and 6 are identical with the parachromatic ⅔ in. and ⅙ in., but have numerical apertures of ·21 and ·65 respectively only.

OBJECTIVES—Continued.

Extract from the proceedings of the Royal Microscopical Society.

"A NEW SEMI-APOCHROMATIC 1/6″."

By Edward M. Nelson.

" During the recess a new objective, viz., a $^1/_6$ in. of N.A. 0·74, computed by Mr. Conrady, has been brought out by Messrs. Watson & Sons. The novelty of its construction gives it the altogether abnormal working distance of 1 m/m., an attribute that will render this objective in many ways useful to biologists, medical men, metallurgists, etc.

" Measurements show that its power and aperture are as stated. Its performance upon the usual test objects is exceptionally good ; the lenses are very well put together, and exhibit no signs of eccentricity. With the large N.A. of 0·65, and F-line screen, Grayson's 60,000 band was resolved ; this agrees with the table of limits, where 60,300 is the limit given for N.A. 0·75. Sections of animal and vegetable tissues, and entomological details were brilliantly shown. The images of diatoms were particularly bright and clear, those of Angulatum, Formosum and Navicula rhomboides, were very sharp. Few lenses (apart from apochromats) have shown as well as this $^1/_6$-in. a balsam-mounted coarse Formosum, the most severe test to which a dry lens, such as this, can be subjected.

" Bacteria were next examined, and Flagella could be seen without any special difficulty. They are not, however, of much service as tests for microscopical lenses, but as several Fellows of this Society belong to the medical profession, some of them might like to know the kind of image this lens gives of bacteria.

" Now with regard to its working distance, this was not directly measured, but when the slide upon the stage was turned upside down, it was found that the lens would just focus the object through the 3 × 1 slide. *The thickness of the slip was then measured by a screw micrometer as being 0·064 in. ; this divided by the refractive index, say, 1·52, is 0·042, or $^1/_{24}$ in. This lens is normally corrected for an 8-in. tube, which is very handy, as it suits either a long or short body.*

" One more point before dismissing this subject. The measured sensibility for the tube-length correction of this lens is just about half that of modern semi-apochromatic sixths—a property which will, of course, prove very acceptable to a biologist, as his mind will be to a great extent relieved from anxiety and strain concerning a correction about which his ideas are in general hazy and undefined. But while it is unimportant to a microscopist, who can in a few seconds deftly bring his objective into best adjustment, it will nevertheless be the subject of considerable interest to him, because first-rate objectives seldom possess this useful property of insensibility to tube-length adjustment. Old objectives with triple fronts held this quality in a marked degree, but most modern semi-apochromats with single fronts require the tube length to be closely watched if fine results are to be obtained.

" The manifest usefulness of a lens of this description is my excuse for bringing it to the notice of the Society."

The new one-sixth is supplied with our Microscopes in our Parachromatic series.

So successful has the introduction of this one-sixth inch objective proved, that all the other high-power dry lenses have been re-computed on a similar formula, to give as far as permissible, the same distinctive corrections, and advantage in working distance.

The above lens is now made with the numerical aperture increased to ·80 N.A., but the long working distance is maintained.

MAGNIFYING POWERS (in nearest whole numbers) OF WATSON'S OBJECTIVES & EYEPIECES.

Tube length, *170* and *250* m/ms. Image distance, *250* m/m. The longer the body tube the greater the magnification.

PARACHROMATIC.

Objective	No.	Huyghenian Eyepieces Diameters 1 A		2 B		3 C		4 D		5 E		6 F		Holoscopic Eyepieces Diameters 5		7		10		14		20	
4 inch		10	*15*	12	*18*	16	*24*	20	*30*	24	*36*	30	*45*	10	*15*	13	*21*	20	*30*	28	*42*	40	*60*
3 ,,		13	*20*	16	*24*	21	*32*	27	*40*	32	*48*	40	*60*	13	*20*	19	*28*	27	*40*	38	*56*	54	*80*
2 ,,		20	*30*	24	*36*	32	*48*	40	*60*	48	*72*	61	*90*	20	*30*	28	*42*	40	*60*	57	*84*	81	*120*
1½ ,,		27	*40*	32	*48*	43	*64*	54	*80*	65	*96*	81	*120*	27	*40*	38	*56*	54	*80*	76	*112*	108	*160*
1 ,,		40	*60*	48	*72*	65	*96*	81	*120*	97	*144*	122	*180*	40	*60*	57	*84*	81	*120*	114	*168*	163	*240*
⅔ ,,		51	*75*	61	*90*	81	*120*	102	*150*	122	*180*	153	*225*	51	*75*	71	*105*	102	*150*	142	*210*	204	*300*
½ ,,		68	*100*	81	*120*	108	*160*	136	*200*	163	*240*	204	*300*	68	*100*	95	*140*	136	*200*	190	*280*	272	*400*
⅓ ,,		142	*210*	171	*252*	228	*336*	285	*420*	342	*504*	428	*630*	142	*210*	203	*294*	285	*420*	399	*588*	571	*840*
¼ ,,	*0·80* N.A.	221	*325*	265	*390*	353	*520*	442	*650*	530	*780*	663	*975*	221	*325*	309	*455*	442	*650*	618	*910*	884	*1300*
⅛ ,,		282	*415*	338	*498*	451	*664*	564	*830*	677	*996*	846	*1245*	282	*415*	395	*581*	565	*830*	790	*1162*	1128	*1660*
Oil Immersion																							
⅛ inch		251	*370*	301	*444*	402	*592*	503	*740*	603	*888*	754	*1110*	251	*370*	352	*518*	503	*740*	704	*1036*	1006	*1480*
1/12 ,,	Versalic ...	425	*625*	510	*750*	680	*1000*	850	*1250*	1020	*1500*	1275	*1875*	425	*625*	595	*875*	850	*1250*	1190	*1750*	1700	*2500*

HOLOSCOPIC AND APOCHROMATIC.

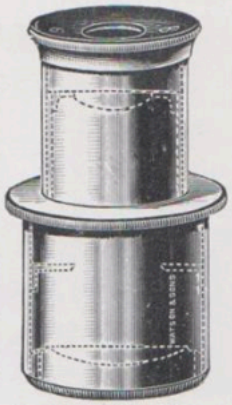
Objective M/ms.	Inches	Eyepieces.—Holoscopic and Compensating Diameters 5		7		10		14		20	
*24	1	34	*50*	47	*70*	68	*100*	95	*140*	136	*200*
*16	⅔	51	*75*	71	*105*	102	*150*	142	*210*	204	*300*
12	½	68	*100*	95	*140*	136	*200*	190	*280*	272	*400*
6	⅓	102	*150*	142	*210*	204	*300*	285	*420*	408	*600*
4	⅙	204	*300*	285	*420*	408	*600*	571	*840*	816	*1200*
Oil Immersion											
2	1/12	408	*6*	571	*840*	816	*1200*	1142	*1680*	1632	*2400*

The figures in heavy type represent the 170 m/m. tube length.

The figures in italics represent the 250 m/m. tube length.

With a shorter or longer tube the magnification can be ascertained by making the tube length employed the numerator and *170* or *250* the denominator, and multiplying the above figures by this fraction. Thus, to ascertain the magnification at *200* m/metres of a ⅙-in. objective *·80* N.A. and No. *2* Eyepiece, the following would be the method, $390 \times {}^{200}/_{250} = 312$ diameters.

The Huyghenian or ordinary type of Eyepiece.



Best Capped Eyepiece

THESE EYEPIECES WORK APPROXIMATELY IN THE SAME FOCAL PLANE, so that on interchanging Eyepieces of different powers, the object remains practically in focus and the working distance of an Objective is not shortened when a high-power Eyepiece is used with it, as is usually the case. Also, there is no disturbance to the corrections of the Objective on interchanging Eyepieces.

Student's Eyepiece.

These Eyepieces are made in two patterns: (1) the capped form, 1·27 in. (32·258m/m.) diameter, and (2) the Student's pattern ·9173 in. (23·30m/m.) diameter. The latter are the regular Eyepieces supplied with the great majority of our Instruments and those of other makers, all of which are interchangeable. These are the standard sizes of the Royal Microscopical Society.

EACH IS ENGRAVED WITH ITS INITIAL MAGNIFYING POWER.

The Eyepieces are numbered 1 to 5, No. 1 being the weakest. They were formerly described as A, B, C, D, etc., but this lettering is no longer used.

Code Word.		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
	Capped, Price	1 5 0	1 5 0	1 5 0	1 15 0	1 15 0	1 15 0
Meand	No.	1	2	3	4	5	6
	formerly	A	B	C	D	E	F
	Initial magnifying power	5	6	8	10	12	15 diams.
Measle.	Student's Price	s. d. 10 0	s. d. 10 0	s. d. 10 0	s. d. 10 0	s. d. 17 6	s. d. 17 6

*Pointer to Eyepiece, 2/6

Watson's Compensating Eyepieces.

These Eyepieces are designed for working with the Apochromatic and Holoscopic Objectives only, they are not suitable for use with Parachromatic or ordinary objectives.

Code Word.			£ s. d.
Measur.	Student's size ×7, 10, 14 and 20 diameters	.. .. each	1 15 0
Meat.	Best Capped pattern, ×7, 10, 14 and 20 diameters	.. .. ,,	2 7 6

"HOLOSCOPIC" EYEPIECES.

NEW FORMULA.

Not a compromise, but the best possible Eyepiece for either Ordinary, Holoscopic or Apochromatic Objectives.

These Eyepieces, already widely known to, and greatly appreciated by, microscopists, have recently been greatly improved by the use of compound lenses of an unusual type, with a view to securing three additional advantages:

Advantages. 1. The Eyepoint has been made longer than formerly, so that even the deepest of the new Eyepieces can be used in perfect comfort.

2. With any given objective the new Eyepieces will give a flatter and more uniformly defined field than ordinary Eyepieces of either the Huyghenian or the Compensating type.

3. The range of adjustment by the small draw-tube has been limited, so that it is impossible to exceed the really useful limits.

How to use them. In nearly every case it will be sufficient to use the Eyepiece (1) with the draw-tube **pushed in** as far as it will go with **ordinary** low-power objectives up to and including the $\frac{1}{2}$ inch.

(2) With the draw-tube **pulled out** as far as it will go with all **Holoscopic** and **Apochromatic** objectives, and with most ordinary $\frac{1}{12}$ inch Oil Immersions.

(3) With the draw-tube at a half-way setting with ordinary $\frac{1}{4}$", $\frac{1}{6}$" and $\frac{1}{8}$" objectives and some $\frac{1}{12}$" Oil Immersions.

Very painstaking observers will find the absolutely best positions of the Eyepiece draw-tube close to those just indicated in those rare cases, where an unusually sensitive object still shows traces of coloured margins (orange and blue) in the outer part of the field of the Eyepiece.

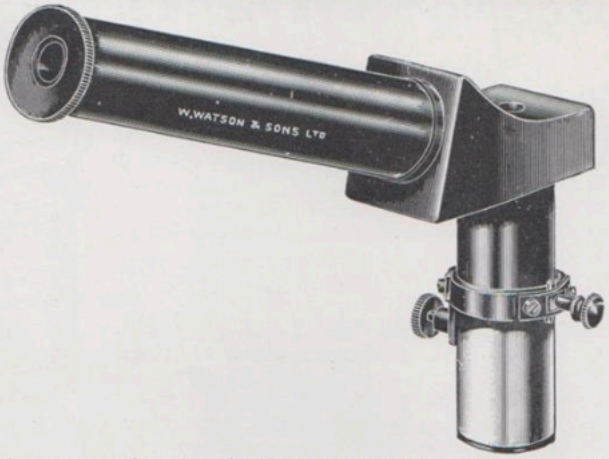
How they act. **The reason why** microscopical eyepieces should be adjustable is that only the lowest objectives can be made strictly achromatic. All modern objectives of less than $\frac{1}{5}$-inch focus have unachromatic front lenses, and owing to that, have a higher magnifying power in blue light than in red, with the result that an ordinary Eyepiece, when used with them, shows spurious coloured edges on strongly marked lines in the outer part of the field. Compensating Eyepieces correct a certain **definite quantity** of this difference of magnification in different colours, but as the amount really present in different lenses varies considerably, our adjustable Holoscopic Eyepiece provides the only true and complete solution of the difficulty.

Magnifying Powers. The Holoscopic Eyepieces are made in two patterns: (1) the ordinary Student's pattern, and (2) the best capped form. Either kind can be used with **any tube length.**

The magnifying powers are calculated for the 10-inch tube length, and are as follows:—

Code Word.		£	s.	d.
Mechan	Student's patterns, 7, 10, 14 and 20 diameters	2	6	6
Medal	Best capped pattern only, 1·27 in. diameter, 5 diameters ..	3	0	0
Meddle	do 7, 10, 14 and 20 diameters ..	3	0	0

WATSON'S DUPLEX EYEPIECE.



An effective means for the simultaneous examination of an object by two observers. Simple in use, free from complications.

The apparatus consists of an Axial Eyepiece which fits directly into the tube of the Microscope and carries a reflector, by means of which the image of the object under examination passes simultaneously with the direct rays to a second eyepiece carried in a projecting tube, set at a convenient angle. Any particular portion of the field can be immediately indicated by either observer by means of a pointer which is moved from the exterior of the eyepiece.

The Microscope is focussed by the direct observer in the ordinary way, and adjustment to focus for the reflecting tube is made by sliding the eyepiece.

Thus two workers can use the same Microscope at the same time quite conveniently, and it will be found especially valuable for instructional purposes, enabling different parts of the object in the field to be pointed out and described. It also saves a large amount of time under such conditions.

The eyepiece is clamped to the outside of the draw-tube by means of a screw.

It will be noticed that the body length is increased by the apparatus, and with medium and high powers it will be advisable to push in the draw-tube correspondingly.

Code Word.	No.		£	s.	d.
Mediat	A3117	Duplex Eyepiece as figured and described	5	15	0
Medico	A3118	In order to render the images seen through the two Eyepieces equally illuminated, a disc of coloured glass is supplied to fit over the direct eyepiece		5	0

The Projection Eyepiece,
for Photo-Micrography, Micro-Projection, etc.

These Eyepieces may be used advantageously with Objectives of either the Apochromatic or ordinary series, for photographic purposes, projecting an exquisitely sharp image of the object on the plate. A divided circle is provided, the figures of which represent in inches the camera extension. For **visual** focussing the pointer should be set to the division marked ∞. **When photographing,** the eyepiece is correct when the focussed image of the diaphragm forms a sharp edge to the photographic picture. Made in two sizes—1·27 in. and the Student's (·9173 in.)

Code Word.		£	s.	d.
Medif	Initial magnifying power, ×6.	2	10	0
Adapters	between Continental Eyepieces and any English size		7	6

Condensers—Substage.

A high degree of excellence in the illuminating apparatus of a microscope cannot be too strongly insisted upon. With low powers the light reflected directly from a mirror is generally sufficient, but not so with the high powers. Here it is not only necessary to obtain **more** light, but it is imperative that such light should be under perfect control, and that the quality of the system producing the illuminating cone should be as carefully considered as the objective itself. In short, the condenser is a necessary adjunct: not a mere refinement. The better the quality of objective used, the more perfect must be the substage condenser, if the full virtue of the former is to be exhibited. A well-corrected objective demands a condenser having an aplanatic aperture which is proportionate to its own. A good objective under favourable conditions, will bear a solid cone of illumination of three-fourths its numerical aperture: the condenser should be selected accordingly.

In our series of substage condensers, we provide for all classes of work, with every power of objective, as follows:—

Condenser.	Full Aperture.	Aplanatic Aperture.		Equivalent Focus.		Page.	Diameter of Back Lens.
		Complete.	Top Lens Removed.	Complete.	Top Lens Removed.		
				Inch.	Inch.		
Macro Illuminator..	—	—	—	·2	—	58	1·25
Aplanatic Low-power ...	·50	·48	—	·66	—	58	·6
The Universal ...	1·0	·95	·40	·4	1·0	59	·77
The Parachromatic	1·0	·90	·40	·29	·4	60	·62
Oil Immersion (Holoscopic series)	1·30 to 1·40	Full	·55	·22	·55	60	·6

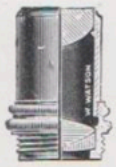
And our well-known Abbe Illuminator, page 61.

The freedom of the lens-system from spherical aberration shows the degree of aplanatism attained. In the above table the aplanatic aperture is very large in relation to the full aperture: a sufficient indication of high efficiency.

WARNING.—*Several Condensers are offered in competition with our Series, professing to have similar large aplanatic apertures. On testing, we have found many quite inferior to their representations. We guarantee that all our Condensers have the aperture—both numerical and aplanatic—claimed for them.*

Condensers—Substage.

APLANATIC LOW-POWER.

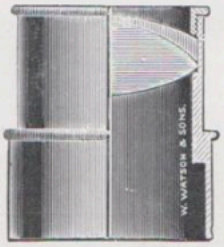


A 3127

This is a most excellent condenser for low and medium powers, up to a numerical aperture of ·65. It has a power of $\frac{2}{3}$ in. and a numerical aperture of ·50, of which ·48 is Aplanatic. The diameter of the back lens is ·6 in.

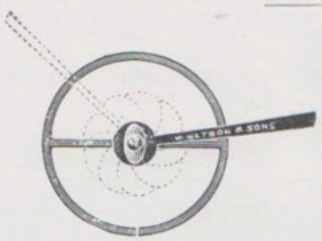
Code Word.	No.		£ s. d.
Mediol	A3127.	Optical part only, with universal R.M.S. thread	3 10 0
Meditat	A3128.	Completely mounted, similar to Parachromatic Condenser, page 60, with iris diaphragm and set of stops	5 0 0

THE MACRO ILLUMINATOR.



A 3129

Code Word.	No.		£ s. d.
Medlar	A3129.	This is a single Achromatic Combination of $1\frac{1}{4}$ in. clear aperture and 2 in. focus It excels for its brilliant and uniform illumination of large objects under low powers. The lens is mounted to fit into the Substage, close to the object, so as to focus the image of the source of light **in the Objective.** Objects up to fully 1 in. diameter may be thus illuminated with uniformity. It is extremely valuable for photography, with Holostigmat lenses and low-power objectives. Mounted for Substage ...	3 10 0



Expanding Stop. A3130.

Dark-Ground Illumination by Expanding Stop.

This Expanding Stop is constructed in a similar manner to an Iris diaphragm, but instead of having a variable central aperture it has an opaque disc of variable size, enabling the best results to be obtained with different objectives.

Code Word.	No.		£ s. d
Medipan	A3130.	Expanding Stop for dark-ground effects, suitable for the mountings for the Universal Condenser and Abbe Illuminator. The central disc variable in size from $\frac{1}{10}$ in. to $\frac{3}{4}$ in.	1 2 6
Medidar	A3130a.	To fit the expanding stop an alteration is usually necessary to the Substage mount costing	5 0

Note.—These Stops are somewhat fragile, and no responsibility can be accepted for them after leaving our hands.

Condensers—Substage.

Holoscopic System.

The Universal Condenser.

A3134

For rapid work, a condenser having large lenses is an immense advantage, and in the Universal Condenser a diameter of back lens is given, which in practice affords all the convenience of the larger sizes. With it work can be done as rapidly, and more accurately, than with any other Condenser, while the beautiful aplanatic corrections render it the finest all-round Condenser procurable.

It is constructed on our Holoscopic System, a triple back lens producing the correcting effect. It is this system which has enabled us to produce in our Holoscopic Objectives and Oil Immersion Condensers, corrections for spherical aberration, which have made them famous as the best examples of optical skill and perfection in aplanatism of the present day.

The power is very suitable for general purposes, with objectives of low, medium and high magnifications, whilst without the top lens it can be used advantageously with the lowest powers.

We would emphasise the enormous aplanatic aperture it yields. Its **total** aperture is aplanatic, if the exact thickness of slip be used for which it is corrected. Its optical perfection suits it for work with the highest powers. It is a "Universal" Condenser in every way.

It will work through any reasonably thick slip, but is slightly under-corrected for thin ones. This can, however, be corrected by partly unscrewing the front lens so as to cause it to touch the slip when in focus.

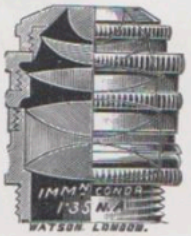
The Mounting is the same as used for the Abbe Illuminator, with which the Holoscopic Condenser will interchange. It has iris diaphragm and rotating cell for stops, etc.

Power.		Total Aperture.	Aplanatic Aperture.		Diam. of Back Lens.
Complete.	Front lens removed.		Complete.	Front lens removed.	
·4 in.	1·0 in.	1·0	·95	·40	·77

Code Word.	No.		£	s.	d.
Meeko.	A3134.	Optical part only.	5	10	0
Mere.	A3135.	Completely-mounted with iris diaphragm. For Understage	6	10	0
Megrim.	A3136.	Do. do. do. For Substage	7	0	0
Meine.	A3137.	Set of stops for dark-ground illumination, etc.		10	0
Melan.	A3138.	Coloured glasses—blue, yellow, signal green, ground, etc., Dr. Spitta's "pot green."		1	6

Condensers—Substage.

The Holoscopic Oil Immersion Condenser.



A 3141.

This condenser possesses the same perfection of correction as the objectives of our " Holoscopic " series, the same principles being adopted in its construction. The elimination of spherical aberration is indicated by the large aplanatic aperture yielded by it. The full aperture is actually as great as that of any condenser at present made, while its aplanatic cone, on which the working quality depends, is greatly in excess of any similar construction. It may therefore be considered the **most perfect Oil Immersion Condenser** obtainable ; a fact widely recognised, as it is used by many of the most distinguished microscopists. It is indeed indispensable to all microscopists who would realize the extreme resolving and defining powers of their objectives. The power is a most convenient one for high-power work ; it can be used dry if desired, when an aplanatic aperture of ·92 is secured ; or with the front lens removed, it forms a most useful and efficient dry condenser for medium and low powers. It may therefore be considered as a generally useful condenser for all Objectives.

The numerical aperture of this condenser varies according to the thickness of slip through which it has to work. It is normally made to work through slips up to 1·6 m/m. thick, and has then an N.A. of about 1·34. If made—to order—to work through slips not exceeding 1·3 m/m, its N.A. can be brought up to 1·40. On the other hand, if greater working distance is demanded, the N.A. falls proportionately to 1·30.

	Oil immersed complete.	Dry complete.	Dry top lens removed.
Power	·22 in.	·22 in.	·55 in.
Full aperture	1·30—1·40	1·0	·60
Aplanatic aperture	do.	·92	·55

Clear diameter of Black Lens, ·6 in.

Code Word.	No.		£ s. d.
Melior	A3141.	Optical part only, having standard R.M.S. thread	8 0 0
Melliff	A3142.	Completely mounted with iris diaphragm, similarly to Parachromatic Condenser shown below, with divisions to indicate aperture employed. With sets of stops complete	9 10 0

For coloured glasses, see A3145.

The Parachromatic.

A 3144.

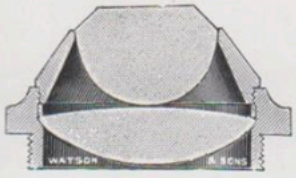
This is the condenser *par excellence* for medium and high-power workers. The optical portion has the Universal Objective Thread and is mounted over an Iris Diaphragm, beneath which is a revolving carrier for Stops for dark ground and oblique illumination. The Iris Diaphragm is divided so as to indicate the N.A. at which the Condenser is being employed. The diameter of the back lens is specially large for such a Condenser. This Condenser is eminently suited for the highest critical and photographic work, and we confidently recommend it.

Power.		Aperture.	Aplanatic Aperture.	Diameter of Back Lens.
Complete.	With top lens removed.			
·29 in.	·4	1·0	·90	·62 in.

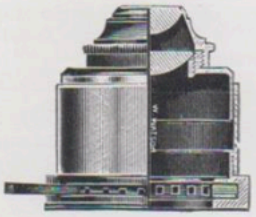
Code Word.	No.		£ s. d.
Mallow	A3143.	Optical part only, having standard R.M.S. thread ..	5 10 0
Melod	A3144.	Completely mounted as figured, with set of stops...	7 0 0
Melt	A3145.	Disc of blue, yellow, signal green, ground-glass or Dr. Spitta's " pot green " (in two thicknesses), for either of the above Condensers ... each	1 6

Condensers—Substage.

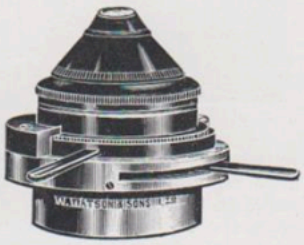
WATSON'S NEW ABBE ILLUMINATOR.



Optical part of Abbe Illuminator. 1·20 N.A. A3149.



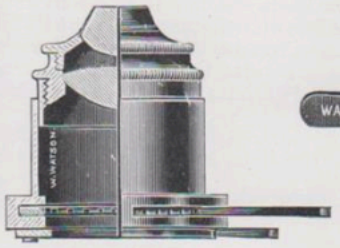
Simplified Abbe Condenser. A3154.



Mounted for Substage. No. A3150.

The continued popularity of this Condenser is due to the ease and rapidity with which it can be employed and for its brilliancy of image.

Although its numerical aperture is great, being 1·20, its Aplanatic Cone is comparatively small, but the ease with which it can be worked has caused it to be universally used for both high and low-power work; for the latter purpose the top lens is removed. A beautiful dark-ground effect may be obtained with it.



Mounted for Understage. No. A3151.

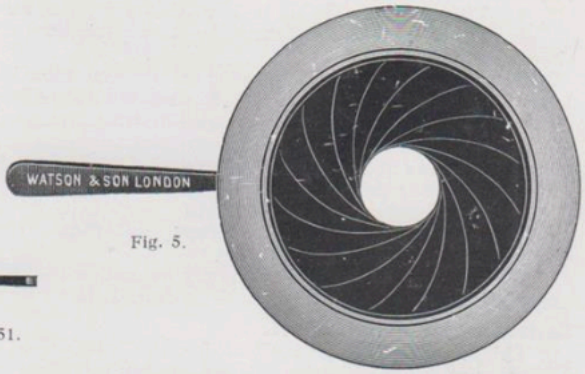


Fig. 5.

We have designed a very perfect Iris Diaphragm for the fittings of these Condensers (as fig. 5), which permits the most precise gradation of illumination being immediately obtained.

Code Word.	No.		£	s	d.
Member.	A3149.	Optical part only, N.A. 1·20.	1	5	0
Memen.	A3150.	Completely mounted for **substage,** with iris diaphragm and carrier for stops, N.A. 1·20.	3	0	0
Memoir.	A3151.	Completely mounted for **understage** with iris diaphragm and carrier for stops, N.A. 1·20.	2	5	0
Memorab.	A3152.	Set of stops for dark-ground, etc., illumination in brass box.		10	0
Memory.	A3153.	Discs of glass, tinted, blue signal green, yellow, ground glass. Dr. Spitta's " Pot Green," (2 thicknesses), etc. ... ... each.		1	6

Simplified Abbe Condenser with Iris Diaphragm.

A3154		The Iris diaphragm can be used independently if the Condenser is removed	1	10	0

W. WATSON & SONS'

HOLOS IMMERSION PARABOLOID.

(For exhibition of Ultra Microscopic Particles).

Gives a brilliantly illuminated object with an intensely black background with high-power dry Objectives up to ·95 N.A. Specially suited for showing unstained living Bacteria.

For the convenience of those who use the English type of Microscope, the optical portion of the Holos Immersion Paraboloid is so mounted that it can be interchanged with the ordinary optical part of the Abbe Illuminator and similar Condensers supplied by ourselves and other English houses, and therefore used in conjunction with the Iris diaphragm mounting which carries the Abbe Illuminator optical part, Nos. 3150 and 3151.

It can usually be supplied to fit any other make of Microscope that may be specified.

Essentials of Successful Working.

1. The Holos Immersion Paraboloid must in every case have oil between it and the object slip, and the contact must be maintained, and all air bubbles avoided.
2. The Condenser must be accurately centred.
3. The object slip must be within 20 per cent. of the thickness engraved on each of the Paraboloid mountings. A supply of suitable slips is included with each Paraboloid.
4. The specimen should be in as thin a layer of fluid as possible.
5. The source of light must be a very brilliant one, and a Bull's-eye condenser should be used.

The annular illumination provided by the Paraboloid extends from about N.A. 1·0 to N.A. 1·45, and it is noteworthy that the use of the iris diaphragm cuts out the rays of low numerical aperture first, so that the illumination becomes more and more oblique. This is a very favourable circumstance, as it secures the greatest resolving power attainable under the circumstances of dark-ground illumination for all objectives exceeding ·48 numerical aperture.

The smaller the source of light the more care is required in making the adjustments, and in using slips of the proper thickness. The latter is, therefore, engraved on the mount of each instrument.

Oil immersion objectives can only be used with the Paraboloid if a special stop is used which reduces their numerical aperture below 1·0.

Annular Illumination.

This Paraboloid is excellent for the resolution of striated objects such as Diatomaceæ. The objective is then used at its fullest aperture, the illumination from the paraboloid being annular and oblique in all azimuths.

Code Word.	No.		£ s. d.
Mercan.	A3160.	Optical part only, mounted to fit Abbe Illuminator Carrier such as is supplied with English Microscopes, with immersion oil and supply of suitable slips. ..	2 15 0
Mercha.	A3161.	Complete Paraboloid with mounting for Sub-stage	4 10 0
Mercher.	A3162	Ditto with mounting for under-stage .. .. .. Immersion oil and supply of slips is included in above.	3 15 0
Merchol.	A3163.	Funnel Stop	6 0
Mercif.	A3164.	This Paraboloid must be accurately centred, and if the Microscope has no centring screws to the Sub-stage, a Centring Nosepiece should be used, which is supplied with the complete Paraboloid at a special extra charge.	1 10 0

For illuminating attachment for above see next page.

For new Cassegrain Darkground Illuminator
See Supplement at end of Catalogue.

ELECTRIC LIGHT ATTACHMENT
FOR
WATSON'S HOLOS IMMERSION PARABOLOID

See previous page.

One of the difficulties associated with the dark ground examination of living micro. organisms, has been that of obtaining a satisfactory illumination. Even when the illuminant has been sufficiently powerful and brilliant, it has not been found easy to use it to the best advantage.

Watson's new method obviates this trouble, and reduces work with Dark Ground Illumination to its simplest possible terms.

Watson's Holos Immersion Paraboloid must be used in the ordinary way, care being taken to centre it with the Objective, and to maintain immersion contact with the under side of the slide, the slide being of appropriate thickness. Beneath the Paraboloid in a special carrier, an electric lamp, and a suitable Condensing Lens are fitted, the holder being merely pushed into the tube of the Paraboloid. This lamp is already centred, and gives a wonderful illuminating power. It may be connected to a storage battery, or dry cells, or the ordinary house supply can be used with a suitable resistance.

The problem of a suitable lamp is solved by this simple but extraordinarily effective means.

Code Word.	No.		PRICE LIST	£	s.	d.
Merd.	A 3279	1.	Electric light, complete with fitting to attach to Holos Immersion Paraboloid, with Condensing Lens, lamp, 3 ft. of flexible wire, no battery ...	2	10	0
Merel.	A 3280	2.	Six-volt battery in box with switch	1	12	6
Merfo.	A 3281	3.	Extra six-volt battery, dry cells	0	10	6
Merfin.	A 3282	4.	Extra lamps ... ... each	0	1	8
		5.	When it is desired to use the ordinary house supply of current, items 2 and 3 are unnecessary. A resistance must then be employed, and will be supplied to suit any specified voltage of current.			
Merge.	A 3283		Resistance for 100-125 volts	1	17	6
Mergil.	A 3284		,, ,, 200-250 ,, ...	2	2	0

When current from a main supply is to be used with a resistance a 12-volt lamp is supplied. If dry cells or a storage battery are employed a 6-volt lamp is usually taken.

REASONS FOR CHOOSING A WATSON MICROSCOPE.

They are British made, and have a special claim on British workers.

They are scientifically constructed for scientific work, and whenever a Microscopist is desirous of wresting from his instrument the utmost it is capable of producing, he has of necessity to employ the refinements and conveniences which the long experience of experts has proved to be the sole means for achieving such results, all of these are embodied in the Watson Microscopes.

The following are distinctive features of the Watson instruments. They will not be found **in combination,** and, in the majority of cases, not individually in any make of Continental Microscope.

The Watson Microscope has

The Tripod foot which imparts perfect rigidity. A Microscope so mounted does not fall over when touched.

A long range of Coarse Adjustment, enabling it to be used for low magnifications as well as for the highest. Low-power Objectives are also supplied.

A mechanical draw tube which allows of precise adjustment of the tube length for thickness of cover glass.

A Mechanical Stage scientifically constructed as a part of the whole instrument, and not an easily disordered attachable accessory.

A Compound Substage with centring screws, so that the Condenser or dark ground illuminator may be easily rendered axial with the Objective. It is fitted with rackwork to focus, and can be supplied with a Fine Adjustment.

The Watson-Wenham Binocular Body, the ideal arrangement for low-power workers and amateurs.

The fittings carry Substage Apparatus, Eyepieces and Objectives of the Royal Microscopical Society's standard size.

The working parts have sprung fittings with adjusting screws, whereby wear and tear may be compensated for.

The Substage Condensers have the necessary aplanatic cones for developing the fullest capacity of the Objective.

WATSON'S BRITISH-MADE MICROSCOPES

are the instruments of to-day and the future. If you use one of them you will work to the fullest advantage.

W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.

PART II.

The following pages describe

MICROSCOPES

of the Highest Class for the purposes of

The Amateur and The Research Worker

together with

Apparatus for Microscopy

OF EVERY DESCRIPTION

THE RESEARCH MICROSCOPE.

The student uses his Microscope principally to see known structures, or to determine the absence or presence of definite appearances. For this purpose a satisfactory equipment can be readily specified.

Not so easy is the choice of the Research worker. He has often to look for that which has never been seen, or endeavour to determine the function, cause, or the reason of existence for something which is before him.

Such a man would be perpetually dissatisfied if he felt that his work was restricted by the use of anything less than the best instrument and lenses that could be obtained.

A Research Microscope then must offer to its user every refinement and delicacy of adjustment that he can desire, and no Microscopes for the purpose compare today with those which are hand made and fitted in the old-fashioned way. Machinery has displaced much of the skill and pride of craftsmanship of by-gone days, but in such instruments as Watson's " Royal " and " Van Heurck " series, the skill and the perfection of movements are still maintained.

Microscopes of this class occasionally come through our hands that have been made and used for more than twenty-five years, and it is a surprise to us to see how satisfactorily the working fittings have retained their condition after so long a period.

For Research work it cannot be too clearly appreciated that the Substage Condenser must bear a definite relationship to the power and numerical aperture of the Objective. Not merely must the Condenser have approximately the same numerical aperture as the Objective, but the cone of illumination which it transmits must be aplanatic. This calls for the best type of construction in Condensers, such as our Parachromatic and Holos Immersion systems, on pages 49 and 50.

When using Condensers of such numerical aperture and power as these possess, the focussing has to be almost as accurately done as for the Objective itself. Hence the inclusion of a Fine Adjustment to the Substage in Research Microscopes—apparently a luxury, but to those who know its value, a necessity.

Another point that is frequently misunderstood is the necessity of using the thickness of cover glass together with the appropriate tube length for which the Objectives are corrected.

Experience soon teaches whether the best possible conditions have been attained, but if the cover glass is thinner than the Objective is corrected for, adjustment can be made by extending the draw tube, and conversely, the body length (that is the distance between the Eyepiece and Objective) must be reduced, if the cover glass is thicker than the Objective is designed for.

The Draw Tube with rackwork adjustment enables this to be done with rapidity and accuracy.

A lifetime of satisfactory working service is secured by using a :

Watson's Microscope for Research.

THE ROYAL OUTFIT.
An Amateur's First-Class Set.

Microscope

	£	s.	d.
The Royal, stand only, as described pages 70 & 71	42	10	0
Divisions to stage movements	1	10	0
Binocular body to interchange with monocular	14	0	0
Best Mahogany Cabinet	5	10	0

Objectives

Holoscopic (page 49)	£	s.	d.
50 m/m	3	0	0
25 ,,	5	5	0
12 ,, ·65	6	15	0
4 ,, ·85	7	10	0
2 ,, 1·37			
Oil Immersion	12	0	0

or

Apochromatic (page 47).	£	s.	d.
16 m/m	6	0	0
8 ,,	8	0	0
4 ,,	10	0	0
2 ,, 1·37			
Oil Immersion	17	10	0

Eyepieces—Holoscopic Series (page 55)

	£	s.	d.
1 pair each, × 5 and × 7, large capped	4	13	0
1 each × 10 and × 14	4	13	0
	9	6	0

Accessories

	£	s.	d.
Parachromatic Condenser 1·0 N.A., with stops, 3144	7	0	0
Polarising Apparatus, 3742	3	2	6
Mica-Selenite Stage, 3762	2	12	6
Bull's-Eye Condenser, 3472	1	7	6
Silver Parabolic Side Reflector, 3460	1	10	0
Beale's Neutral Tint Camera Lucida, 3451		8	9
Triple-dust-proof Nosepiece, 3112	1	5	0
Aluminium Reversible Compressor, 3535	2	2	0
Rousselet Live Box, 3537, **17/6**; Extra Covers, 3538, **5/0** doz.			
2 Troughs, 3548: 3″ × 1″, **1/6**; and 3″ × 1½″, **2/6**			
Stage Forceps, 3785		12	6
Micrometer, one each for Eyepiece, 3603, **7/6**; and Stage, 3606, **7/6**		15	0
Standard Lamp, 3525, **£1 10 0**; and Case, 3527, **£1 0 0**	2	10	0

Mounting Materials

	£	s.	d.
Laboratory Dissecting Microscope, page 97, and set of 3 Aplanatic Magnifiers, page 117	5	5	0
Mounting Cabinet, B 3663	6	15	0
Cathcart Microtome, pattern 3626	3	5	0

	£	s.	d.
Complete Cabinet of 200 Microscopic Slides of general interest, 3699, see page 129	18	10	0

The total may be arrived at after the selection of the objectives.

This Set may be varied to meet individual requirements, and every assistance toward a suitable selection will be afforded intending purchasers. Any of the Sets included with the Royal Microscope on page 72 could be arranged with the above.

Code word with Holoscopic Objectives—Milfo
,, ,, with Apochromatic Objectives—Milia.

THE "ROYAL" MICROSCOPE.

Horizontal mechanical movement of Stage increased to 1½ in.

Carries larged-sized Eyepieces: has Mechanical and Sliding Draw-tubes: stage bolted to limb as in Van Heurck Microscope: new swinging-out Substage.

For high-class practical work, with absolute rigidity, in a convenient size, this Instrument is unexcelled, for it combines all those working qualities which have gained so high a reputation for the Van Heurck Microscope, but in a more compact form and at a lower cost.

The height, when placed vertical and racked down, is 11¼ inches.

The tripod foot is shod with cork and has a spread of 7 inches.

The Mechanical Stage is our Standard pattern. It has a horizontal movement of 1½ inches, and is covered with ebonite attached by a vulcanizing process. It is fitted with a sliding bar.

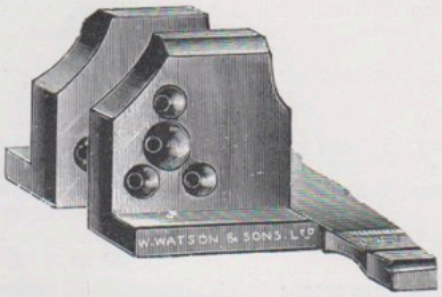
The Mechanical Draw-tube with inner sliding draw-tube, as described page 75, is incorporated. It carries eyepieces 1·27 in. diameter, but, if so desired, can be supplied to carry eyepieces of the Students' or Continental size.

The Union of Parts. The method of uniting the stage and limb and bolting all together, as described with the Van Heurck Microscope, on page 76, is used here. Further, the limb is continued beneath the stage and carries the Compound substage. The latter is therefore quite independent of the stage itself. This will be more clearly understood by reference to the accompanying illustration. It will be observed that the Stage base is continued in a solid casting so as to embrace the Limb " A," to which it is screwed, the axis bolt passing through the hole at " B."

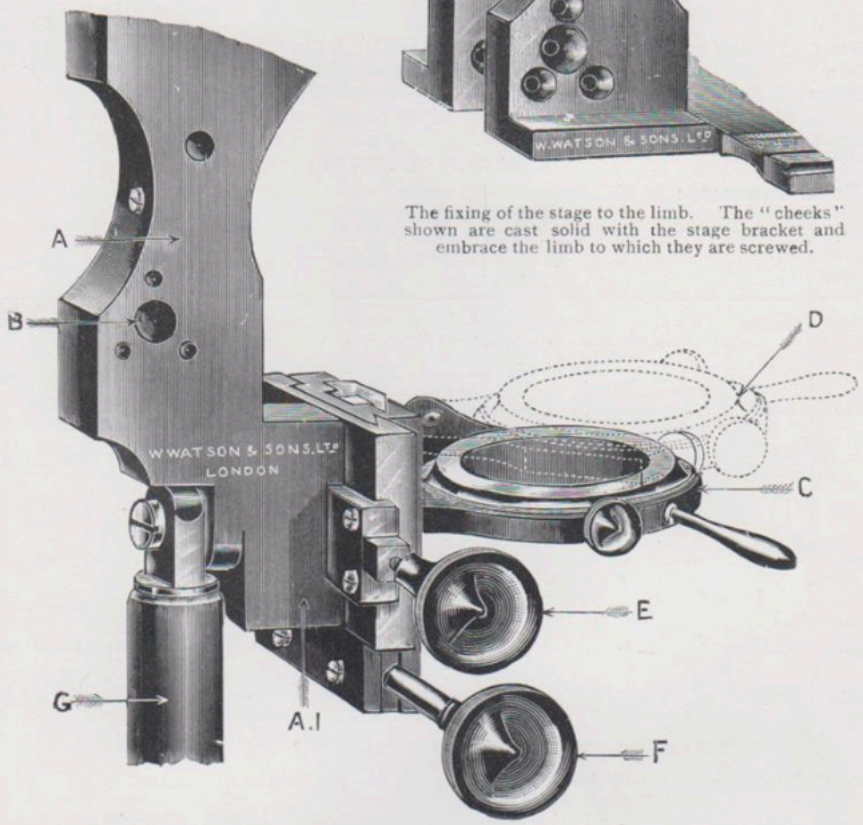
The Limb " A " is continued downwards so as to support the stage base from beneath and carry the Substage on the part marked A1.

The Substage, which in the regular model has coarse adjustment and centering screws only, but may be provided with fine adjustment if desired at an extra cost of £3 0 0, has, in addition, a new swing-out arrangement for turning the condenser and the centering fitting only, out of the optical axis, as shown in the illustration, " C " representing the axial position and " D " when turned aside. A spring catch secures all when the condenser is in use. E and F represent the milled heads of the fine and coarse adjustments of the Substage respectively.

The Coarse Adjustment is by diagonal rack and pinion, as described page 6, and in connection with the Van Heurck Microscope, on page 75.



The fixing of the stage to the limb. The "cheeks" shown are cast solid with the stage bracket and embrace the limb to which they are screwed.



The lower end of the Limb of the Microscope to show the build of the various parts.

The Fine Adjustment is our standard lever pattern.

It will thus be seen that the many special features combined in this Microscope render it suitable for those who require an instrument of the highest class. It will be found to respond in the fullest manner to the exacting demands of the photo-micrographer and high-power worker. Its many conveniences enable the best results to be obtained rapidly with all types of objectives. It is invaluable in the laboratory, for which its strong construction and excellent mechanical stage are especially advantageous, while for the varied purposes of the Amateur it is unequalled.

PRICES OF THE "ROYAL" MICROSCOPE.

Code Word	No.		Price £ s. d.
Mesh	B 3285	Royal Microscope, stand only, as described, pages 70 and 71	42 10 0
Mesma	B 3286	Royal Microscope, as described, pages 70 and 71, but with Wenham Binocular instead of Monocular body (see page 88)	51 10 0
Messa	B 3287	Royal Microscope, as described, pages 70 and 71, having both Monocular and Wenham Binocular interchangeable bodies	56 10 0
Metag	B 3288	Mahogany Cabinet to contain Microscope and apparatus	2 10 0
Meta	B 3289	Mahogany Cabinet to contain the Binocular Instrument	4 0 0
Metam	B 3290	Mahogany Cabinet, superior construction, with cupboard door and drawer for apparatus	5 10 0
Meteo	B 3291	Bell-glass Shade . . With ebonised base	1 7 6

COMPLETE SETS.

Royal Microscope in Mahogany Case, with handle, lock and key, and with the following accessories :—

Code Word	No.	Objectives.	Best Capped Eyepieces.	Nosepiece.	Condenser.	Extras.	Price. £ s. d.
Metre	B 3292	Two Parachromatic $\frac{1}{2}$ in., ·80 N.A. or $\frac{1}{4}$ in., and 1 in., or $\frac{2}{3}$ in.	2—Nos. 1, 2, 3 or 4	—	Abbe No. 3150	—	55 7 6
Mew	B 3293	Do.	Do.	Double No. 3111	Do.	Divisions to Stage	58 0 0
Miad	B 3294	Do. with $\frac{1}{12}$ in. Oil Immersion, Versalic.	Do.	Triple No. 3112	Do.	—	64 2 6
		WITH HOLOSCOPIC OBJECTIVES					
Mica	B 3295	Two—25 m/m. ·30 N.A. and 4 m/m. ·85 N.A.	2—Holoscopic, 5, 7, 10 or 14.	—	Universal No. 3136	—	70 15 0
Mid	B 3296	Do.	Do.	Double No. 3111	Do.	Divisions to Stage	73 7 6
Midg	B 3297	Do. with 2 m/m. Oil Immersion 1·37 N.A.	Do.	Triple No. 3112	Parachromatic No. 3144	—	84 0 0
		SPECIAL FOR GENERAL AND AMATEURS' USE.					
Might	B 3298	Three—Parachromatic 2 in., 1 in., and $\frac{1}{4}$ in.	2—Nos. 2 and 3	Triple No. 3112	Abbe Illuminator No. 3150 and box of Stops	Stand Condenser No. 3472 Live Cage No. 3537, Stage Forceps No. 3785	62 5 0
Mign	B 3299	Three—50 m/m., 25 m/m., ·30 and 4 m/m., ·85 N.A. Holoscopic Series	2—Holoscopic 7 and 10	Triple No. 3112	Universal Condenser, No. 3136, and box of Stops	Do.	78 17 6

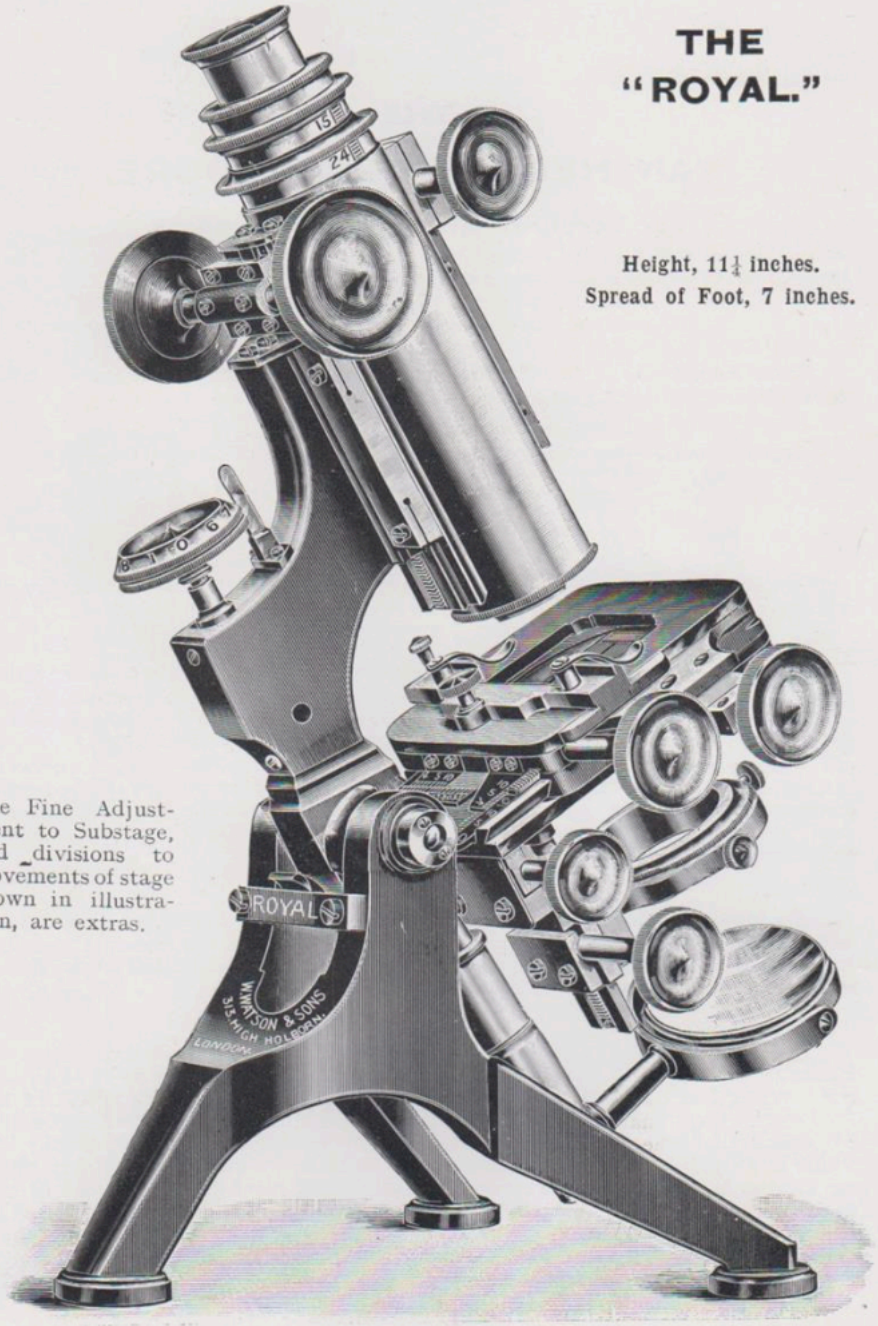
Migro B 3300. If small-sized Eyepieces are preferred, deduct 14/6 per Eyepiece

EXTRAS

			£ s. d.
Milch	B 3301	Divisions to movements of stage reading by verniers to 1/10th of a millimetre	1 10 0
Mild	B 3302	Fine adjustment to substage	3 0 0
Mileg	B 3303	Adapter to carry Eyepieces of Continental size	7 6

THE "ROYAL."

Height, 11¼ inches.
Spread of Foot, 7 inches.



The Fine Adjustment to Substage, and divisions to movements of stage shown in illustration, are extras.

THE
VAN HEURCK MICROSCOPE.

For Research and General Purposes.

Three Models—No. 1 and Circuit Stage. Range of horizontal Mechanical Stage movement increased to 1½ in.

Grand Model.—Reconstructed generally. Range of horizontal Mechanical Stage movement increased to 2 inches.

The Van Heurck is the most completely-fitted model which we make, and represents all that is most modern in microscope design and manufacture.

The aim in its construction has been to present, in the most efficient form possible, mechanical movements of complete and comprehensive description, in a design of maximum rigidity, and to maintain every feature in the most up-to-date manner, and we can assert unhesitatingly that the complete control which is afforded in working enables the finest results to be secured with a rapidity and comfort which is unique. It has brought the most gratifying testimony from many of the leading microscopists of the day, and this, coupled with the fact that the Van Heurck is now used by many of the foremost workers in every branch of research, is a sufficient guarantee of the perfection attained.

This Microscope was first made by us to the specification and order of the late Dr. Henri Van Heurck, the celebrated Microscopist, of the Botanical Gardens, Antwerp, for conducting the researches for which he gained such distinction, and for his high-power Photographic work.

Photo-Micrography, especially with high powers of large aperture, demands a working excellence and accuracy of the highest grade in every part—it is, in fact, the severest test to which a microscope can be put. In the construction of this Instrument the usual causes of failure have been eliminated. It will at once be recognised that the precision which is requisite for high-power photography and which is provided in this Instrument, is of immense value to the ordinary visual worker, for it enables him to secure the fullest and most effective means of conducting his researches. Especially does this apply to Laboratory work, in which reliance has to be placed on the results obtained; and to those who are doing original and accurate work, this microscope will be found to embody every convenience for rendering such work more easy and exact.

The Van Heurck is, in fact, the last word in modern microscope construction.

VAN HEURCK MICROSCOPE—Continued.

The Van Heurck series includes three models—The No. 1, The Circuit Stage and the Grand Model. The general construction of these instruments merits special consideration.

The Coarse Adjustment is effected by Watson's diagonal rack and pinion, and has sufficient range for a 4-inch objective. The pressure of the pinion on the rack is adjusted by the two screws shown in the accompanying figure 380. N is a block of anti-friction metal which supports the pinion shaft on each side, and it is on this supporting block that two adjusting screws act, one of which, M, is shown in figure. The most sensitive relation of pinion to rack can be established and maintained at all times. These adjusting screws are shown in position on the fitting plate in figure 381.

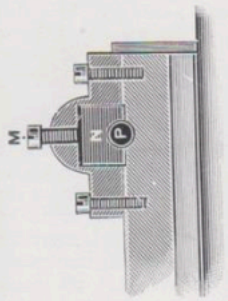


Fig. 380. Sectional View of adjustable fittings of rack and pinion.

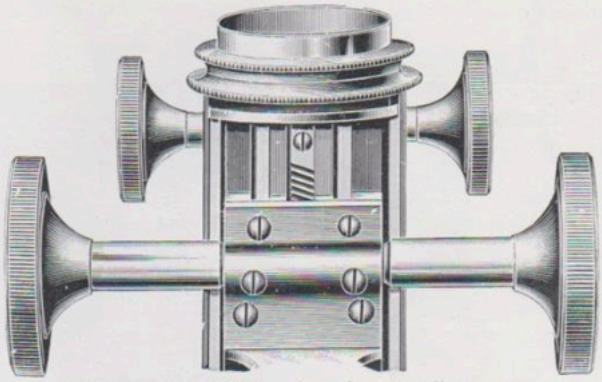


Fig. 381. View of fitting plate of coarse adjustment.

The Fine Adjustment is our standard lever form, but, being made with a very long lever, the motion imparted is very slow and precise.

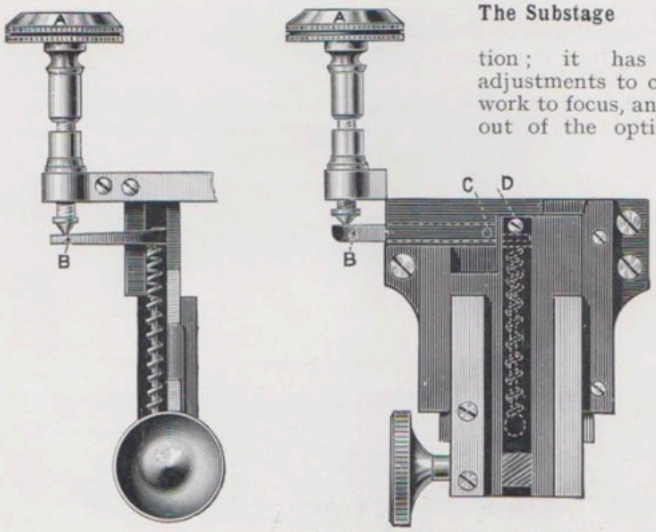
The milled head is divided to hundredths, and one revolution moves the body, up or down, the thirteenth of a millimetre. The adjustment is sensitive to the hundredth of a turn of the milled head, which would give the one thirteen hundredth of a millimetre, or the 1/33300th of an inch of motion.

The Body is provided with two Draw-tubes, one actuated by Rackwork and the other sliding inside it, as figured above. The advantage of having these is, that the body can be made very short, or extremely long. Thus sufficient latitude can be obtained to use Objectives corrected for either English or Continental tube lengths, and to adjust them for thickness of cover glass by variation of tube length.

The lower end of the draw-tube has the universal screw for low-power Photographic Objectives, the Apertometer, etc., and the nosepiece is removable by unscrewing. The usual size of Eyepiece-fitting is the Royal Microscopical Society's gauge, 1·27 in. diameter, but any smaller size can be employed, and larger sizes can be had specially to order.

VAN HEURCK MICROSCOPE—Continued.

The Stage varies in each of the three stands of the Van Heurck series. Particulars are given in the specifications of the respective models. Concentric rotation is afforded, there is a large rectangular central aperture, and the plates are as thin as can be combined with rigidity. Above all a large clear surface is afforded for the free movement of Specimens with the fingers, and a sliding bar is provided to support the object when desired. Any special arrangement for holding Specimens, other than the usual sliding bar and springs, can be supplied to order, if required.



Side View. Fig. 382. Front View.

Fine Adjustment as fitted to the Substage of the Van Heurck Microscope, working from upper surface of stage. The Substage itself is removed to show the construction.

The Substage is of specially substantial construction; it has rectangular screw adjustments to centre, very fine rackwork to focus, and is arranged to swing out of the optical axis, as in the "Royal" Microscope, page 71. A **Fine Adjustment** is included with the Grand Model Instrument, and is supplied at an additional cost (see Extras) to the other models. It may be either of two patterns: (1) to work from above the Stage surface by the method shown in figure 382 and in position on the Instruments on page 79, or (2) by means of a vertical lever worked by a milled head, mounted parallel with and just above the rackwork milled head of the Substage, as shown (F) on the Circuit Stage Instrument on page 81.

A Fine Adjustment is of great utility and enables slight alterations to be made to the focus of the Condenser without imparting vibration to the whole fabric, thereby affording great accuracy.

A Special Feature. The maximum stability is imparted by a unique system. Instead of the various parts being merely screwed together, they are fitted one into the other, thus rendering the structure as solid as though it were one piece of metal. As will be seen from the accompanying figure, the Bracket CC carrying the stage, instead of being screwed to the front of the limb, as is customary, is made in one solid casting, taking the substage beneath on the plate D, and going right into the joint at the top of the pillar. The limb A is fitted into the Stage Bracket D, held firmly by screws, and the joint bolt B goes through the whole—Limb and Stage Bracket—making the Limb, Stage, and Substage as if they were one piece. We venture to say that the strength and freedom from spring obtained by this means is unique in microscope construction, and altogether superior to microscopes which depend on screws only for the joining together of their parts.

VAN HEURCK MICROSCOPE—Continued.

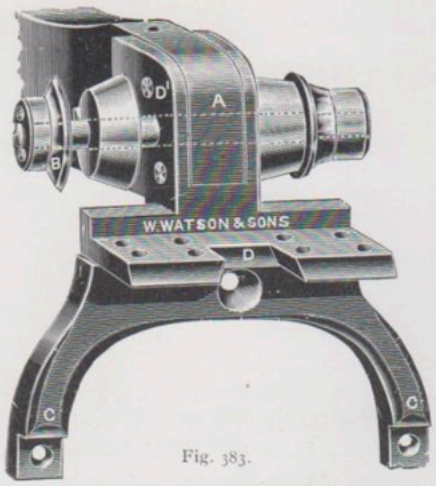


Fig. 383.

View of the method of fitting the Stage and Limb in the Van Heurck Microscope.
A—Limb CC and D—Stage Bracket

The Foot. The original Foot for this Instrument was of the Continental form, but the Tripod has met with so much favour and is so strongly recommended by most of the leading Microscopists, that it has entirely superseded it. At the points of contact with the table the foot is provided with cork pads, to further reduce vibration, while preventing the Instrument from slipping and the table from being scratched. The tripod foot has recently been slightly re-modelled for the three Instruments, so that the milled head controlling the substage rackwork may stand out beyond the foot when the instrument is vertical.

The stand is perfectly steady in any position, and the joint has a steel clamping bar, to fix it at any desired angle.

All the fittings are of the universal (R.M.S.) size.

The foot of the Van Heurck Microscope, either Model, may be of the horseshoe pattern as here illustrated. The price is the same as with the tripod.

PRICES OF THE No. 1 VAN HEURCK MICROSCOPE.

The No. 1 Van Heurck Microscope is the least expensive of the three models in this series. The workmanship is as perfect as in the Grand Model and the Circuit Stage Models, and the general dimensions are the same as the latter, but, being more closely built, complete rotation of the Stage is not possible.

SPECIFICATION.

The **height** of the stand when vertical and racked down is 12½ inches. The height to optical centre when placed horizontally is 8¾ inches.

The **tripod** is shod with cork and has a spread of 7¾ inches.

The **stage** is 5 inches in diameter, and has a range of movement of 1½ in., in the horizontal and 1 inch in the vertical directions. It has almost complete rotation.

The **compound substage** is arranged to be lifted aside from the optical axis.

The **mirrors** are plane and concave, and are 2⅜ inches diameter.

All **fittings** are of R.M.S. Standard gauge.

PRICES.

Code Word.	No.		Prices. £	s.	d.
Mimic	B 3310	Microscope, Stand only with Rackwork draw-tube .	62	0	0
Mince	B 3311	Ditto, but without Rackwork to second draw-tube .	55	0	0
Mind	B 3312	Microscope, as above, but fitted with Binocular instead of Monocular body and tubes to adjust to width of user's eyes . . . . . (The length of this Binocular body is about 9 inches, the draw-tubes racking out to 10 inches).	71	0	0
Miner	B 3313	Microscope, as above, but having both Monocular and Binocular interchangeable bodies	76	0	0

CASES.

Mingle	B 3314	Mahogany Case for Instrument and Apparatus . .	4	10	0
Minim	B 3315	Mahogany Cabinet of superior construction, with cupboard door to exclude dust, and drawers for apparatus	6	15	0
Minio	B 3316	Mahogany Cabinet with rabbeted door to exclude dust, and fitted inside with a flat mahogany case for apparatus; of handsome design and best construction	12	10	0
Minus	B 3317	Bell-Glass Cover on polished ebonised base . . .	1	10	0

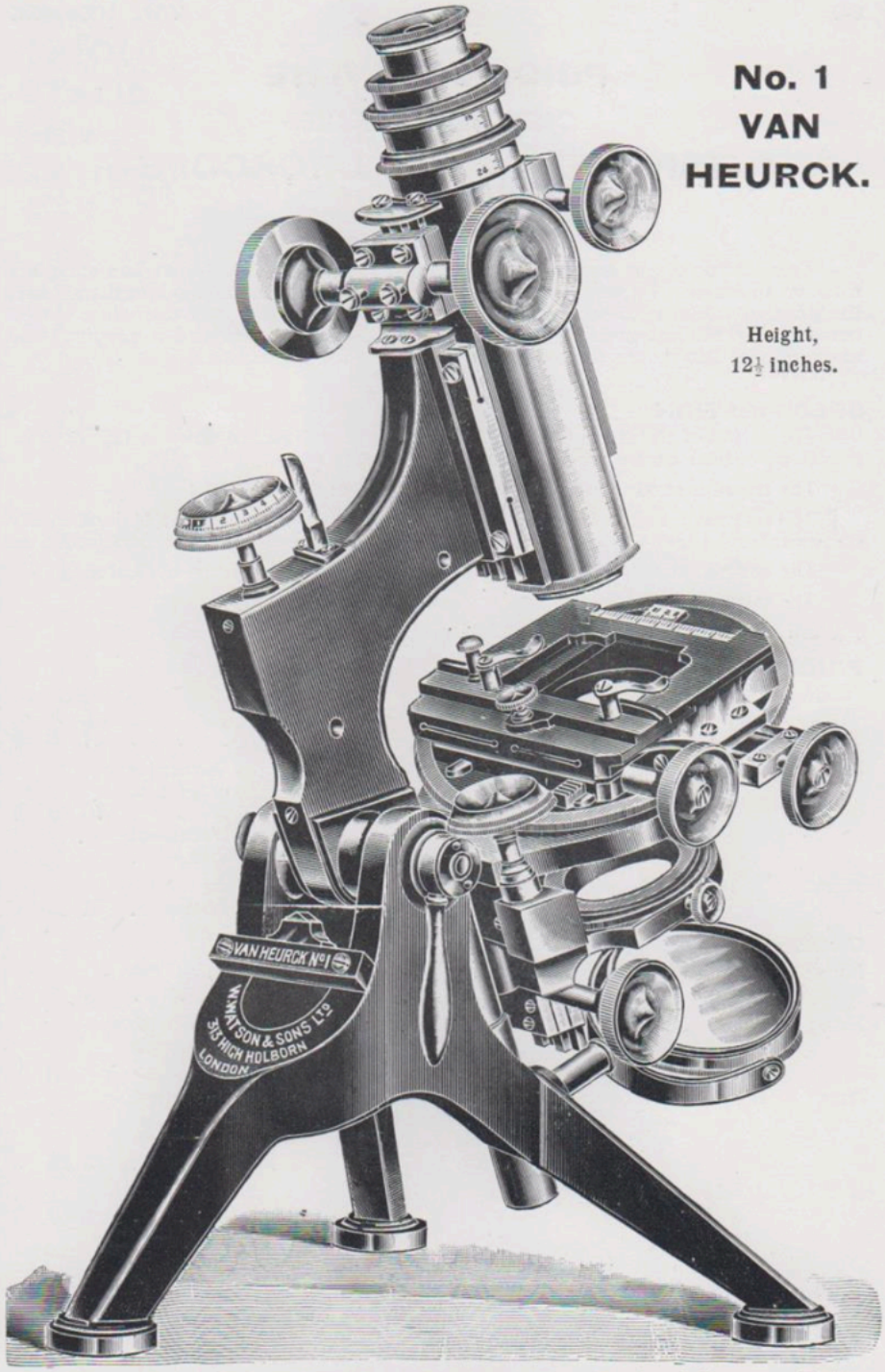
As the Bell-Glass Cover has to be packed separately, the expense of so doing will be charged at cost, and the risk of breakage in transit must be borne by the purchaser.

The extra fittings and accessories to the No. 1 are identical with those to the Circuit Stage, for which see page 82.

For "Sets," see page 87.

No. 1 VAN HEURCK.

Height, 12½ inches.



The Fine Adjustment to Substage and divisions to movements of Stage are Extras.

W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.

PRICES OF THE
CIRCUIT STAGE
VAN HEURCK MICROSCOPE

This Microscope is generally similar in design to the No. 1, but has complete rotation to stage. To secure this the bracket carrying the stage is lengthened and the limb is extended to correspond; this makes the height to centre when placed horizontal somewhat greater. The Instrument is of full size, and is proportioned in every detail to secure the maximum stability and effectiveness.

SPECIFICATION

The **height** of the stand when placed vertically and racked down is 12½ in. The height to optical centre when horizontal is 9¾ in.

The **tripod** is shod with cork and has a spread of 7¾ in.

The **stage** is 5 inches in diameter, and has a range of movement 1½ inch in the horizontal and 1 inch in the vertical directions. It has complete concentric rotation.

The **compound substage** is arranged to be lifted aside from the optical axis.

The **mirrors** are plane and concave, and 2⅜ in. diameter.

All fittings are of Standard (R. M. Society's) gauge.

PRICES

Code Word.	No.		Prices. £ s. d.
Minno	B 3322	Microscope, Stand only	67 10 0
Mim	B 3323	Microscope, as described above, but with Binocular instead of Monocular body and tubes to adjust to width of user's eyes . . . . . (The length of the body of Binocular Instrument is about 9 in., the draw-tubes racking out to 10 in.) .	76 10 0
Minut	B 3324	Microscope, as described above, having both Monocular and Binocular interchangeable bodies .	81 10 0

CASES

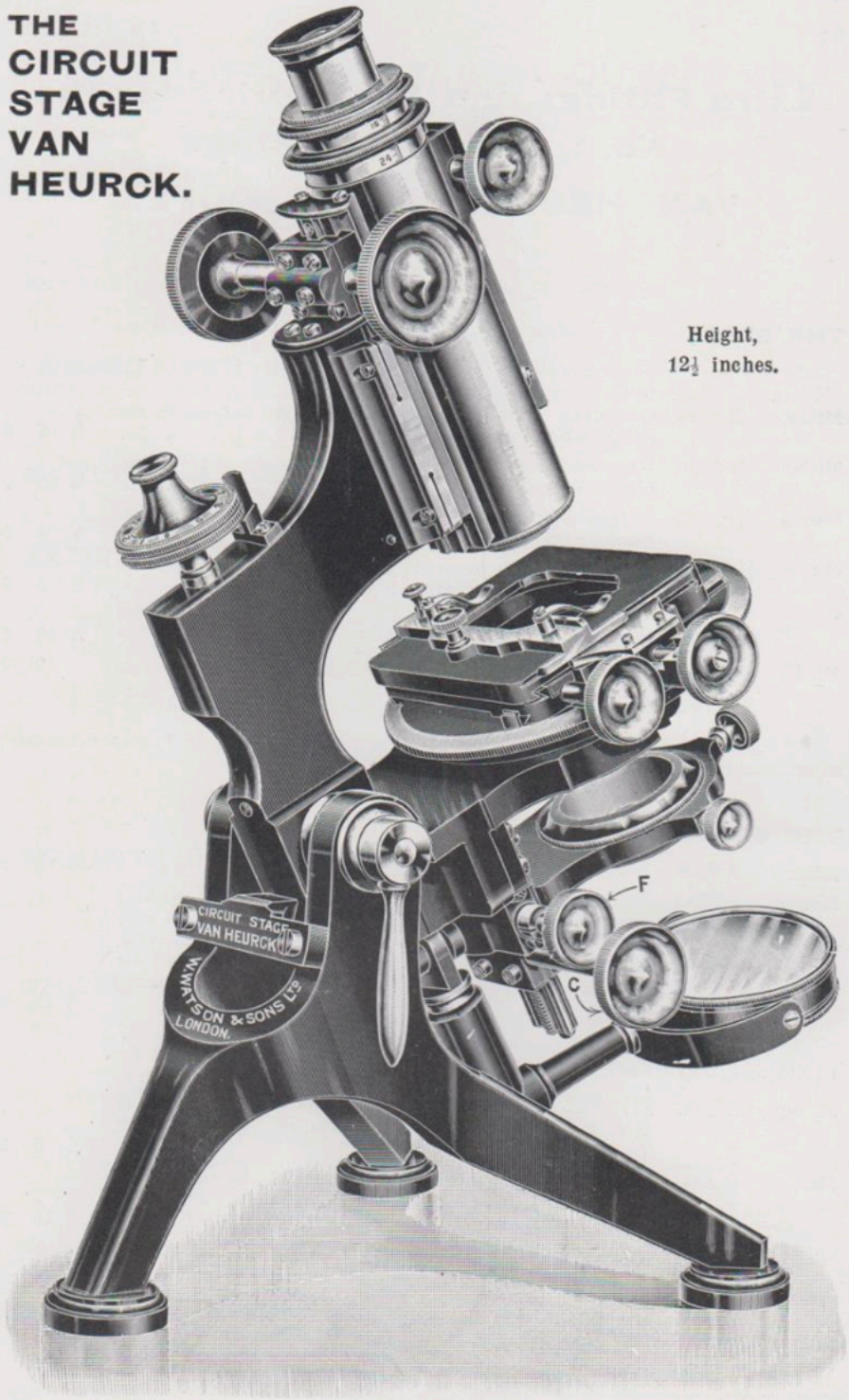
Minx	B 3325	Mahogany Cabinet to contain instrument and apparatus	5 5 0
Mirag	B 3326	Mahogany Cabinet of superior construction, with cupboard door to exclude dust, and drawers to contain apparatus	7 15 0
Mire	B 3327	Mahogany Cabinet with cupboard door to exclude dust, and inside a flat mahogany case to contain various apparatus. Of handsome design and best construction	13 10 0
Misad	B 3328	Bell-Glass Cover on polished ebonized base for Van Heurck microscope	1 10 0

As the bell-glass cover has to be packed separately, the expense of so doing will be charged at cost, and the risk of breakage in transit must be borne by the purchaser.

For extra fittings to the Circuit Stage Van Heurck, see page 82.

For " Sets," see page 87.

THE CIRCUIT STAGE VAN HEURCK.



Height,
12½ inches.

Extra Fittings and Accessories for the No. 1, and Circuit Stage VAN HEURCK MICROSCOPES.

THE STAGE

Code Word.	No.		Prices £ s. d.
Misap	B 3335	Centering screws to Stage, and clamp screws to fix Stage when centred	8 10 0
Misbe	B 3336	Rackwork rotation to Stage, with means of throwing pinion in and out of gear	5 10 0
Misca	B 3337	* Divisions to circumference of Stage to degrees, reading by verniers to five minutes	3 3 0
Misch	B 3338	* Divisions to movements of Stage, reading by verniers to $^1/_{10}$th of a millimetre	3 5 0
Misci	B 3339	* Plate to fit in dovetailed grooves to cover surface of Stage, for rough work	2 10 0
Misda	B 3340	* Screw to clamp rotation of Stage	10 0

This last-named is not required when rackwork rotation is taken.

* These items can be conveniently fitted to the Microscope at a small extra cost after manufacture.

THE SUBSTAGE

			£ s. d.
Miser	B 3341	Rackwork rotation to Substage	4 15 0
Misla	B 3342	Substage mounted on bar, sliding in extra dovetailed fittings, so that the Substage may be set in any desired position, irrespective of the rackwork, which operates independently, thus allowing the use of every variety of Substage apparatus. With clamp screw	4 15 0

FINE ADJUSTMENT TO SUBSTAGE.

Misog	B 3342	(1) With milled head to work above the surface of the Stage as shown on page 76, and on the Microscope, page 79	5 0 0
Mist	B 3344	(2) To work in same manner, but with the controlling milled head placed as shown at " F " on the Circuit Stage Microscope, illustrated on page 81 . . .	3 15 0

For complete list of objectives, eyepieces, condensers, etc., see page 45 onwards.

Complete outfits suitable for high-class work and including the Circuit Stage Microscope are detailed on pages 83 and 87.

COMPLETE RESEARCH OUTFIT 400.

		£ s. d.
The Circuit Stage Van Heurck Microscope Stand, on Tripod foot, as illustrated, page 81		67 10 0
Fine Adjustment to Substage, as shown at F, page 81	£3 15 0	
Divisions to Stage, reading to $\frac{1}{10}$ millimetre	3 5 0	
Plate to cover Stage for rough work	2 10 0	
Centering Screws to Rotation of Stage	8 10 0	
Rackwork Rotation to Stage	5 10 0	
Dividing Rotation of Stage	3 3 0	
Best Mahogany Case to contain Instrument and Apparatus	7 15 0	
		34 8 0
Extra Binocular Body to interchange with the Monocular		14 0 0

***OBJECTIVES** (see page 49), Watson's Holoscopic Series

25 m/m., **£5 5 0**, 12 m/m. ·65 N.A., **£6 15 0**, 4 m/m. 0·85	7 10 0	19 10 0
2 m/m. Homogeneous Immersion, 1·37 N.A.		12 0 0
2 in., **£3 0 0**; 3 in., **£3 0 0**		6 0 0

EYEPIECES, Holoscopic Series—

Magnifying powers 5, 7, 10 and 14 diameters	12 0 0
Extra, to make pairs for Binocular, 1 each, 5 and 7 diameters	6 0 0

ACCESSORIES.

Parachromatic Condenser 1·0 N.A. with Iris diaphragm and set of stops for darkground and oblique illumination,	7 0 0
Abbe Model Illuminator (1·2 N.A.), No. 3150 and set of stops	3 10 0
Ramsden Screw Micrometer Eyepiece, 3600, **£7 15 0**; Stage Micrometer, 3606, **7/6**	8 2 6
Polariser, large size, 3742, and Analyser	3 2 6
Dust-proof Triple Nosepiece or Objective Changer	1 5 0
2 Live Boxes, 3537, **17/6**; and 3545, **£1 0 0**	1 17 6
Lamp, 3525, and Case, 3527	2 10 0
Bull's-Eye Stand Condenser, 3472	1 7 6
Set of 12 Test Objects (see Object Catalogue)	1 15 0
Abbe Pattern Camera Lucida, 3450	4 5 0

MOUNTING APPARATUS.

Pine Cabinet of Mounting Apparatus, 3663	6 15 0
" Universal " Dissecting Microscope with two Aplanatic Magnifiers	7 15 0
Cathcart-Darlaston Microtome for Embedding and Freezing, 3635	4 7 6
Section Razor	3 6

PHOTO-MICROGRAPHIC APPARATUS.

Laboratory Camera (see separate list part 5)	37 10 0	
2 Inner Frames, fitting Microscope and supplying connecting Flanges	2 12 0	
		40 2 0
Watson-Conrady Condenser on Stand with Centering screws and Iris diaphragm		11 10 0
Focussing Glass **16/6**, and Projection Eyepiece **£2 10 0**		3 6 6
Trough on Stand, to contain Light and Heat Absorbing Media, No. 3562		4 0 0
Chemicals for Development, etc., in case		4 10 0

All the necessaries for Photo-Micrography with Oil Light are included above.

Complete Cabinets of Choice Microscope Objects (see page 129).

Code word for above outfit—Mime.

* Apochromatic Objectives, as per page 47, may be substituted for above if desired.

VAN HEURCK GRAND MODEL MICROSCOPE

This Model has been altered in several respects in order that the demand for a long range of Mechanical Stage movement with complete rotation at any position may be met. The stage now has 2 inches of horizontal traverse and is fitted with movable object clips and removable spring bar clips. It will be readily seen that the shape of the limb gives great freedom to the stage surface, and incidentally acts as a convenient handle.

This is the largest and most completely fitted of the three Van Heurck Stands. It is especially recommended to those who require a full-sized instrument of highest grade for the most critical work.

SPECIFICATION.

The **height** of the stand, when placed vertically and racked down, is 14 in. The height to optical centre, when the stand is horizontal, is 10 in.

The **tripod** is shod with cork and has a spread of $9\frac{3}{4}$ in.

The **stage** is capable of complete rotation, and has a range of 2 inches in the horizontal and about $1\frac{1}{4}$ in. in the vertical directions. The milled heads work on one centre, and, if desired, can both be rotated simultaneously, affording a diagonal movement. The diameter of the stage is 5 in. It has complete concentric rotation. The object is gripped by double sliding bars. Ordinary Object clips are also supplied, but are removable. The Instrument may be fitted with a less expensive pattern of stage as quoted below, if desired.

The Fine Adjustment may be either our Standard horizontal lever or our vertical lever with operating milled heads at sides of limb, as illustrated, without difference in price.

The **compound substage** is arranged to be lifted aside from the optical axis and is fitted with a fine adjustment.

The **mirrors** are plane and concave, and are $2\frac{3}{4}$ in. diameter.

All fittings are of R.M.S. standard gauge.

The instrument is accurately balanced and remains firm and rigid in any position, and is therefore especially recommended for photo-micrographic, analytical, and general high-class work.

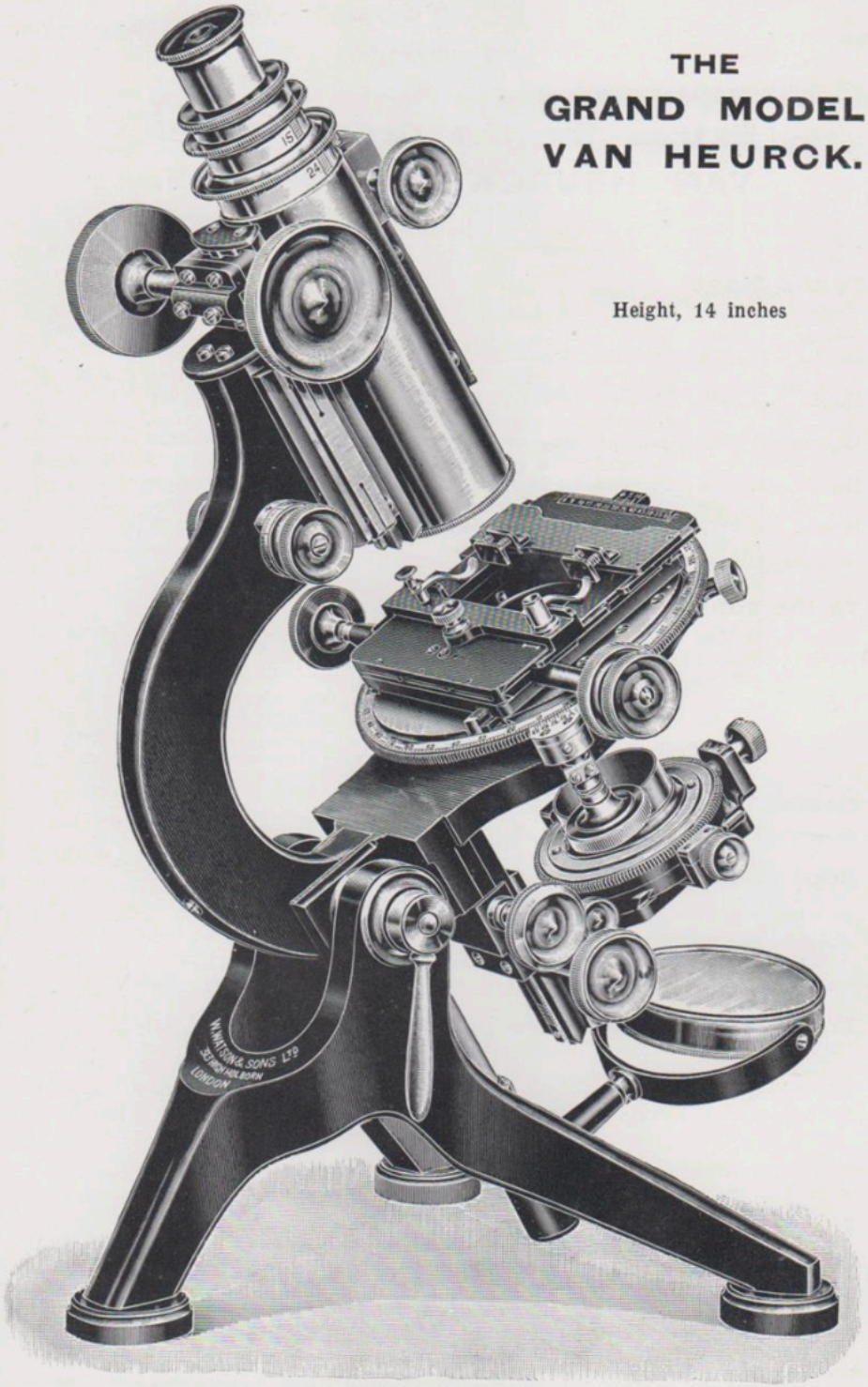
The construction has been detailed on pages 74 and 77.

Code Word.	No.	PRICES	£	s.	d.
Moil	B 3363	Grand Model Microscope Stand, as described . .	100	0	0
Moist	B 3364	Microscope, as described above, but with stage as fitted to the " No. 1 " Model (page 79)	90	0	0
Mola	B 3365	Microscope, as above, B 3363, but with Binocular instead of Monocular Body and tubes to adjust to width of user's eyes . . . . . (The length of the Binocular Body is about 9 in., the draw-tubes racking out to 10 in.)	109	0	0
Molt	B 3366	Microscope, as above, with both Monocular and Binocular interchangeable bodies . . . . . (When two bodies are supplied they are planed together, that they may correspond exactly; we recommend, however, that centering movements be fitted to the stage, so that the latter may rotate quite concentrically with either body).	114	0	0
		PRESENTATION FORM.			
Mome	B 3367	" Grand Model " Van Heurck Microscope, on Tripod foot, fitted with centering screws to Stage, and clamp screws to fix centred Stage, Rackwork rotation to stage, with means of throwing pinion in and out of gear. Rotation of Stage divided to degrees, reading by verniers to five minutes. Divisions to movements of Stage, reading by verniers to one-tenth of a millimetre. Rackwork rotation to Substage. Finished **throughout in bright polished lacquered brass** in the very best manner. Stand only	150	0	0

For extra fittings to the " Grand Model," see page 86.

THE GRAND MODEL VAN HEURCK.

Height, 14 inches



Extras for the Grand Model VAN HEURCK MICROSCOPE.

To the Stage

Code Word.	No.		Prices. £ s. d.
Monad	B 3375	Centering Screws to Stage, and Clamp Screws to fix Stage when centred	8 10 0
Monk	B 3376	Rackwork rotation to Stage, with means of throwing pinion in and out of gear	5 10 0
Monom	B 3377	Circumference of Stage divided to degrees, reading by verniers to five minutes	3 3 0
Month	B 3378	Divisions to movements of Stage, reading by verniers to one-tenth of a millimetre	3 5 0
Mood	B 3379	Plate to fit in dovetailed grooves to cover surface of Stage, for rough work	2 10 0

To the Substage

Moral	B 3380	Rackwork rotation to Substage	4 15 0
Morb	B 3381	Substage mounted on bar, sliding in extra dovetailed fittings, so that the Substage may be set in any desired position, irrespective of the rackwork, which operates independently, thus allowing the use of every variety of Substage apparatus. With clamp screw	4 15 0

CABINETS

Moros	B 3382	Mahogany Cabinet to contain Instrument and Apparatus	5 15 0
Morph	B 3383	Mahogany Cabinet, superior construction, with cupboard door to exclude dust, and drawers to contain apparatus	9 0 0
Morse	B 3384	Mahogany Cabinet, with cupboard door to exclude dust, and having fitted inside a flat mahogany case to contain apparatus. Of handsome design and best construction	15 10 0
Morta	B 3385	Bell-Glass Cover on polished ebonised base, for Van Heurck Microscope	1 15 0

As the Bell-Glass Cover has to be packed separately, the expense of so doing will be charged at cost, and the risk of breakage in transit must be borne by the purchaser.

For list of objectives, eyepieces, condensers, etc., see page 45 onwards.

A suggestion for a complete high-class outfit is given on page 83. We are at all times glad to assist and advise intending purchasers, and to arrange special outfits for various classes of research. Customers are invited to examine our models before purchasing, as it is only by critical inspection that the superiority of our instruments can be fully appreciated.

COMPLETE
VAN HEURCK MICROSCOPES,

consisting of Microscope, Stand and Accessories as below. Complete in Mahogany Cabinet with lock and key.

Microscope—	No. 1 Page 79.	Circuit Stage Page 81.	Grand Model. Page 85.
	£ s. d.	£ s. d.	£ s. d.
Code Word. No.			
Mite Set B 3350. **With Parachromatic Objectives.** Two Parachromatic Objectives—1/6 in., ·80 N.A., and choice of 1 in., 2/3 in. or 1/2 in. Two Eyepieces, large capped pattern. Abbe Illuminator, No. 3150. Mahogany Cabinet . .	76 17 6	83 2 6	116 2 6
Mix Set B 3351. Same as Set B 3350, but with the addition of dust-proof triple nosepiece and 1/12 in. Oil Immersion Objective	85 12 6	91 17 6	124 17 6
Mizen Set B 3352. **With Holoscopic Objectives.** Two Holoscopic Objectives—25 m/m. (1 in.) and 4 m/m. (1/6 in.) Two Eyepieces, Holoscopic, capped pattern. Universal Condenser, No. 3136. Complete in Mahogany Cabinet	92 5 0	98 10 0	131 10 0
Moan Set B 3353. Same as Set B 3352 but with the addition of 2 m/m. (1/12 in.), 1·37 N.A. Oil Immersion Objective, Holoscopic Series and dust-proof triple Nosepiece, complete in **best** Mahogany Cabinet, with drawers for apparatus	107 15 0	116 10 0	150 5 0
Mob Set B 3354. **With Apochromatic Objectives.** Two Apochromatic Objectives, 16 m/m. (2/3 in.) and 4 m/m. (1/6 in.). Two Eyepieces, Holoscopic capped pattern. Universal Condenser, No. 3136. Complete in Mahogany Cabinet	95 10 0	101 15 0	134 15 0
Mock Set B 3355. Same as Set B 3354, but with the addition of 2 m/m. (1/2 in.) Oil Immersion, Apochromatic Series, Dust-proof triple Nosepiece. Oil Immersion Holoscopic Condenser, No. 3141, to replace the Universal Condenser, complete in best Mahogany Cabinet with drawers for apparatus	119 0 0	125 10 6	159 5 6
Mode Set B 3356. **For Amateurs' Use.** Binocular and Monocular bodies to interchange. Five Holoscopic Objectives—50 m/m., 75 m/m., 25 m/m., 12 m/m., ·65 N.A., 4 m/m. Holoscopic Eyepieces—1 pair, ×7, one only × 10. Universal Condenser, No. 3136, with set of Stops for dark ground and oblique illumination Bull's-Eye Stand Condenser, 3472. Rousselet's Live Cage, 3537, and Compressor, 3536. Stage Forceps, 3786. Complete in **best** Mahogany Cabinet	129 12 0	136 2 0	170 15 0

The above sets are suggestive and may be varied at the differences in the Catalogue prices. Extras, such as Divisions to movements of Stage, additional Mechanical Screws, etc., etc., can be added at the respective prices given with each Instrument.

Code Word. If the No. 1 Microscope is required, use the Code Word only: if either of the other Instruments is selected, add "Circuit" or "Grand" to the Code Word, as the case may be.

BINOCULAR MICROSCOPES.

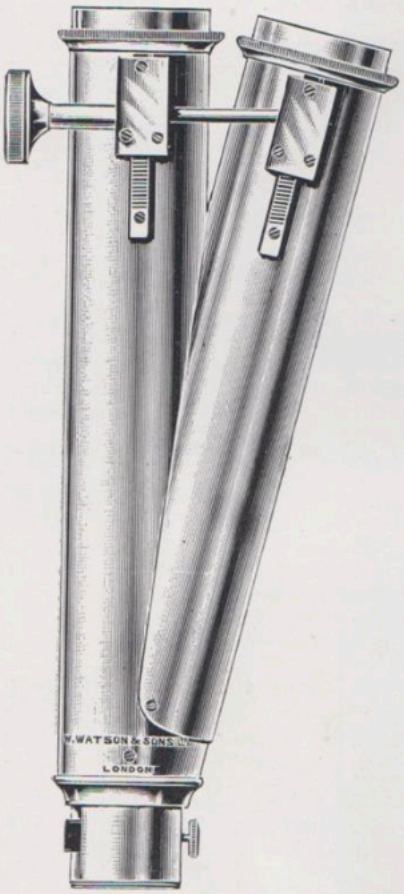


Fig. 22. Binocular Body for Microscope.

The Watson-Wenham Stereoscopic System.

The prices for binocular bodies for the various instruments will be found in the list, either separately to interchange with the monocular body, or for the stands with binocular body only.

The Binocular Microscope offers many advantages and conveniences, especially to the amateur. Very few specimens that are examined with low powers are thin and flat and it is difficult to form a correct idea of shape and structure with the Monocular instrument. Examined with the Binocular, the several planes of a globular or irregularly shaped object stand out in wonderful stereoscopic clearness, giving a new beauty and charm, with better understanding of the subjects observed, together with the increase in comfort from employing both eyes. The effect with pond life subjects is most striking. Its many advantages are frequently overlooked. It cannot be advantageously used with objectives having a numerical aperture over ·34, but by sliding out the binocular prism when high-power objectives are used, the light passes directly up the straight or monocular tube alone, and no depreciation is suffered.

A rackwork is provided to the draw-tubes so that the inter-ocular centres may be altered as required.

The advantages yielded by the Wenham Binocular over other Binoculars are—

It can be used as Stereoscopic Binocular.

It can be used us Monocular without sacrifice of efficiency in comparison with the usual Monocular Instrument.

Has adjustment to width of eyes.

Can be readily interchanged with Monocular body if desired.

WATSON GREENOUGH BINOCULAR DISSECTING MICROSCOPE.

For use with Low Power Objectives, up to 25m/m

This instrument consists of two Microscopes placed side by side, and by the incorporation of a Porro Prism Erecting system to which the two bodies are attached, the object is viewed in an erect position, and with a true stereoscopic effect. The Prism boxes are provided with a lateral motion, giving sufficient latitude to accommodate any pupillary width. A very long range of coarse adjustment is provided, to allow of the examination of thick objects.

Two Objectives, accurately paired and adjusted, are necessary for each Microscope and are all mounted in such a manner as to be par-focal, and interchangeable in a dove-tailed slide.

A fine adjustment is not provided with this instrument owing to the low magnifications with which it is used. A large stage is provided with a diaphragm below, giving black and white backgrounds.

The mirror box, containing plane and concave mirrors, is mounted upon a swinging arm giving universal motions.

The Watson Greenough Binocular Microscope is made in two patterns in order to meet the varied requirements of the users of this popular Microscope.

Pattern 1 is in the original form, the upper part of which is removable from the stage and base by releasing two thumb-screws; it can then be attached to the metal fork. In its completed form it is as shown in Fig. 3395, page 90. In Fig. 3395a on the same page it is shown arranged with a metal fork only.

Pattern 2 is illustrated on page 91, Fig. 3398, and combines in itself the conveniences of Pattern 1, and practically obviates the inconvenience which is caused by having the metal bar to which the rackwork is attached in close proximity to the Objectives.

The upright pillar of the foot is rectangular in shape. The whole of the upper part of the Microscope can be raised or lowered on the pillar, and fixed in any desired position.

For this purpose a strongly built frame, which fits the pillar, is attached to the lower part of the limb of the Microscope, and a clamping screw "C" on this frame fixes the Microscope where required.

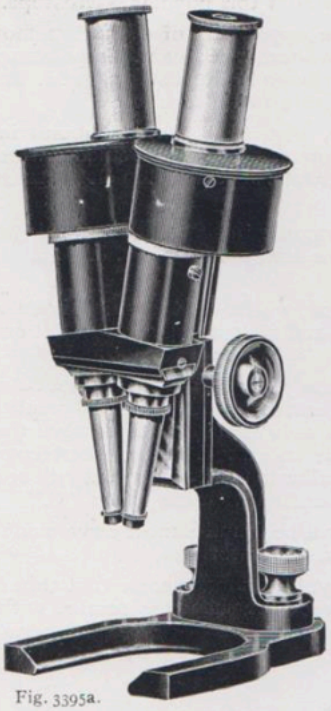
When the Stage is used the Microscope with the rackwork motion and fittings are set at the top of the foot pillar. When, however, the same result is required as when the metal fork only is used, it is only necessary to remove the Stage by releasing a metal button "A" and slide the whole of the Microscope with the rackwork adjustment, etc., down the foot pillar to the height which will be convenient for working the Objectives and fixing in position with the screw "C."

This can be so quickly done that it will be found a most convenient method of arranging this Microscope for different classes of work.

The foot is unusually large and steady, but is made somewhat thin and shaped in the inner portion so as to give the convenience that is associated with the metal fork.

WATSON GREENOUGH BINOCULAR MICROSCOPE.

Fig. 3395.



WATSON GREENOUGH MICROSCOPE WITH METAL FORK ONLY.

Fig. 3395a.

WATSON GREENOUGH BINOCULAR MICROSCOPE (Pattern 2).

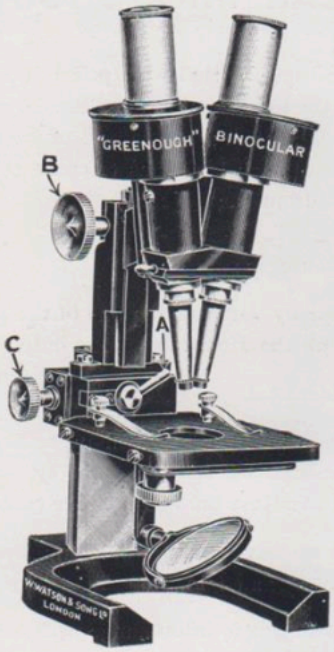


Fig. 3398.

Microscope fittings clamped in position for using the stage, at upper end of pillar.

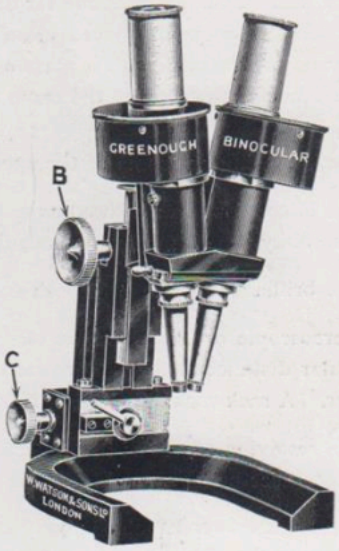


Fig. 3398a.

Microscope fittings clamped to lower end of pillar, stage removed.

"A"—Clamping nut for stage. "B"—Coarse adjustment milled head.
"C"—Clamp of fitting for raising and lowering.

PRICES.

Code Word.	No.		Prices. £ s. d.
Mosel	B3395	Watson Greenough Pattern 1 Binocular Microscope, as described on page 89, and illustrated on page 90, with mahogany arm rests, complete in stout wooden case, with carrying handle	17 10 0
Moslet	B3398	Watson Greenough Pattern 2 Binocular Microscope, as described on page 89, and illustrated above, with mahogany arm rests, complete in stout wooden case, with carrying handle	20 0 0
Mote	B3396	Eyepieces 1, 2, 3 and 4 ... ... per pair	1 0 0
Motive	B3397	Eyepieces 5 and 6 ... ... per pair	1 10 0
Mould	B3400	Objectives, dry, 54 mm., 45 mm., 37 mm., 27 mm., per pair, either power	4 0 0
Moun	B3401	Flankton Searcher Objectives, 22 mm., water immersion ... ... per pair	5 0 0
		Pattern 1 can be supplied without case, and with metal fork only for laboratory dissecting purposes	

WATSON'S
HIGH POWER BINOCULAR MICROSCOPE.

The Watson High Power Binocular Microscope is fitted with prisms based on a system first employed by Abbe for dividing the light coming from the Objective, the dividing prism being placed close to the Objective; the lateral or binocular body prism is provided with a glass extension of such length as to cause the two separated beams to focus at the same distance from the Objective.

The following are some of the special advantages:—

The Microscope can be used as a Monocular by withdrawing one of the prisms from the body; the light then passes directly up the Monocular Body only.

The brilliance of image in both tubes is identical.

Stereoscopic or Pseudoscopic effects may be produced at will by setting the interocular distance slightly narrower or wider than the centres of the eyes of the observer. A rackwork adjustment is provided to adjust the width of eye centres.

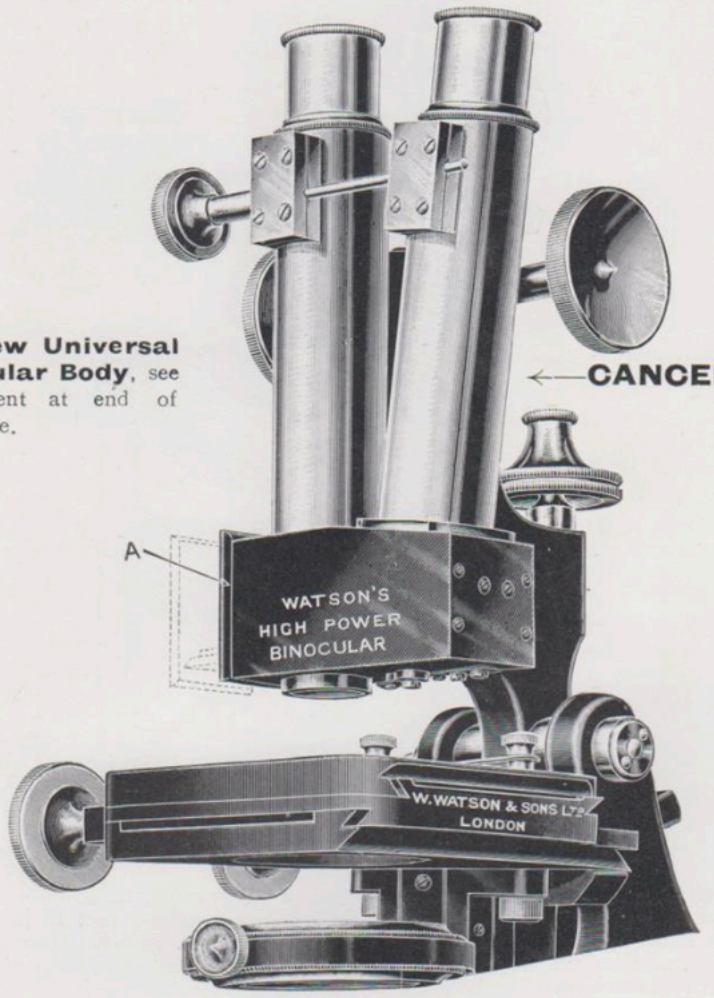
The resolving power of the Objective is in no way impaired or diminished, the binocular effect being available for all Objectives from 1 in. to $\frac{1}{12}$ in.

The High Power Binocular body can be arranged to interchange with a Monocular body in the same fittings, so that either can be used as required.

Code Word.	No.		Prices. £ s. d.
Pseudo	3850	Watson High Power Binocular Body, as illustrated on page 93, and described above, fitted to the "Service," "Edinburgh Student's," "Research" or "Bactil" Microscope in place of the ordinary Monocular Body ...	20 0 0
Pseumic	3851	Watson High Power Binocular Body, fitted to the "Royal" or "Van Heurck" Microscope in place of the Body, with Rackwork draw-tube	17 10 0
Pseubin	3852	Watson High Power Binocular Body supplied in addition to the ordinary Monocular Body with any of the above Microscopes to interchange with the ordinary Monocular Body	23 10 0
		The High Power Body can be fitted to Microscopes by other makers that have bodies of not less than $1\frac{1}{2}$ in. diameter.	
Pseular	3853	Students' Eyepieces for the above Binocular Body per pair	1 0 0

WATSON'S
HIGH POWER BINOCULAR MICROSCOPE.

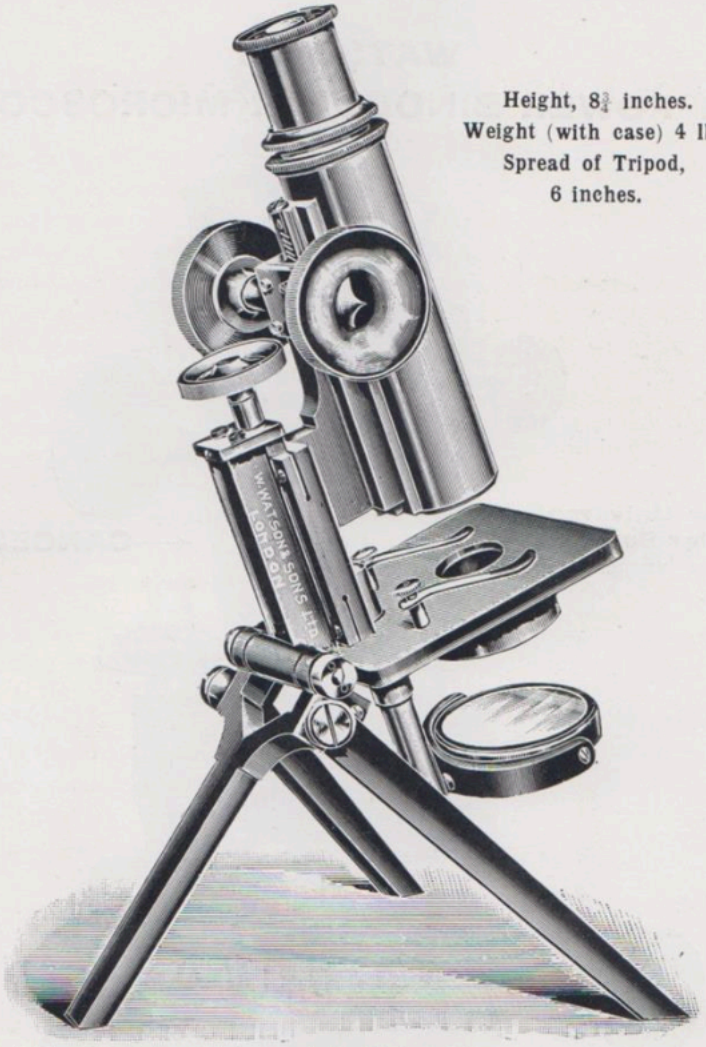
For New Universal Binocular Body, see Supplement at end of Catalogue.



←—**CANCELLED**

When the prism is withdrawn as shown at "A" the light passes uninterruptedly up the monocular tube only.

THE "CLUB" PORTABLE MICROSCOPE.



Height, 8¾ inches.
Weight (with case) 4 lbs.
Spread of Tripod,
6 inches.

A rigid, compact, and thoroughly efficient Microscope, sufficiently strong to bear constant travelling. It does not necessitate taking any part to pieces; the legs fold backwards against the limb; the mirror tailpiece pushes upwards through the Stage, and the whole packs completely in a stiff leather case, measuring about $7\frac{1}{2} \times 4\frac{1}{2} \times 3\frac{1}{2}$ inches, with space for Eyepieces and Objectives.

The Coarse Adjustment is of Standard pattern, and enables a 3-in. Objective to be focussed. The Fine Adjustment is a direct-acting one with Micrometer Screw.

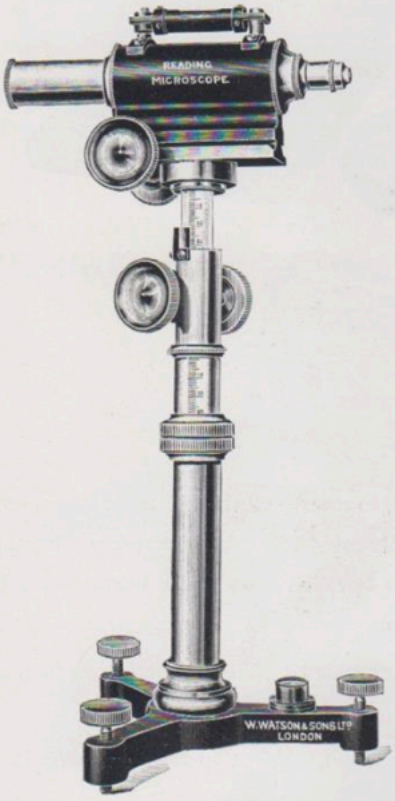
The Mirrors are Plane and Concave.

The Body, which is fitted with draw-tube, carries Eyepieces of Student's size.

It is a thoroughly practical and efficient microscope, suitable for high-power work, and carries apparatus of Universal size, so that the accessories of larger instruments can be used with it.

Code Word.	No.		Price. £ s. d.
Mosac	B 3854	Stand only, as figured, in Stiff Leather Case . .	12 10 0

HORIZONTAL OR READING MICROSCOPE.



This consists of a Microscope Body, of large diameter, fitted with an Eyepiece, having in it a micrometer scale, and at the other end, a 2-inch Objective.

This Microscope Body is focussed in the same manner as a Telescope by means of rack and pinion. It is surmounted by a sensitive bubble for levelling purposes.

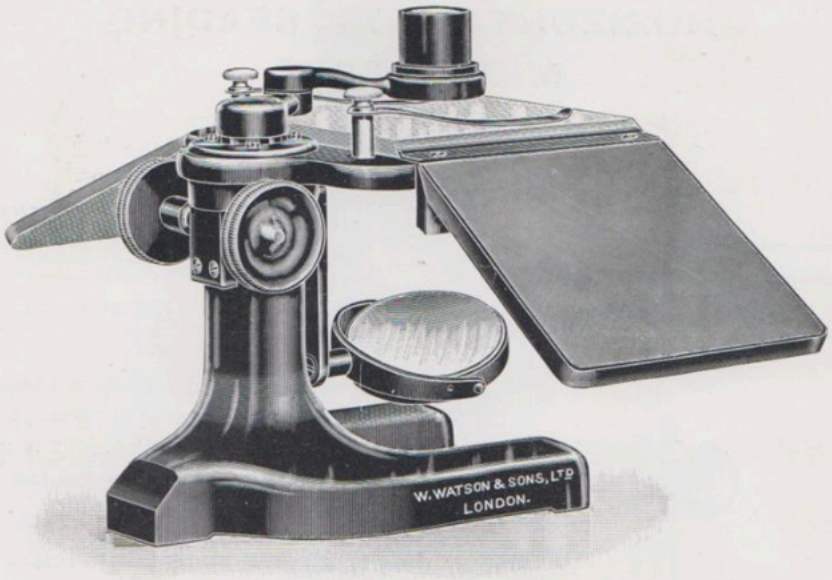
The adjustment for height is made by rack and pinion, of very strong construction, divided into m/ms. and reading by a vernier, and there is in addition a divided Draw Tube which allows of additional adjustment in height; it is clamped by means of a strongly-fitted knurled ring.

The foot is a triangular one, with levelling screws and a spirit bubble for levelling.

The whole instrument is made in the same style, quality and finish as a Microscope.

Code Word.	No.	Price.
Motle	3855	£10 10 0

UNIVERSAL DISSECTING MICROSCOPE.



This instrument is made with jointed arm, to receive all the aplanatic Magnifiers mounted for dissection, listed on page 117. Mounted on a heavy horseshoe foot, the upright carries a large stage, provided with a bevelled glass plate, below which is mounted the Diaphragm.

A plane mirror and opal glass disc are provided to the mirror box, which is mounted independently of the pillar.

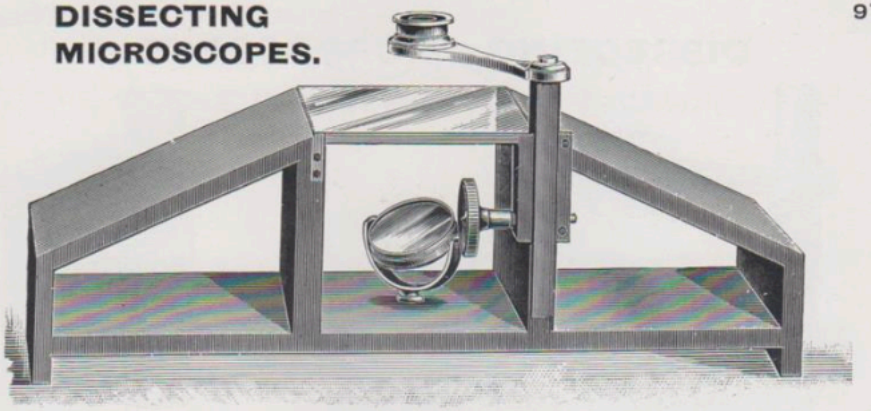
Focussing is by means of a rack and pinion adjustment to the Lens carrier.

Strong metal hand rests, removable at will, are provided.

It will be noticed that the arm carrying the Dissecting lens is jointed, so as to allow the comfortable examination of an object covering the whole area of the stage.

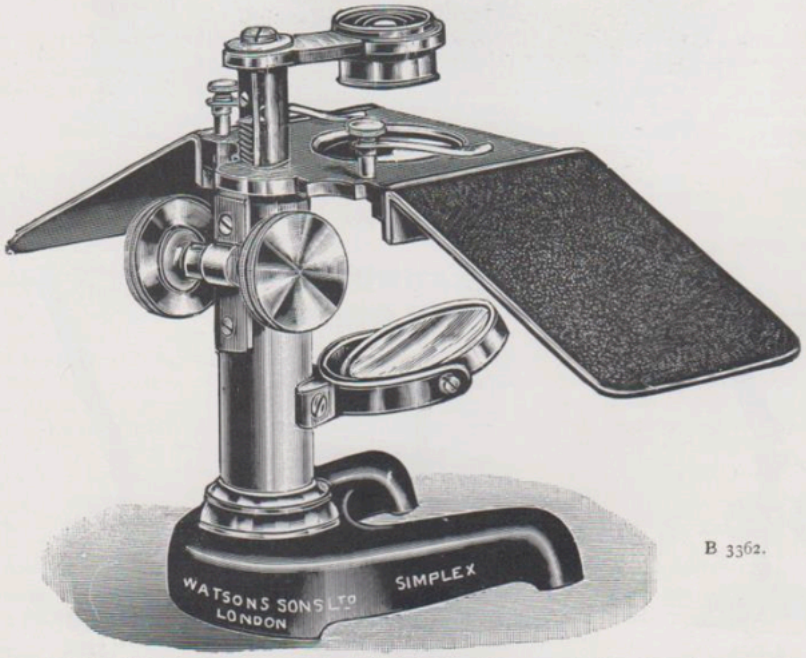
Code Word.	No.		Prices. £ s. d.
Move	B 3350	Universal Dissecting Microscope, without lenses ...	6 0 0
Mow	B 3351	Aplanatic Magnifiers ×6, ×10, ×15 or ×20 each	15 0

DISSECTING MICROSCOPES.



Code Word.	No.	"Laboratory." B 3360.	Price. £ s. d.
Muce	B 3360	This instrument is strongly made of mahogany. The sides slope at a convenient angle, affording support to the hands, the stage is of glass, 4½ in. square, and removable. Arm to carry lenses, having spiral rack and pinion adjustment of best quality, giving long range; mirror on gymbal. Complete with Aplanatic Magnifiers, Nos. 3570 and 3573, magnifying 10 and 20 diameters	3 15 0
Muda	B 3361	Ditto. ditto. without Lenses	3 0 0

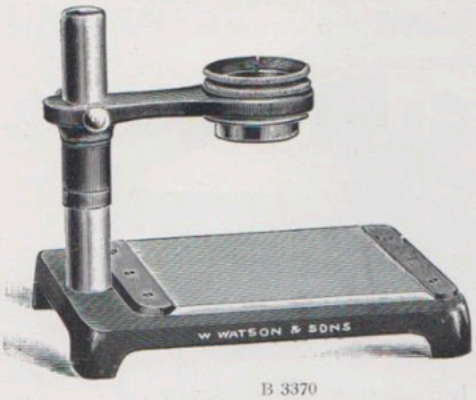
"SIMPLEX" DISSECTING MICROSCOPE.



B 3362.

			£ s. d.
Muff	B 3362	This Stand receives all the Aplanatic Magnifiers mounted for Dissecting, on page 117. For focussing, it is fitted with a rackwork and pinion adjustment. It is fitted with glass disc for Stage, plane mirror, and matt opal reflector, complete with hand rests	2 15 0
Mug	B 3363	The above Stand, fitted with simple lens magnifying 8 diameters. Excellent for botanical work	3 2 6
Mula	B 3364	The above Stand, with one Aplanatic Magnifier, selected from page 117 .	3 12 6
Multi	B 3365	The above Stand, with two Aplanatic Magnifiers, selected from page 117 .	4 10 0

DISSECTING MICROSCOPES.



B 3370

B 3372

Code Word.	No.		Price. £ s. d.
Mump	B 3370	This is a simple metal base, 4 × 3½ in., on which fits in grooves a piece of matt opal glass, 2¾ × 2¾ in. Rising from the base is a cylindrical rod on which slides an arm to carry an Aplanatic Magnifier. This forms a very useful Dissecting Microscope	10 6
Munch	B 3371	Single Lens Magnifier for ditto, magnification about 8 diameters . . .	7 6

PORRO-PRISM ERECTOR for Dissecting Microscopes.

This fits the Laboratory, Simplex and Universal Dissecting Microscopes and enables ordinary microscope objectives to be used instead of the usual dissecting type. Greater working distance with high powers is thereby afforded. Further, the image is seen erect instead of inverted and enables dissecting to be done with greater facility. We recommend the 1½ in., 1 in. and ⅝ in. objectives, which give magnifications 35, 50 and 80 diameters, and ample working distance.

PRICES

			£ s. d.		£ s. d.		£ s. d.
Murma	B 3372	Porro-Prism Erector with Ramsden Eyepiece.					3 10 0
		Objectives. Argus Series .	1½ in., 1 2 6	1 in., 1 2 6	⅝ in.,		1 2 6
		Parachromatic Series	1½ in., 1 12 6	1 in., 1 12 6	⅝ in.,		1 12 6

B 3374.

MAGNIFIER HOLDERS.

B 3373.

B 3375.

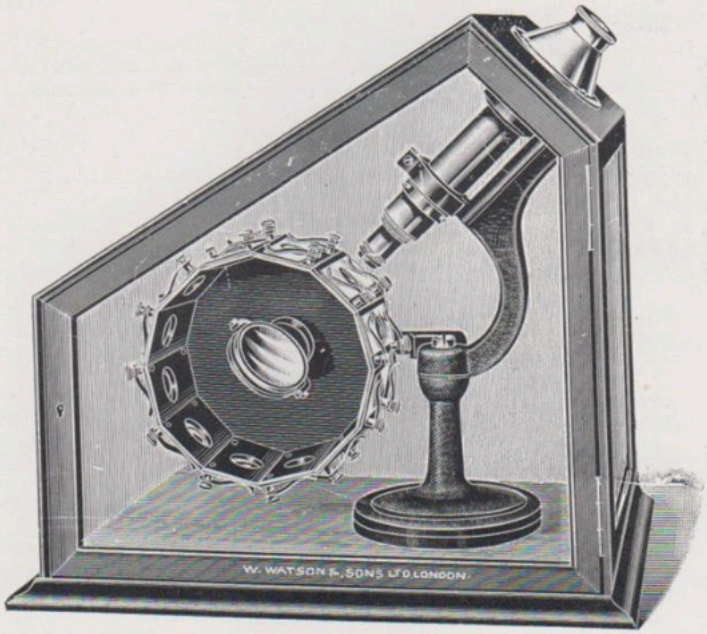
			£ s. d
Muse	B 3373	Magnifier Holder as figured, consisting of brass foot and upright rod, carrying a horizontal arm with fitting for lens. A clamp screw is provided to fix the lens at any desired height	17 6
Musha	B 3374	Magnifier Holder, with rackwork to focus, and two joints with clamps .	2 5 0
Music	B 3375	Magnifier Holder on firm base, with universal movements in ball joints .	1 5 0

Any of the Magnifiers in Dissecting Mounts quoted on page 117 will fit the above holders.

MUSEUM MICROSCOPE

THE WATERHOUSE PATTERN.

As supplied to the South Kensington and other Museums.



The Museum Microscope gives facilities to display a number of mounted microscopic objects in a museum or exhibition, where it is required to leave the instrument unattended, and at the same time prevent the injury of microscope and specimens. As here illustrated, it will be found thoroughly reliable and adequate in every way.

It consists of a dust-proof mahogany-framed glass case, in which the Microscope is fitted. The 3 × 1 in. objects, 12 in number, are placed upon a brass drum, which can be rotated from outside the case, a spring catch indicating when the object is centred. The Eyepiece of the Microscope projects outside the case, and fine focussing is effected by moving the eyepiece end in a spiral slot.

This new pattern combines advantages which past experience has suggested, and in addition to placing the observer in the most favourable position for examining, every part is securely fixed to prevent interference with any loose or easily-removed parts. The door is fitted with a lever lock.

Code Word.	No.		Price.
Musk	B 3380	**PRICE** complete, with one Eyepiece and 1½ in. Parachromatic Objective.	**£31 10 0**

Museum Microscope, No. 2 Pattern.

Museum Microscope, No. 2 pattern, is similar in general construction to the large Waterhouse pattern, but is arranged to carry only 5 mounted objects 3 × 1 in.

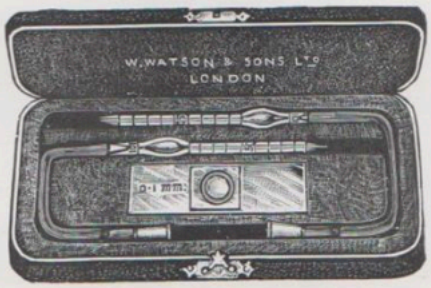
The focussing adjustment is by rack controlled from the outside right-hand of case. All the projecting milled heads, etc., are effectually protected against improper treatment. Owing to the smaller number of objects exhibited, this model is recommended where large numbers of visitors are to be provided for without undue waiting.

Muster	B 3381	**PRICE**, with Eyepiece and 1½ or 2 in. objective . .	**£27 10 0**

BLOOD TESTING APPARATUS.

Code Word	No.		Price. £ s. d.
Mute	B 3390	**EHRLICH'S EYEPIECE** with square diaphragm, for estimating the relative proportion of red and white blood corpuscles in dry preparations. With instructions	2 10 0
Myr	B 3391	Hæmacytometer (Dr. Gower's)	4 16 6
Mysto	B 3392	Hæmacytometer and Hæmaglobinometer (Dr. Gower's), both instruments in one case	6 12 6

THE THOMA HÆMACYTOMETER.



B 3393.

This apparatus consists of a counting chamber in combination with two accurately calibrated mixing pipettes for diluting the blood in a certain ratio (1 : 100 for red, 1 : 10 for white corpuscles), with directions, in case.

				£ s. d.
Myth	B 3393	Thoma Hæmacytometer, complete, with 2 Pipettes and covers		2 10 0
Pab	B 3394	Ditto,	Counting Chamber only .	1 7 6
Pace	B 3395	Ditto,	Counting Chamber with covers in case	1 12 6
Pacha	B 3396	Ditto,	Pipettes, each . . .	7 6
Pacif	B 3397	Ditto,	Covers, thick or thin, per pair .	3 0
Pack	B 3398	Glynn Helber Ditto, with ·02 Counting Chamber, complete		2 15 0
Pade	B 3399	Ditto,	Counting Chamber, only .	1 12 6
Pact	B 3400	Ditto,	Counting Chamber with covers in case	1 17 6
Pagan	B 3401	Ditto,	Pipettes and covers, as above	2 12 6
Page	B 3402	Hæmaglobinometer, Dr. Haldane's		2 17 6
Pail	B 3403	Hæmaglobinometer, Tallqvist's, book form . .		5 0
Paint	B 3404	Hæmometer, Sahli's		2 5 0

WORKS ON THE MICROSCOPE, Etc.

Code Word.	No.		Price. £ s. d.
Palas	B 3409	COLES, Dr. A. C. "Critical Microscopy" 1921. "How to get the best out of the Microscope"	7 6
Palet	B 3410	CROSS & MARTIN J. COLE. "Modern Microscopy," a handbook for beginners and students. New Edition —the fifth	10 6
Palin	B 3411	DALLINGER. "The Microscope and its Revelations" (Carpenter). The standard text-book on the microscope and its manipulation. Eighth edition, revised and partly rewritten. Edited by the Rev. W. H. Dallinger, LL.D., F.R.S., etc. 1136 pages, 817 illustrations, 23 plates, 8vo. cloth . . . nett	1 16 0
		Ditto, in two volumes :—	
Palm	B 3412	Vol. I.—"The Microscope and its Accessories"	1 0 0
Palsy	B 3413	Vol. II —"The Revelations of the Microscope"	1 0 0
Palstic	B 3435	DOWDY, "The Microscope—How to choose and use it."	5 6
Pam	B 3414	HALL. "How to use the Microscope." A guide for the novice	2 6
Pane	B 3415	SCALES. "Practical Microscopy." A handbook for beginners. Crown 8vo. Second Edition	7 6
Panel	B 3416	SPITTA, Dr. E. J. "Microscopy." Third edition, 1920, freely illustrated. Most explicit treatise (Postage 9d.)	1 5 0
Panfo	B 3436	WRIGHT, LEWIS. "The Microscope." Revised by Dr. A. Drew, new edition	5 0

MICROSCOPY, Etc.

Pang	B 3417	ASH, E. C. "Pond Life"	1 0
Panic	B 3418	BUTLER. "Pond Life Insects"	1 6
Paper	B 3419	COLE. "Diseases of the Blood"	10 6
Papis	B 3420	DANIEL. "Laboratory Studies in Tropical Medicine"	16 0
Par	B 3421	HATCH. "Text-book of Petrology." Sixth edition, 1910	7 6
Parag	B 3422	HOWE. "Iron, Steel and other Alloys"	1 10 0
Parch	B 3423	LEE. "The Microtomist's Vade Mecum." New Edition	1 8 0
Pardo	B 3424	MUIR & RITCHIE. "Manual of Bacteriology"	16 0
Parie	B 3425	OSMOND & STEAD. "Microscopic Analysis of Metals"	10 6
Park	B 3426	PRIMROSE. "Practical Metallography of Iron and Steel"	4 0
Parle	B 3427	RHODES. "Micro-Petrology for Beginners." 1912	3 0
Parod	B 3428	SAUVEUR. "The Metallography of Iron and Steel"	2 2 0
Parot	B 3429	SCHÄFER. "Elements of Histology"	14 0
Parse	B 3430	SQUIRE. "Methods and Formulæ for the Preparation of Tissues for Microscopical Examination"	3 6

PHOTO-MICROGRAPHY.

Pash	B 3432	BARNARD, J. E. "Practical Photo-Micrography," 1913. 310 pages, numerous illustrations and plates	New edition in preparation
Past	B 3433	HIND & RANDLES. "Handbook of Photo-Micrography." 292 pages, 44 plates comprising 8 three-colour and 85 half-tone reproductions of photo-micrographs and 71 illustrations. 1914	10 6
Pat	B 3434	WEST. "The Practical Principles of Plain Photo-Micrography," by George West. Lecturer in Botany, University College, Dundee. Sm. 4to. 145 pages. Illustrated. 1916	4 6

LANTERN SLIDES OF WATSON'S INSTRUMENTS.

Lantern Slides of any of our Instruments are lent by us FREE OF CHARGE for exhibiting at meetings of Scientific Societies, etc. or may be purchased for 1s. 6d. each.

CAMERA LUCIDAS.

The Abbe. No. B 3450.

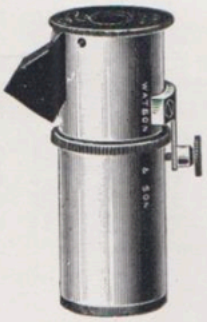
Beale's. B 3451.

The Abbe Pattern.

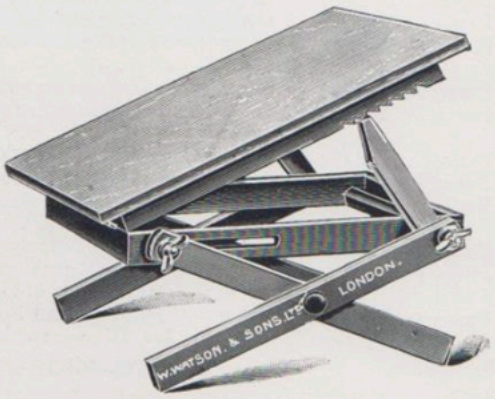
			£	s.	d.
Patha	B 3450	This is considered to be one of the best and most easily used camera lucidas. Instead of the image being traced by its projection on paper, the reverse is the case, the paper and pencil being projected into the field of view. The mirror reflects the paper on to the silvered surface of a prism placed over the Eye Lens of the Eyepiece of the Microscope, and it is thereby conveyed to the eye. When desired, the apparatus may be turned aside from the optical axis, as shown in the drawing. It can be used with the Microscope at any angle, the only necessity being that the paper on which the sketch is made should be in the same plane as the stage. Two neutral-tint shades are provided. Price in case	4	5	0
		NOTE.—That this may fit perfectly, the Eyepieces (if a capped one) and draw-tube should be sent to us to fit it. It works best with low-power eyepieces.			

Beale's.

Paus	B 3451	Beale's neutral-tint Reflector, as figured		8	9



No. B 3452.



No. B 3453.

Drawing Eyepiece. (As figured).

			£	s.	d.
Pave	B 3452	This is a combined Eyepiece and Camera Lucida, for use when the Microscope is inclined at an angle of 45°. The drawing paper and pencil point are reflected into the field by the prism attached to the Eye Lens, and tracings can be made with great precision, comfort and rapidity . With tinted glasses to regulate light, complete	2	0	0
		The Eyepiece with the above Camera Lucida fits the Student's size. If required of larger size, an adapter is supplied at an extra cost of . . .		7	6

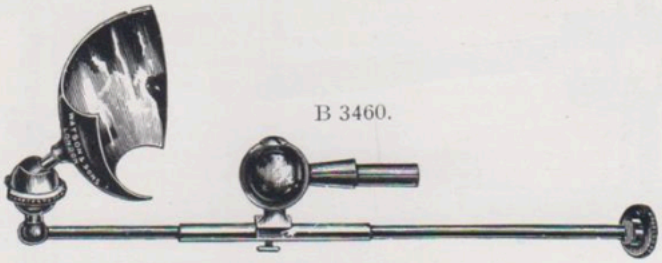
Drawing Table.

Pawn	B 3453	Inclines to any angle, thus obviating distortion of image. Size of table, 19×12 inches, as figured, and of best make	1	5	0

STAGE CONDENSERS, ETC.

SILVER PARABOLIC SIDE REFLECTOR.

Code Word.	No.		Price. £ s. d.
Pay	B 3460	This gives beautiful illumination for opaque objects, the light being thrown upon it by the Bull's-Eye Condenser and then reflected on the object. To attach to limb or stage of Microscope, with ball and socket joints, as figured	1 10 0



B 3460.

Pea	B 3461	Ditto, ditto, to attach to Nosepiece of Microscope .	1 12 6

NOSEPIECE IRIS DIAPHRAGM OR DAVIS'S SHUTTER.

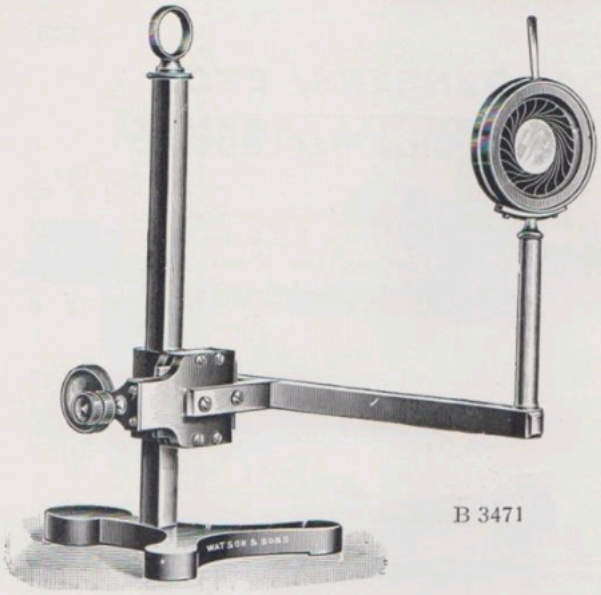
Peace	B 3462	The Iris Diaphragm gives a clear aperture equal in diameter to that of the back lens of any Objective, while the collar in which the leaves work is exceedingly compact. It is specially useful for moderating the Aperture of Objectives, for producing dark ground illumination, and for increasing penetration. So that the handle of the Iris Diaphragm may be readily set at the most convenient position, the collar to which it is attached is made to revolve very stiffly .	1 2 6

B 3462

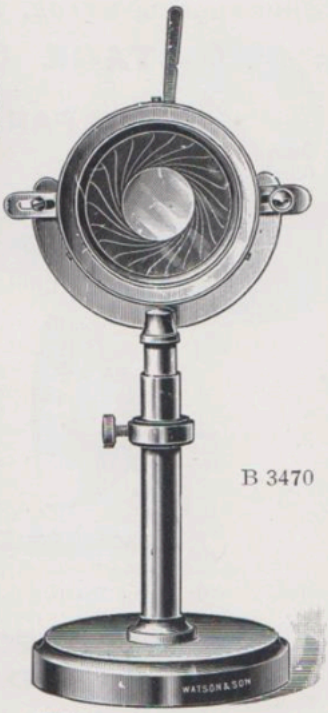
Peak	B 3463	Ditto, ditto, with fitting to go into Substage, so that Objectives may be used as Condensers . . .	1 7 6

SUNDRY ILLUMINATING APPARATUS.

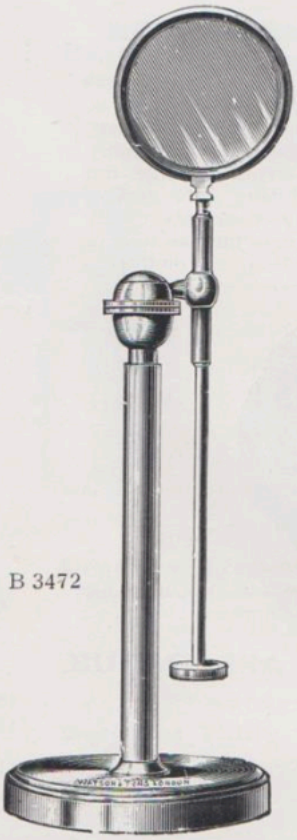
Peca	B 3464	**Spot Lens** for dark ground illumination . . .	15 0
Pedal	B 3465	Ditto, in Sliding Mount	18 6
Peep	B 3466	**Erecting Glass,** to fit draw-tube, to erect the image for dissecting, etc.	1 12 6



B 3471



B 3470



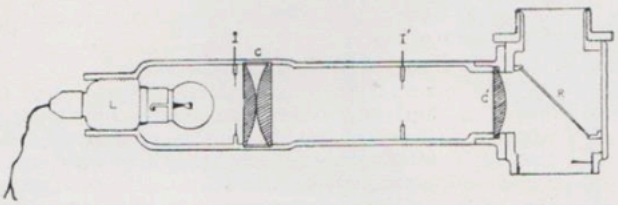
B 3472

B 3477

CONDENSERS—STAND OR BULL'S EYE.

Code Word.			Price. £ s. d.
		The Scōp.	
Peg	B 3470	This is a special form of condenser, on a lengthening pillar. The lens is 2⅛ in. diam., and fitted with an iris diaphragm, horizontal adjustment being also afforded. It is particularly intended for use with the vertical illuminator, or for photo-micrography. With it a small point of light of intense brilliancy may be obtained. The iris diaphragm gives complete control of the beam of light	3 15 0
		Scōp with Mechanical Adjustments.	
Pelf	B 3471	This is mounted with mechanical adjustments, as shown in illustration. It is frequently found when working with a Vertical Illuminator in the examination of Metal Specimens, etc., that necessity arises for the minutest possible alteration of the position of the bull's-eye lens, sometimes laterally, sometimes vertically. The Mechanical Scōp Condenser fulfils every demand in such cases. It is mounted upon a rackwork pillar with which adjustments can be made to the finest point by turning the pinion milled head. Laterally, similar slight movements can be effected by means of a spiral screw. The whole is mounted upon a substantial tripod foot	8 10 0
		Standard Pattern.	
Pelvis	B 3472	With upright lengthening bar, and ball and socket motions, large size, as figured	1 7 6
Pen	B 3473	Ditto, medium size	1 2 6
Penal	B 3474	Ditto, small size	16 6
		Aplanatic—Mr. E. M. Nelson's Formula.	
Pence	B 3475	Is designed to minimise the spherical aberration of the ordinary Stand Condensers, and to considerably increase the brilliancy of illumination. It is composed of two Lenses. Its use is specially indicated in photographic work, and it will be found not only to shorten the exposure, but to materially improve the image. For ordinary work it is much superior to the old form. Mounted as No. 3472	2 0 0
Pend	B 3476	With Iris Diaphragm . . . . . extra	1 5 0
Peon	B 3477	Ditto, mounted on upright heavy stand (as figured) with lengthening bar and clamp screw, lenses fitting in ring having centering screws, and clamp screw to fix centering, specially arranged for photography, projection, etc.	4 0 0
Perd	B 3478	Ditto, ditto, with Iris Diaphragm. This is a most important addition, and enables a clear and evenly illuminated disc to be obtained when photographing, etc.	5 5 0
		The Watson-Conrady Achromatised Aplanat.	
Perfi	B 3479	This is a highest-class Achromatised Aplanatic Combination, specially computed by Professor Conrady for photographic and critical visual work. Although of medium size, it utilises all the rays from the illuminant which it is possible to employ for microscopical purposes. Mounted on massive stand with lengthening bar, with centering screws and Iris Diaphragm (similar to illustration No. B 3477)	9 10 0
Perk	B 3480	Similar form to above, mounted with upright lengthening bar and ball and socket motion, similar to No. B 3472	6 5 0

THE WATSON-CONRADY PATENT CONDENSER VERTICAL ILLUMINATOR.



B 3485. Watson-Conrady Vertical Illuminator.

Workers with the Vertical Illuminator, which is now so largely used in the examination of metals, are aware of the annoyance that is experienced in consequence of glare, and of the extreme difficulty in adjusting the illuminant so as to obtain an evenly illuminated field with the light properly focussed. Even the directions that are to be found in text-books on the subject frequently seem to increase the difficulties instead of diminishing them, and the majority of workers become accustomed to altering the position of the illuminant until a sufficiently good result is obtained.

This new Condenser Vertical Illuminator overcomes the whole of the difficulties once for all.

The objects attained by this piece of apparatus are :—

1. To bring the illumination under the same complete control which is obtained with transparent objects and the best substage apparatus.

2. To obtain the brightest possible illumination from a small source of light.

3. To simplify and render certain the correct placing of the illuminant, whether it be supplied as a fixed portion of the apparatus or separate.

4 To render unnecessary the usual short mounting to Objectives for Metallurgy.

Reference to the illustration will show that it is built on the plan of a condenser system in miniature, complete with lenses and Iris diaphragms.

The Reflector, which is mounted in a Central Box, is a large transparent plate.

For general purposes a small 3·5 volt electric lamp may be fixed in a suitable position at the end of the condenser system, and when work is to be done, it is only necessary to switch on the current from the battery, and everything will be found to be in good order. With this an illumination can be obtained sufficient for visual or photographic purposes. An arrangement can also be supplied for using the Illuminator from the ordinary current supply. If an independent illuminator is

THE WATSON-CONRADY

PATENT

CONDENSER VERTICAL ILLUMINATOR.

Continued.

used, it should be set about 1½ inches from the outer end of the tube. Any small source of light can be used, such as the edge of an oil lamp flame or small incandescent lamp, or if a very brilliant illumination is required for projection, etc., a small arc lamp should be used, such as our " Argus " model.

The apparatus is used in the following manner :—

The illuminator is attached to the nosepiece of the microscope, the objective is screwed into it and approximately focussed on the polished metal object. The light is turned on, and the illumination is then regulated by the inner Iris diaphragm so as to cover the extent of the object actually under observation. This eliminates a large amount of stray light, and consequent gain in the contrast in the image is obtained. The Iris diaphragm nearest the illuminant is then used in precisely the same manner as that of the ordinary substage condenser, and by its means the cone of illumination is adjusted to give the best effect.

The Illuminator can be fitted with a permanently attached Metallic filament Lamp which reduces the trouble of setting up and adjusting to the absolute minimum. Further it enables Metallurgical work to be done on an ordinary Microscope, for when the body is focussed, the **whole of the Vertical Illuminator and its Lamp is carried with it.**

The current for the lamp can be obtained from dry cells, storage battery or main house supply : in the latter case a resistance is necessary and the exact voltage should be specified.

If an independent Arc Lamp is used, it should be fitted with a short-focus Aplanatic Bull's Eye, such as the " Nelson's Aplanatic," or the Watson-Conrady.

PRICES.

Code Word.	No.		Price. £ s. d.
Perme	B 3485	Condenser Vertical Illuminator with disc reflector— without Lamp	6 0 0
Pern	B 3486	Do. do. with 3·5 Volt Lamp fixed to Condenser tube with one yard silk-covered wire . .	6 5 0
Pery	B 3487	4 Accumulator Volt Battery for 3·5 Volt Lamp, with switch, in case	2 0 0
		Resistances for use when main house current is employed.	
Merge	B 3283	. . . . . 100-125 volts.	1 17 6
Mergil	B 3284	. . . . . 200-250 volts.	2 2 0

VERTICAL ILLUMINATORS.

The Vertical Illuminator.

By means of this, opaque objects adherent to the cover-glass, or uncovered, may be examined with the highest powers. It has become an important accessory for the microscopical examination of metal surfaces.

The Vertical Illuminator is attached to the lower end of the Microscope body and receives the objective. A concentrated beam of light is directed from the illuminant by means of a Bull's-eye, through a small aperture in the side of the Illuminator, and falls upon a reflector inside. In one form this reflector consists of a disc of thin **optically worked** glass and in the other of a prism. By means of the reflector the light is thrown downwards through the objective to the specimen, thus illuminating it, the objective acting as its own condenser. The specimen is then viewed through the eyepiece and objective in the ordinary way.

NOTE.—Some workers are more successful with the prism Vertical Illuminator than with the cover-glass disc pattern, and *vice versa*. It will, however, be generally found that both kinds have their distinctive advantages. For a complete equipment, therefore, both are desirable. A brass box is supplied to contain the Illuminators.

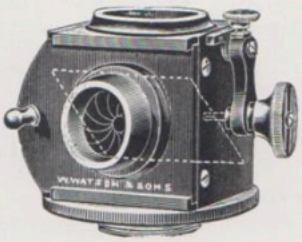
PRICES.

B 3495.

B 3497.

Code Word.	No.		Price. £ s. d.
Pert	B 3495	Cover glass Reflector, as figured	1 5 0
Perus	B 3496	Do., with metal diaphragm to aperture . . .	1 6 6
Pest	B 3497	Prism pattern, as figured . . .	1 14 6
Petal	B 3498	Do., with Iris diaphragm . .	2 5 0

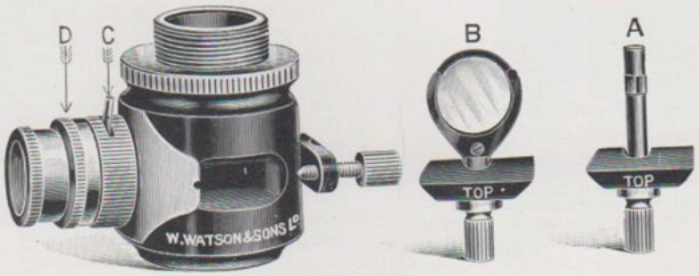
Pety B 3498 This improved cover-glass pattern was designed by Dr. Johnstone Stoney, to enable the large back lenses of certain objectives to be filled with light. The reflector is larger than in other patterns, and fills the largest back lens of objectives in general use. A large body tube is essential with this Illuminator.



B 3498.

		£ s. d.
	Without Iris diaphragm	2 0 0
Pew	B 3499 With Iris diaphragm	2 10 6
Phal	B 3500 The Iris diaphragm of No. 1128 may be mounted with eccentric adjustment at an extra cost of . .	10 0

W. WATSON & SONS' COMBINED VERTICAL ILLUMINATOR.



Code Word.	No.		Price complete. £ s. d.
Pham	B 3501	Metallurgists usually find in their microscopical work that for some purposes they need a Prism Vertical Illuminator, and for other purposes a Disc Reflector pattern is better. To obviate the necessity of having two separate pieces of apparatus we have devised a holder into which the Prism Carrier " A " or the Glass Reflector " B " can be set, as required. When in position, rotation within necessary limits can be effected, and adjustments for centrality can be made by means of a screw acting on a wedge. Mounted on the side of the apparatus is an Iris Diaphragm " C," and a small Condenser lens " D." Either of these can be removed when desired. It is believed that this combination arrangement will be found highly convenient, saving time, expense and superfluous fittings	3 10 0

LAMPS ELECTRIC.

B 3510

Code Word.	No.		Price. £ s. d.
Phanel	B 3509	**Simple Laboratory Electric Lamp Stand,** of plain construction with hinge and clamp nut, shell-shaped shield for lamp, complete with switch, lamp holder and one yard of flexible cord, no lamp or wall plug .	1 5 0
Pharo	B 3510	**" Laboratory " Electric Lamp** stand, specially designed for Microscopic work. It consists of a heavy metal base carrying a metal hood, the upper half of which is removable by bayonet catch, thus permitting the ready insertion or withdrawal of lamp bulb. The interior of the metal hood is enamelled white and the whole of the exterior is in dark bronze, an ideal lamp for constant or occasional work. Including Key-switch, Lamp Holder, one yard of flexible cord, but without Lamp Bulb or Wall Plug	2 5 0

Argus Hand-Feed Arc Lamp.


B 3511

Code Word.	No.		Price. £ s. d.
Phase	B 3511	Specially designed for Micro work. Arranged on the right-angle principle, maximum light is obtained from the Carbons. It is compact and small, consumes only about 4 ampères of current, so can be connected to ordinary domestic supply. Price, with hood and condensing lens on stand . . .	4 10 0
Phel	B 3512	Extra for Clockwork regulator to Carbons . . .	4 0 0
Phia	B 3513	A Resistance is required for the above—For 100 Volts	1 1 0
Phon	B 3514	Ditto For 200 Volts	1 1 0
Piano	B 3515A	Ditto. 25 pairs Carbons for ditto . .	10 0

The " Pointolite " Electric Incandescent Arc Lamp for direct current only. The light-giving part of the Lamp is a small ball of Tungsten which gives a point of light far exceeding in its intensity anything hitherto obtained. An ideal lamp for Photo-Micrography and Optical Projection.

PRICES—

Piece	B 3518	" Pointolite " Lamp, 100 candle power . . . N.B.—The " Pointolite " Lamp can only be used in conjunction with the special resistance set consisting of:	1 10 0
Pig	B 3519	Standard Universal Resistance, adaptable to all circuits, with Plug, Starting Switch, Lamp-Holder, Adapter and Flexible Cord	5 0 0
Pigmy	B 3520	Metal Reflector, with Tray and Adjustable Lamp-Holder, suitable for Projection Lanterns . . .	2 11 0

THE K. B. B. MERCURY VAPOUR LAMP.

For Microscope Work.

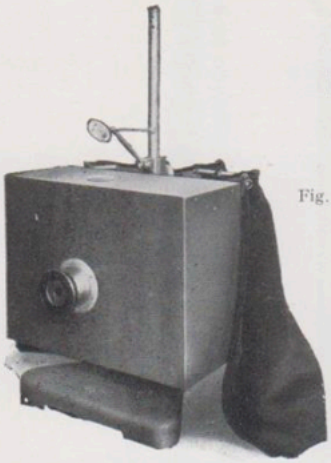


Fig. 1.

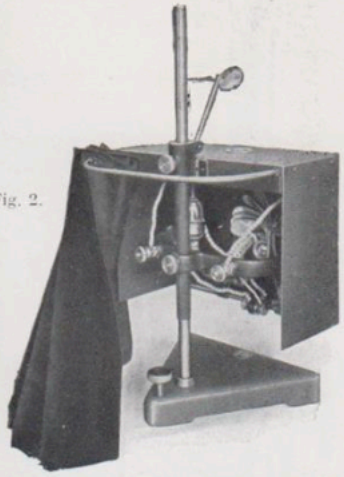


Fig. 2.

An entirely new design of Mercury Vapour Lamp with fused quartz envelope, which provides an absolutely steady monochromatic light of high intrinsic brilliancy for general microscopical observations, photomicrography, and visual work of all kinds.

The K.B.B. Lamp also provides a very rich source of Ultra-Violet radiation for research work in the invisible region of the Spectrum.

Its salient features are :—

1. The fused quartz burner is not exhausted but is at all times freely vented to the atmosphere.
2. No mechanical devices are required for starting the arc.
3. When the lamp is in operation, the quartz burner tube is completely filled with mercury, and may be transported from place to place without any risk of damage to the burner through hammer action of the mercury contents.
4. The life of the lamp is practically unlimited.

The form of lamp for general use with the Microscope is illustrated in Figs. 1 and 2.

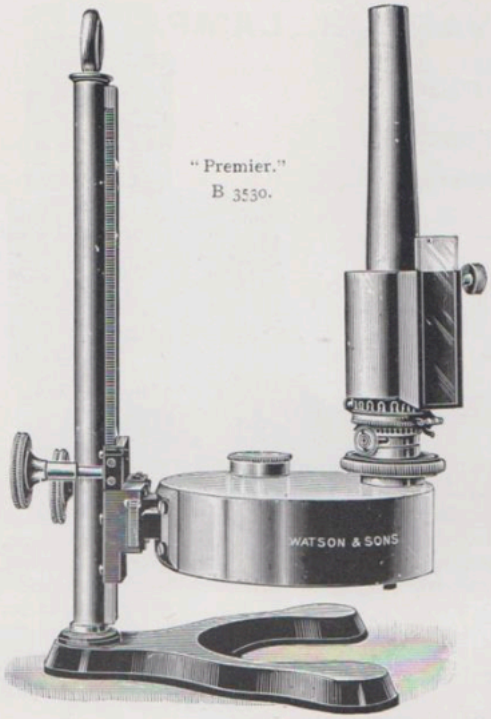
The burner can be lowered, raised or rotated on a vertical rod, fixed to a heavy tripod base. It can also be tilted.

The metal housing carries a condenser tube and Iris Diaphragm in the front. A small silvered mirror fitted above an aperture in the roof of the housing enables both vertical and horizontal beams to be employed.

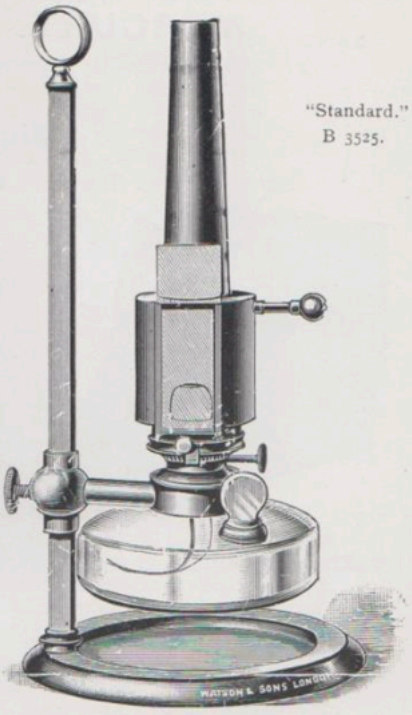
The K.B.B. Lamp may be operated off a five ampère plug on any direct current supply, provided a series resistance is used to suit the existing voltage.

Code Word.	No.	PRICES.	£	s.	d.
Pewter	B 3540	The K.B.B. Microscope Illuminant as described, for running on 100/150 Volt D.C. Circuit, current consumption approximately 3·5 amps.	20	0	0
Pewmer	B 3541	Adjustable series resistance	1	11	6
Pewcur	B 3542	K.B.B. Microscope Illuminant as above for running on 200/250 volt D.C. Circuit, current consumption approximately 2·5 amps	20	0	0
Pewvap	B 3543	Adjustable series resistance	2	7	6
Pewlam	B 3544	Condenser Stand, with light filter holder fitting for R.M.S. Substage Condenser, together with Iris Diaphragm and quartz condensing lens, $\frac{7}{8}$ inch diameter	3	15	0

LAMPS, PARAFFIN AND GAS



"Premier."
B 3530.



"Standard."
B 3525.

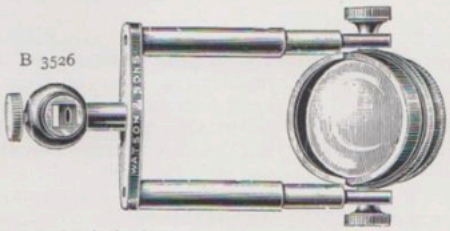
B 3528

Piglam B 3528 **Inverted Incandescent** Gas Lamp, as figured; sliding adjustment to raise and lower with clamp; hood, regulator to air inlet, coloured glass disc, tap and connection. Can be set at any angle . . £ 2 12 s. 6 d

"PREMIER."

Pigmer B 3530 This is a highest-class Microscope Lamp, with rackwork and screw movements fitted to the upright bar in vertical and horizontal directions, by means of which the light can be exactly set in any desired position. It has very solid brass foot and brass oil container; the burner can be rotated so that either the flat or edge of wick may be used. With Metal chimney for 3 in. by 1½ in. slips 10 10 0

B 3526



Pike	B 3521	**Premier** ditto, without mechanical adjustments	6 15 0
Pilf	B 3522	Nelson's Aplanatic Bull's-Eye, mounted on arm attached to oil container, for use on Nos. 3530 and 3525, with sliding adjustment for focussing, etc. . . . . extra	2 10 0
Pin	B 3524	Case for Lamp, for No. 3530	1 10 0

LAMPS, PARAFFIN and Gas—Continued

"STANDARD."

Code Word.	No.		Price. £ s. d.
Pira	B 3525	The type most frequently used by workers. It has a flat glass reservoir, which allows of the light being brought close to the table. The lamp itself may be securely fixed at any height on the upright bar, which latter being square, prevents it from swinging round. A metal chimney, taking 3 × 1½ slips, is provided. This lamp will burn for 10 hours and is especially suitable for photo-micrography. With supply of blue and white slips	1 10 0
		This Lamp will be found a most perfect illuminant for Photo-Micrography.	
Pish	B 3526	Ditto, ditto, fitted with Nelson's Aplanatic Bull's-Eye Condenser, as described No. 3475 . .	4 0 0
		This is mounted in the manner illustrated, Fig. 3526, and fits the bar of the lamp stand ; means of focussing are provided.	
Pilot	B 3523	Iris diaphragm fitted to Bull's-Eye 3526 . . .	1 5 0
Pit	B 3527	Case for No. B 3525	1 0 0
		NOTE.—After use remove the metal chimney, or it may smell when re-lighted.	

LIGHT FILTERS, Etc.

GIFFORD'S GELATINE AND GLASS SCREEN.

Pitch	B 3528	It consists of an optically worked disc of green glass, coated with a hard coloured gelatine film, and protected by covering glass. It is the best light filter obtainable for the busy worker. To fit Substage Mount of Abbe or Parachromatic Condenser . . .	8 6

RHEINBERG'S COLOUR DISCS.

Pity	B 3529	Set of Coloured Gelatine Discs, to fit the Stop Carrier of Abbe Illuminator, per dozen pairs	2 6

WRATTEN "M" FILTERS.

For Photo-Micrography and Visual Work.

Special booklet with prices on application.

STAINLESS STEEL MIRRORS FOR MICROSCOPES.

The necessity for a Mirror giving one reflection only of the lamp flame has long been recognised, and in special cases parallel worked mirrors have been supplied, as well as, in some cases, mirrors with surface silvering.

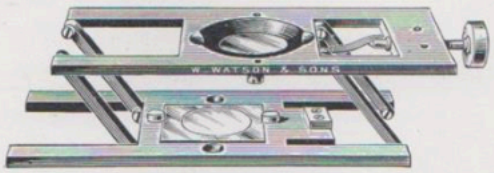
These, however, have had obvious disadvantages. Stainless Steel is well known in connection with cutlery ; it is non-corrosive, takes a very high polish and can be worked perfectly plane.

After extended experiments, we have produced Stainless Steel Mirrors with a perfectly flat surface, and suited in every way for microscopical work.

Made in one size only, **50 m/m diameter (about 2 inches). Price 15/- each.**

LIFE CELLS, ETC.

Reversible Compressor.



Code Word.	No.		Price. £ s. d
Pivot	B 3535	With this form the specimen may be examined from either side. Made of aluminium throughout. With covers	2 2 0

Rousselet's Compressor.

B 3536.

Plaid	B 3536	The compression is by means of a screw in the drum, and the cover glass having a square top, media may be introduced during examination of specimens. The Objective may be worked at any point where compression takes place. The arm carrying the cover glass may be turned completely aside for cleaning or replacing covers, and is held centrally by a spring catch. We have introduced a special improvement with two screws, instead of cement to hold the cover glass 17 6

Rousselet's Live Box.

B 3537.

Plan	B 3537	Rousselet's Live Box for use with Condenser, Paraboloid, etc. 17 6

The advantages of this are :—It can be used with the Substage Condenser, Spot Lens, etc., and there is sufficient margin between the edge of the glass base disc—on which the object is compressed—and the edge of the cell carrying the cover glass, for the Objective to work at any point where compression can take place.

*** B 3538. Extra covers for Live Boxes, per dozen, **2/6**

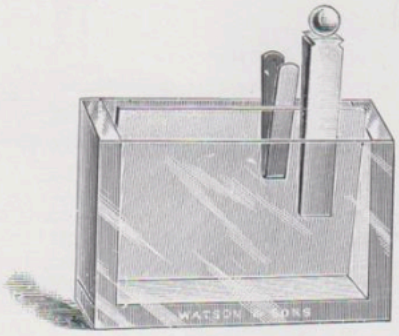
LIVE BOXES AND TROUGHS.

Live Boxes.

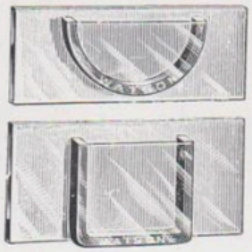
B 3545

Code Word	No.		Price £ s. d.
Plat	B 3545	Live Box, large size, best quality	1 0 0
Plea	B 3546	Ditto medium size	13 6
Plig	B 3547	Ditto small size	6 6

Glass Troughs.



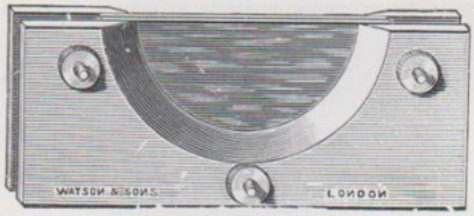
B 3549.



B 3548.

Plod	B 3548	Troughs for Animalcules; various widths, 3 × 1, 1/6 and 3 × 1½	2 6
Pluc	B 3549	Zoophyte Trough, with plate, wedge and spring .	6 6
Plum	B 3550	Watch Glasses, flat bottom, per dozen . . .	4 6

Botterill's Trough.

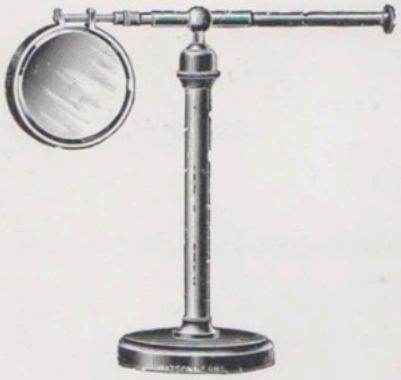


B 3551

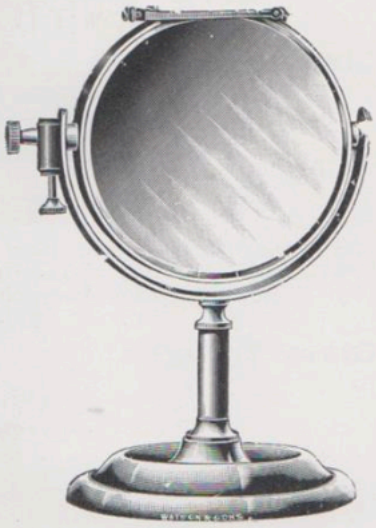
Ply	B 3551	This has two plates of vulcanite, held together by three screws, between which are placed two slips of glass separated by an ordinary india-rubber ring. The glass can be readily taken apart and cleaned, and in the event of being broken can at once be replaced	5 0

GLASS TROUGHS.

KINGSFORD'S TROUGH.



B 3561.



B 3562.

These troughs are designed especially for watching the development of " Pond Life," and for the purposes of small Aquaria. In addition, they form exceptionally advantageous light filters, the smaller size especially. Their construction is very simple, consisting essentially of an outer circle of brass, drawn together at the top by means of a screw or screws. The brass circle is lined with india-rubber, and with blocks of india-rubber so placed as to keep the glass faces, which are circular, in position. These glass discs are gripped by the indiarubber when the tension on the outer metal band is increased by the tightening of the Screws. They are absolutely water-tight.

The distinct advantages over all other troughs are that :—

By merely releasing the Screws, all parts can be taken to pieces and cleaned.

Any broken part can be at once replaced.

Code Word.	No.		Price. £ s. d.
Poach	B 3560	As figured on B 3561, 2¾ in. internal diameter. Trough only, to interchange with Bull's Eye Lens of Stand Condenser	17 6
Pod	B 3561	Trough, complete with Stand, as figured	1 12 6
Poem	B 3562	Large Table Trough, as figured, with 6 in. solid metal base. Internal diameter of Trough, 7½ in. mounted in gymbals, with clamp to fix at any desired angle, complete	3 3 0

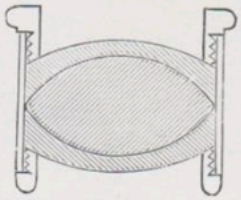
PHOTO-MICROGRAPHS.

Photo-Micrographs of Micro. slides are taken by a skilled microscopist for book illustrations, demonstrations, lantern slides, etc.

B 3563	Magnifications under 500 diameters with one negative and one print	10 6
B 3564	Ditto, over ditto	15 0

MAGNIFIERS—APLANATIC.

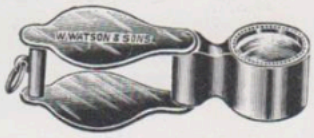
(Also known as Platyscopic Lenses).



B 3570.

Flat field, bright and exquisitely crisp image.

B 3570-73.



B 3570A-3573A.

These magnifiers consist of three lenses cemented together, as shown in Fig. B 3570. They give a large and very flat field, exquisite definition, and good working distance. They all have large apertures, and consequently yield a very brilliant image. They are unexcelled for dissecting purposes and as pocket lenses, and strongly recommended.

	No. 3570	No. 3571	No. 3572	No. 3573
Magnifying Power	6	10	15	20 dia.
Diameter of Visual Field	1·4 in.	·8 in.	·4 in.	·25 in.
Focal distance from lower surface of Lens to Object	1·5 in.	·9 in.	·6 in.	·45 in.

Three patterns of mounting are supplied for these Magnifiers :—

1. Similar to B 3570, to fit any of the Dissecting Microscopes and Lens Stands quoted on pages 96 to 98.
2. Similar to B 3570A, in nickelled metal or shell mounting for the pocket.
3. A Combination pocket mount, similar to B 3570A, to receive either of the Dissecting Mounts, pattern B 3570, so that the same magnifier may be used either for dissecting or the pocket.

Code Word.	No.	Magnifying Power.	In Dissecting Mounts. s. d.	No.	In Nickelled Metal Pocket Mount. £ s. d.	No.	In Combination Mount as described above. £ s. d.
Poice	B 3570	6 diameters	15 0	B 3570A	1 0 0	B 3570B	1 5 0
Point	B 3571	10 ,,	15 0	B 3571A	1 0 0	B 3571B	1 5 0
Poise	B 3572	15 ,,	15 0	B 3572A	1 0 0	B 3572B	1 5 0
Poila	B 3573	20 ,,	15 0	B 3573A	1 0 0	B 3573B	1 5 0

MAGNIFIERS—Continued.

Special Doublet Magnifier.

B 3580.

This Magnifier is composed of two Lenses only, but gives very good results. As a useful and cheap Dissecting or Pocket Lens it is much appreciated.

Magnification, 8 diameters—

Code Word.	No.		Price s.	d
Poke	B 3580	In Dissecting Mount, as figured	7	6

The above Magnifier fits the Dissecting Microscopes and the Dissecting Lens Stands, pages 96 to 98.

POCKET MAGNIFIERS.

B 3581

B 3589

B 3588

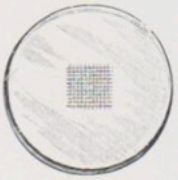
B 3590

			s.	d.
Polar	B 3581	Pocket Magnifier, in folding tortoise-shell mount, of very best quality, 3 lenses with diaphragm, as figured	12	6
Polem	B 3582	Ditto, ditto, 2 lenses, **10/0** Ditto, 1 lens . .	7	6
Polka	B 3583	Ditto, ditto, in horn or vulcanite, 1 lens . .	3	0
Pool	B 3584	Ditto, ditto, ,, ,, 2 lenses . . .	4	6
Pop	*B 3585	Ditto, ditto, ,, ,, 3 ,, ...	6	0
Pore	*B 3586	**Special Magnifier for Botanical Work,** 2 Plano-Convex lenses	4	6
Post	B 3587	Stand to hold either of the preceding, for dissecting .	5	0
Pota	B 3588	Coddington Lens, in German silver mount, in 4 sizes, as figured, . . . **7/6, 10/6, 12/6** and	15	0
Potch	B 3589	Watchmakers' Eye-Glass, as figured	2	6
Pour	B 3590	Pocket Magnifiers, with Horn Cases, in 3 sizes, as figured, ... **2/9, 5/0**	8	6

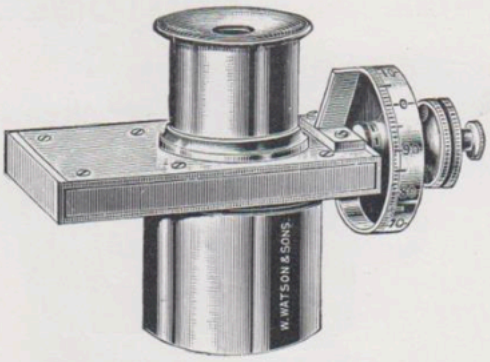
* Nos. 3585 and 3586 are adopted by many Technical Schools, Botanical Classes, etc., and are eminently suitable for the purpose They are mounted as B 3581.

Special quotations for quantities.

Eyepiece Micrometer, B 3603.



Eyepiece Micrometer in squares B 3604.



Screw-Micrometer Eyepiece, B 3600.

Screw-Micrometer Eyepiece.

Code Word.	No.		Price. £ s. d.
Pounce	B 3600	This is constructed almost entirely of aluminium, and is very light in weight. The teeth are cut to 1 m/m., and the drum indicates the 1/100 part of each tooth. The reading can therefore be taken to 1/100 part of a millimetre. The fixed web is set a little to the side of the field, as recommended by Dr. Dallinger. Of best and most accurate construction. With Huyghenian Eyepiece	7 15 0
Powd	B 3601	Screw-Micrometer Eyepiece, similar design to above, but in brass. The eye lens has sliding focussing adjustments and it is of the utmost precision throughout. It is made for Eyepiece fittings of Students' or Continental diameter—·9173 in.—only	5 10 0

Students' Micrometer Eyepiece.

Power	B 3602	Micrometer Eyepiece, for use with Micrometer No. B 3603 or B 3604, Eye-lens mounted on telescopic sliding tubes for focussing micrometer. Without micrometer . .	15 0

Eyepiece Micrometers.

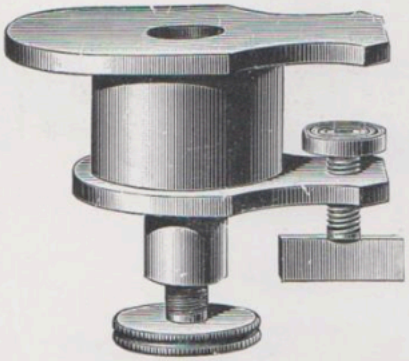
Prac	B 3603	Ruled with scale, as figured, 1 c/m in 100 parts	7 6
Pragm	B 3604	Ditto, ditto, in Squares, 1 c/m in 100 parts	7 6
Prais	B 3605	Ditto, ditto, the same as No. B 3603 or B 3604 but mounted to fit large-sized capped Eyepiece (Eyepiece not included)	10 0

NOTE.—The values of the lines of the Eyepiece Micrometer are ascertained by means of the Stage Micrometer and vary with every objective and tube-length. It is not therefore important what the divisions represent, so long as they are equi-distant.

Stage Micrometers.

Prank	B 3606	On 3 × 1 slips, Ruled to 1/10 and 1/100 m/m . .	7 6
Prate	B 3607	On Ditto, ditto, 1 100 and 1/1000 inch . .	12 6

MICROTOMES.



B 3612.

B 3615.

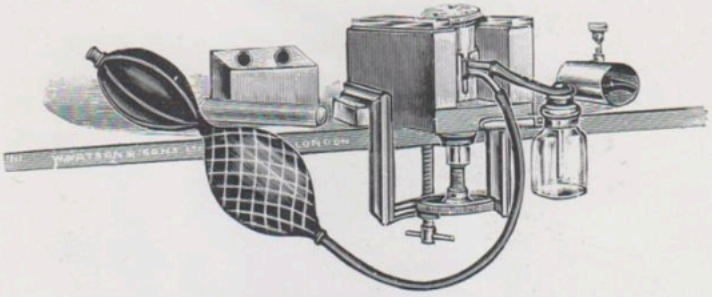
Code Word	No.		Price. £ s. d.
Prawn	B 3612	Mr. Cole's Pattern Section-Cutter, as figured. This is a most useful and efficient Section-Cutter, being very solid and rigid in use. The screw for raising the sections is very fine, and the milled head extra large, enabling very thin sections to be cut . . .	2 12 6
Preach	B 3613	Set of Punches, complete in case, for cutting out embedding substances, extra	10 0
Pream	B 3614	Mr Cole's Pattern Section-Knife, in case . . .	8 6
Prebo	B 3615	Hand Section-Cutter, for Botanical work . . .	9 6

B 3616.

Preca	B 3616	Darlaston's Hand Section-Cutter, as Fig. B 3616. Of simple construction, but of especially solid make, enabling considerable accuracy to be attained. It is of solid brass, $1\frac{1}{2}$ inch diameter, and has a well $\frac{11}{16}$ inch diameter. The raising screw—which is purposely fitted loosely to facilitate exact adjustment—has 35 threads to the inch	14 6

MICROTOMES—Continued.

THE CATHCART.



B 3620.

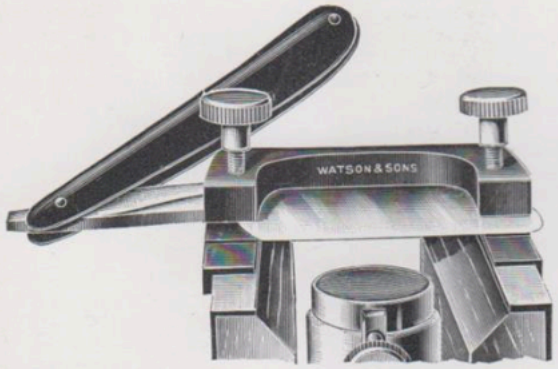
The Cathcart Microtome.

This popular form of Microtome is fitted for Ether Freezing or Embedding. For freezing tissues it is arranged as shown above; to embed tissues the tubes, bottle and the freezing tube are drawn out; the latter being replaced by another tube, with clamp. The substance to be cut (embedded in paraffin or other medium) is then inserted, and the clamp screwed up. This Instrument is thoroughly well finished, and the adjusting screw milled head is made specially large to permit a fine movement.

Code Word.	No.		Price. £ s. d.
Pray	B 3620	Microtome as above, with double clamp to fasten it to table, spray bellows and freezing apparatus, tubes for making paraffin blocks, etc., complete . . .	2 0 0
Prel	B 3621	The above Instrument, arranged for Ether Freezing only	1 11 6
Prema	B 3622	Ditto. ditto. for Embedding only .	1 10 0
Prepo	B 3623	Plane Iron Section Knife, in handle	8 6
Pres	B 3624	Ether Points, extra sets	4 6
Pride	B 3625	Rubber Spray Bellows	5 0

W. WATSON & SONS' KNIFE CARRIAGE PATTERN.

Cathcart Microtome B 3626.



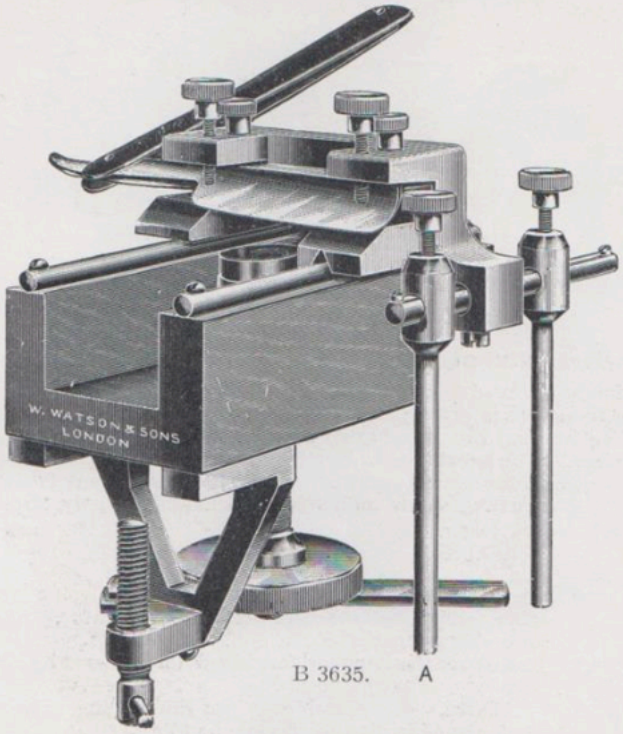
B 3626.

Code Word. Prim — This is a similar instrument to No. B 3620, but the razor carrier runs on brass, and not glass, guides. This latter has an adjustment allowing the razor edge angle to be adapted to the work in hand. The milled head for raising the materials is also furnished with an indicator by which the thickness of section can be accurately gauged.

Price, for Freezing and Embedding with one razor . £3 5 0

Code Word.	No.		
Prism	B 3627	For Freezing only	2 15 0
Priva	B 3628	For Embedding only	2 17 6

MICROTOMES—Continued.



B 3635. A

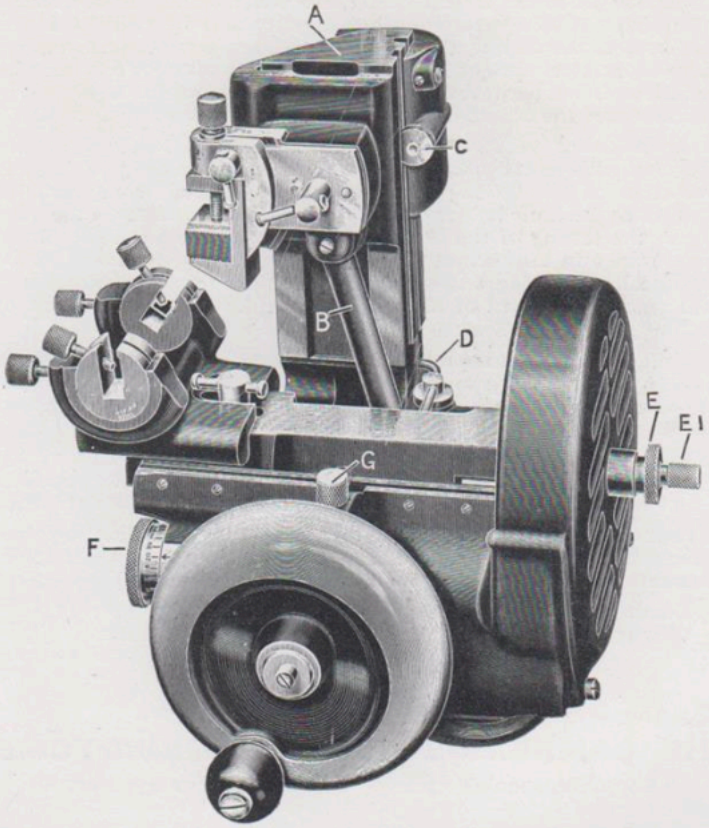
The Cathcart-Darlaston (Registered).

Realising the demand for a low-priced microtome, which, while preserving the simplicity and excellence of the Cathcart pattern, would yet enable the worker to cut sections of a definite thickness, we have lately carried out a suggestion made by Mr. Darlaston, and produced an elaboration of the ordinary Cathcart microtome which will, we believe, be much appreciated by careful workers. The illustration shows the general principle, which is briefly as follows :—The forks A are attached to the knife carriage, and in drawing the latter back one of the forks engages with a lever attached to the milled head, and thus raises the material a distance of from 1/250 to 1/5000 of an inch, according to the position in which the forks are placed ; thumb-screws permit the distance between the two being varied at will. The forward traverse of the carriage causes the second fork to engage, which replaces the lever in its original position ready for the return thrust. The entire system is automatic, and work as accurate as that of a complicated and expensive instrument is possible. The automatic motion may be dispensed with at pleasure, and the milled head rotated by the hand as usual.

Code Word.	No.		Price. £ s. d.
Privy	B 3635	Price, complete, for Freezing and Embedding . .	4 7 6
Prize	B 3636	For Embedding only	3 17 6
Probe	B 3637	For Freezing only	4 2 6
Proct	B 3638	Razor for above	3 6

THE WATSON-DENNE MICROTOME

Originated and Designed by M. T. DENNE, Esq.



WATSON-DENNE MICROTOME.

Proces. B 3640.

In Laboratories where large numbers of sections cut to uniform degrees of thickness are frequently required, and also for special research where serial section work is desired, a Microtome of the rotary action type is now an absolute necessity.

The Watson-Denne Microtome is entirely novel in design, embodying the ideas of one of the most eminent microtomists and skilled experts in instrument engineering. This new Microtome, we confidently believe, will prove in the hands of the Laboratory and Research worker the very last word in perfection of design and precision of action, and will surpass in results all other types of Laboratory Microtomes hitherto produced.

As will be seen from the illustration the Microtome is extremely solidly built of the very finest cast tool-steel, and all the working parts are accurately machined and ground together ; compactness and rigidity throughout are also special features.

The following are the chief points of its construction, from which will be readily understood the extreme simplicity and freedom from intricacy of the various parts :—

THE WATSON-DENNE MICROTOME.—Continued.

The balanced driving wheel on being rotated actuates the crank arm B, which in turn is connected to the Object holder, the latter moving in a vertical plane on the steel upright A. To ensure absolute rigidity and freedom from vibration of the object holder, the casting to which the latter is secured is accurately ground to the faces of the steel upright A, only sufficient clearance for a lubricating film of oil being allowed. A hardened steel roller C, travelling in a groove, maintains accurate contact of the object holder casting with the steel upright A.

The knife-feeding arrangement is controlled by a 6-inch diameter toothed-wheel provided with metal protecting cover, as shown on right of illustration. At each revolution of the driving wheel a fine steel screw, connecting the 6-inch toothed wheel to the knife holder clamp, draws the latter towards the object holder according to the setting of the Micrometer Drum F. The scale on drum permits of sections from 1 to 20 microns being cut. A special mechanism at D provides for automatically throwing out of gear the feeding arrangement when the knife holder has reached the limit of its travel, thus entirely preventing risk of damage to the feeding mechanism.

The knife holder block is provided with two cast steel clamps, the latter being adjustable, so that the angle of the knife can be readily positioned to the block of material being cut; the position of the knife block can also be set approximately in relation to the object holder by means of the set screws E, E1.

A clamp screw at G enables the user to fix the object holder at any desired height. The object holder itself is provided with universal movements, thus enabling paraffin and celloidin-embedded and also frozen material to be dealt with.

We reserve to ourselves the right to vary the specification in minor details, such as the position of the divided drum, or the design of the knife holder, but all the movements and chief mechanism will remain the same.

Dimensions of the Watson-Denne Microtome, 12″ × 12″ × 11″
Weight of ditto, 36 lbs.

Quotations on application.

THE CAMBRIDGE ROCKING MICROTOMES.

Supplied at maker's prices. Prices quoted on application.

MICROTOME ACCESSORIES.

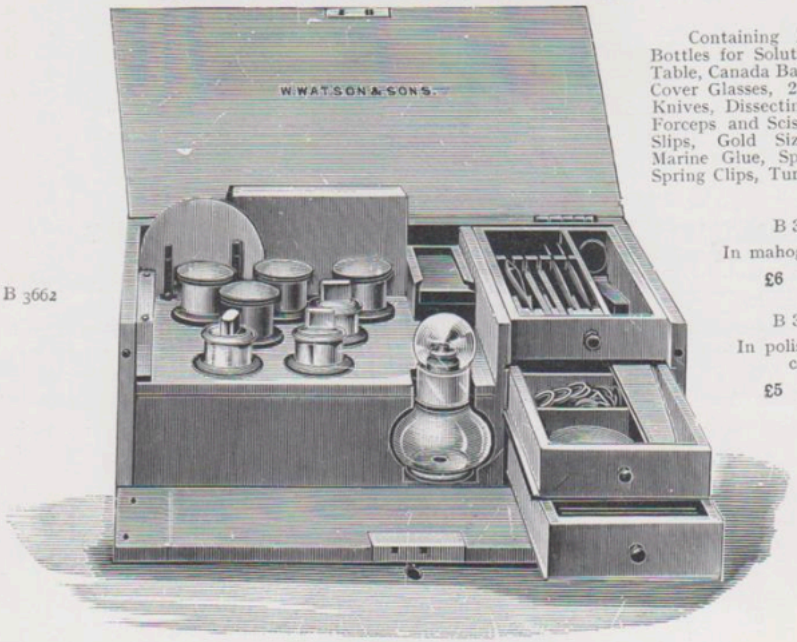
		£ s. d.
B 3650	Metal Moulds, L-shaped for casting, Paraffin blocks per pair	4 0
B 3651	Elder Pith, for Embedding per bundle	9
B 3652	Paraffin Wax, Hard or Soft . . . per lb.	2 6
B 3653	Strong Razor, of good quality	3 6
B 3654	Cole's Pattern Section Knife, with fixed steel handle	8 6
B 3655	Plane Iron with handle for Cathcart Microtome . .	8 6
B 3656	Vacuum Embedding Water Bath, heated by gas. Uniformity of temperature is maintained by means of a thermostatic capsule acting upon a gas valve by which the supply of gas is regulated	14 14 0
B 3657	Vacuum Embedding Water Bath, heated by petroleum lamp with thermostatic heat regulator. Specially designed for use where coal-gas is unobtainable . .	15 15 0

MOUNTING MATERIALS.

			s.	d.
B 3658	Brushes for Ringing, best quality	each	1	6
B 3659	Ditto, ordinary		1	0
B 3660	Buff Blocks for Cleaning Cover Glasses	per pair	3	0
B 3661	Clips, Spring Wire, for mounting	per doz.	6	0

COMPLETE CABINETS FOR MOUNTING

B 3662



Containing Asphalt, 3 Bottles for Solutions, Brass Table, Canada Balsam, Cells, Cover Glasses, 2 Dissecting Knives, Dissecting Needles, Forceps and Scissors, Glass Slips, Gold Size, Labels, Marine Glue, Spirit Lamp, Spring Clips, Turntable, etc.

B 3662.
In mahogany case.
£6 10 0

B 3663.
In polished pine case.
£5 15 0

COVER GLASSES.

(Best quality only.)
In three thickness—No. 1, very thin; No. 2, medium; and No. 3, ordinary thickness used.

Circles, $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in. diameter.

		1 oz.	½ oz.	¼ oz.
		s. d.	s. d.	s. d.
B 3664	No. 1	7 6	3 9	2 0
B 3665	No. 2	5 6	2 9	1 6
B 3666	No. 3	4 4	2 3	1 3

Squares $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in. square.

		1 oz.	½ oz.	¼ oz.
		s. d.	s. d.	s. d.
B 3664A	No. 1	7 0	3 6	1 10
B 3665A	No. 2	5 0	2 6	1 4
B 3666A	No. 3	4 0	2 0	1 1

Assortment of above sizes at same rate. Special quotations for quantities.
Only the above sizes regularly kept in stock.

B 3670 Smaller, intermediate or larger sizes of, and not less than ½ oz., can be cut to order at **1/0** per oz. extra.

B 3671 **Special Thin No. 1 Covers.** Circles, ⅝ in. diameter only. These are excessively thin—·005 inch—for high-power work. Not less than ½ oz. supplied, **17/6** oz.

SLIDES OR SLIPS.

3 × 1 inches, ground edges.

		doz.	½ gross.	1 gross.
			s. d.	s. d.
B 3672	"The Student's," greenish tint, thin	7d.	3 3	6 0
B 3673	Extra thin, greenish tint	9d.	4 0	7 6
B 3674	Glass Slips, 3 × 1 ins., with round or oval excavation in centre, suitable for pond life, or objects to be mounted without pressure	doz.		3 6
B 3675	Blue Slips, 3 × 1½ ins., for use with lamp chimneys	doz.		9 0
B 3676	Adhesive Slide Labels, square, 3 lines, per 100			6
B 3677	Ditto. oval, for 3 × 1 inch slips, per 500			1 0
B 3678	Ditto. square, with printed name or other matter to order, per 1000			8 6

MOUNTING MEDIA, ETC.

			s.	d.
B 3780	Asphalt or Black Cement	Per Bottle	1	6
B 3781	Bell's Cement	,, ,,	4	6
B 3782	Canada Balsam, Natural	,, ,,	2	0
B 3783	,, ,, in Benzole	,, ,,	2	0
B 3784	,, ,, in Xylol	,, ,,	2	0
B 3786	Cedar Oil, thick, for Immersion	,, ,,	1	0
B 3787	Gold Size	,, ,,	1	6
B 3788	Varnish, Blue, Green or Red	,, ,,	2	0
B 3789	Zinc White Cement	,, ,,	2	0

Packing and Postage for single Bottles, **5d.** extra.

Burroughs Wellcome & Co.'s "SOLOID" BRAND MICROSCOPIC STAINS.
(Trade Mark)

"Soloid" Microscopic Stains will be found exceedingly useful for the rapid preparation of small quantities of solution.

A descriptive list, in each packet, gives full directions for making up and staining.

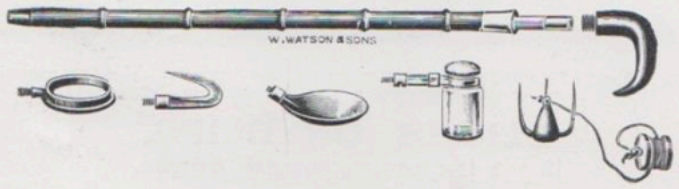
Price **1/0** per packet, excepting those marked otherwise.

The following "Soloid" stains are obtainable :—

		s.	d.
B 3790	Bismarck Brown, pure 0·1 gm.		
	Borax Methylene Blue		
	Eosin, pure 0·1 gm.		
	Eosin-Azur (for Giemsa Staining) 0·038 gm.	1	6
	Eosin-Methylene Blue (Louis Jenner's Stain) 0·05 gm.		
	Fuchsine (Basic), pure 0·1 gm.		
	Gentian Violet, pure 0·1 gm.		
	Gram's Iodine Solution 15 c.c		
	Hæmalum		
	Hæmatoxylin, pure 0·1 gm.		
	Methyl Violet, pure 0·1 gm.		
	Methylene Blue. 0·1 gm.		
	Romanowsky Stain (Leishman's Powder) 0·015 gm.		
	Toison Blood Fluid		

Each tube contains 6 "Soloid" products.

POND AND ROCK POOL COLLECTING STICK.



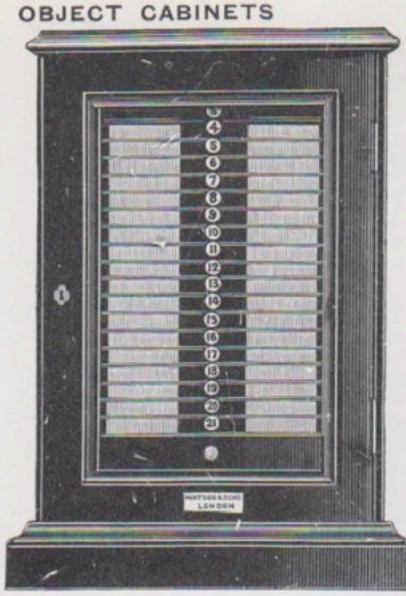
The Stick is of Bamboo, with an inner extensible rod which is removed by unscrewing the handle and then fitted at the ferrule end. The handle may be a nickelled cap of neat appearance, or a crook shape.

The outfit consists of the Stick, with two wide-mouth bottles and metal clip for same, metal ring for net, cutting hook, metal spoon, triple drag hook with line and reel.

Code Word
Pond.

Price - £1 5s.

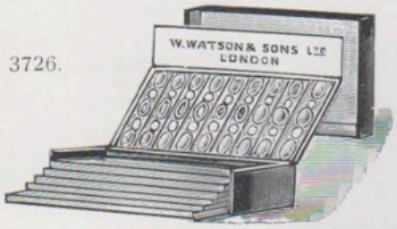
MICROSCOPIC OBJECT CABINETS AND BOXES.



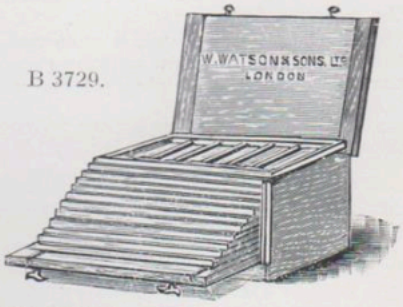
B 3724 B 3720.

Code Word.	No.		Price. £ s. d.
Pun	B 3720	Neatly-made Cabinet of polished pine, with glass door, lock and key, to hold 200 objects, as figure . .	2 10 0
Punch	B 3721	Ditto, ditto, 500 objects	4 10 0
Punt	B 3722	Ditto, ditto, 1000 objects	7 15 0
Pupe	B 3723	Mahogany Cabinet of superior workmanship with mouldings top and bottom, to hold 280 objects, each drawer numbered, with an extra deep drawer for materials, etc.	7 15 0
Pupil	B 3724	Large handsome Mahogany Cabinet to hold 500 objects, each drawer numbered and furnished with porcelain plates, as figure	15 0 0
Puppy	B 3725	Ditto, ditto, to hold 1000	21 0 0

B 3726.



B 3729.



MICROSCOPE SLIDE BOXES.

Cloth-covered Cardboard Boxes, with drop fronts, white Cardboard Trays with linen-jointed flaps.

		s. d.
B 3726	With 6 trays to hold 54 slides flat	3 0
B 3727	,, 12 ,, ,, 108 ,, ,, ...	5 6
B 3728	,, 16 ,, ,, 144 ,, ,, ...	6 9

Polished Pine Object Boxes, with partitioned trays.

B 3729	To hold 6 dozen in 12 trays	10 6
B 3730	,, 12 dozen in 12 double trays	15 0

OBJECTS FOR THE MICROSCOPE.

For more than thirty-five years we have maintained the premier position of the scientific world for the supply of highest class Microscopic Objects, and they are in universal use for Biological, Medical and Industrial study, book illustrations and other purposes, including the varied interests of the amateur.

No worker who values his Microscope as an aid to Natural Science should fail to provide himself with our Classified List of Microscopic Objects (Part 3), which forms a separate publication. The number of slides amounts to over 40,000, and for the comprehensive nature of the list, and the minute attention paid to each specimen, it is unequalled. The slides are prepared by experts, each of mature experience in his speciality. The objects are, therefore, fitted to be used in the most critical manner. As standard specimens for demonstrators and students they are unsurpassed.

The Microscope is constantly extending its field of usefulness and new branches of research have consequently to be provided for; especially is this the case in numerous manufacturing processes; new specimens are therefore continually being added to our cabinets to assist workers, and correspondence is always invited.

The following subjects are fully dealt with :—Botany, Comparative Anatomy, Dairy Series, Diatomaceæ and Foraminifera, Entomology, Geology, Histology, Pathology, Parasitology, Bacteriology, Marine and Fresh Water Life, Paper Making, Pharmacology, Polariscopic Specimens, Public Health Series, Zoology, etc.

Amateurs are strongly recommended to investigate the particular sections which appeal to them. It is always possible to obtain for selection a large number of striking preparations.

It is our endeavour to maintain our stock in such a condition of completeness that we may be in a position to despatch any specimen that is quoted in our catalogue immediately; but it sometimes happens that a temporary cessation in the supply of material occurs, or the time of the year may not be suitable for obtaining gatherings and, in consequence, delays may be experienced. We suggest, therefore, that when an order is given, extra alternative specimens may be named, to replace any that might be temporarily out of stock.

Special attention is drawn to the staining methods, by means of which all the tissues are differentiated, thereby aiding demonstrators very considerably.

Our exceptional facilities enable us to prepare objects for the Microscope from customers' materials to the greatest advantage; special care is displayed in such work.

Every slide is examined before being placed in stock, and special care is taken in selecting specimens when forwarding; satisfaction to customers is assured by this means. We claim for our Objects a quality superior to the usual commercial level and it will always be our aim to maintain this.

We beg that you may take the opportunity of proving the excellence of our specimens by entrusting us with your orders and kind recommendations.

On the next page are several standard sets, which are typical of the subjects in the general collection.

CABINETS OF MICROSCOPIC OBJECTS

COMPLETE FOR PRESENTATION, Etc.

Code Word.	No.		Price. £ s. d.
Prop	B 3695	Handsome Mahogany Cabinet of finest workmanship and finish, containing 1000 objects of varied interest. Each specimen is a carefully selected example of the subject it typifies. Many novel and interesting preparations are included, Anatomical, Entomological, Zoological, etc., also many rare Diatomaceæ, Foraminifera and Radiolaria, forming a collection of the highest order, eminently suited for presentation. Each drawer has a tablet of its contents	97 10 0
Prose	B 3696	Handsome Mahogany Cabinet, equal to the above in every respect, but containing 500 objects	50 0 0
Push	B 3697	Mahogany Cabinet, as above, containing 280 objects, all carefully selected, including many novel and attractive slides for exhibition purposes, as well as a large number of rare specimens of Zoological interest, etc.	29 5 0
Prote	B 3698	**The Student's Cabinet,** of polished pine with glass door, lock and key, containing 200 preparations, illustrating Anatomy, Bacteriology, Pathology, Physiology, Urinary Deposits, etc.	22 10 0
Proud	B 3699	**The Amateur's Cabinet,** containing 200 specimens of general interest—Botanical Sections, Crystals for polariscope, Diatomaceæ, Entomological Objects, Foraminifera, Hydrozoa for Dark Ground Illumination, Soundings, all of the highest quality	18 10 0
Prove	B 3700	Pine Case, containing 72 objects of General Interest, all carefully prepared and selected	6 5 0

Other Microscopic Object Cabinets made to any size or pattern, and furnished with slides typical of any required subject.

EDUCATIONAL SERIES FOR STUDENTS.

BOTANY.

			£ s. d.
Prow	B 3701	Two sets of Typical Structures, the first (Series 14) being 24 Elementary Tissues, and the second (Series 15) illustrating the Comparative Anatomy of Plants. These have been adopted by the London County Council for use in their Technical Classes, Series 33 in case	1 16 0
Prune	B 3702	,, 35 ,,	2 5 0

EMBRYOLOGY

Pry	B 3703	Seven slides, illustrating the development of a Chick, mounted in Canada Balsam, showing with great distinctness the nervous and circulatory system, etc., in case	1 15 0

EXHIBITION SLIDES.

Pruce	B 3704	An attractive selection of 36 interesting objects, many of which are quite novel in character, including slides for Polariscope and Dark Ground Illumination	3 10 0
Puf	B 3705	**Forensic Medicine.**—Set of twenty-four slides of pairs, blood corpuscles, starches, etc., as suggested by R. Henslowe Wellington, Esq., M.R.C.S., L.R.C.P., Barrister-at-Law, etc.	1 15 0

GEOLOGY.

Puke	B 3706	Twenty-four Typical Rock Sections, sedimentary metamorphic and igneous. Several peculiar specimens are included showing features which have never before been demonstrated in a Microscopic section. The series will be found very useful for Petrological candidates for the B.Sc. degree	2 15 0

PHYSIOLOGY.

Pull	B 3707	Four complete series (Nos. 67-73) of 24 Typical Tissues, each a selected example of its kind. The complete series illustrates the Standard Text-books of Histology. Per set of 24, in case	1 16 0

PUBLIC HEALTH.

Pulse	B 3708	Seventy-two specimens, suitable for candidates for the Diploma, as approved by Dr. F. J. Allan and mentioned in his "Aids to Sanitary Science."	6 15 0

ZOOLOGY.

Pump	B 3709	Twenty-four selected specimens, Cœlenterata, Infusoria, Polyzoa, Protozoa, Vermes, etc. Many of these, apart from their Biological interest, will be found of great interest as exhibition objects. In case	3 0 0

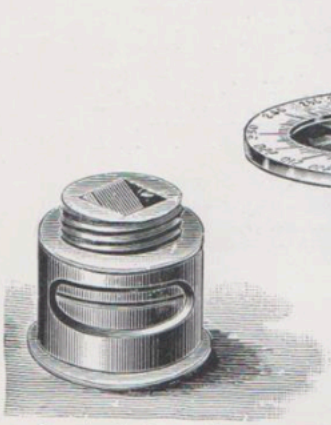
POLARISING APPARATUS.

Consisting of Polariser and Analyser. A disc of selenite is supplied with sets B 3740, B 3741, and B 3742.

Polariser. B 3741.

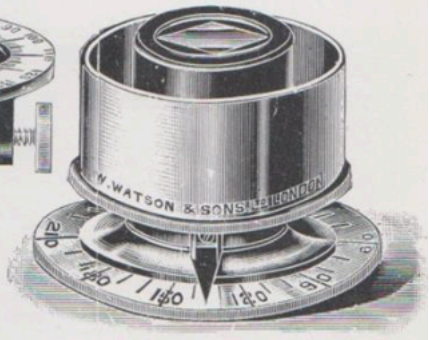
Analyser. B 3741.

Code Word.	No.		Price. £ s. d.
Purr	B 3740	Polariser and Analyser, with selenite, complete, small size	1 10 0
Purge	B 3741	Ditto, ditto, medium size	2 5 0
Purl	B 3742	Ditto, ditto, large size	3 2 6
Purse	B 3743	Rotating Analyser, as figure, instead of fixed form, extra	7 6
	B 3744	Analyser to fit over Capped Eyepiece £2 0 0 and	3 0 0
	B 3745	Do., fitted to Body of Microscope when new . . .	3 10 0
	B 3746	Adapting Polariser to work in conjunction with Abbe Illuminator or other condenser for Substage . .	7 6



Rotating Analyser. B 3743.

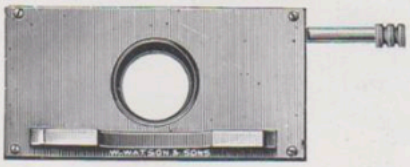
Eyepiece Analyser. B 3749.



Polariser with divided circle. B 3747.

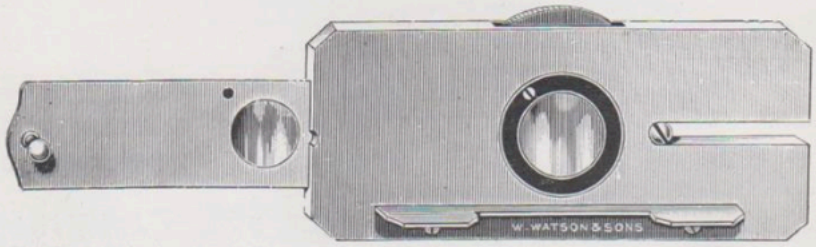
			£ s. d.
Pyre	B 3747	**Polariser for Petrological Work,** large size Prism, with Rotating Flange, divided, with reader and spring catch to indicate quarter circles	3 10 0
Pyx	B 3748	Condensing Lenses of large aperture to fit over the above Polariser	1 5 0
Polpet	B 3749	Analyser to rotate over Eyepiece, with large field prism, with reader against divided circle, complete with Student's Huyghenian Eyepiece, having cross-webs	4 5 0
Poleye	B 3750	Do., with best large sized Capped Eyepiece . . .	4 15 0
Polcac	B 3751	Extra for Calcspar plate to above	1 1 0

POLARISCOPE-SELENITES.



B 3760.

Code Word	No.		Price. £ s. d.
Prosele	B 3760	**SELENITE STAGE,** as figured, with pinion to rotate the central well carrying the Selenites. With a set of 3 Darker's Best Selenites, having P/A marked on each, complete	3 15 0
Prodar	B 3761	Set of Darker's best Rotating Selenites for Substage, each fitting into a separate revolving ring so that all three can be rotated over one another independently or in combination; each ring can be turned out of the axis when not required. This may be fitted either to the Substage or to the Polarizer	5 10 0



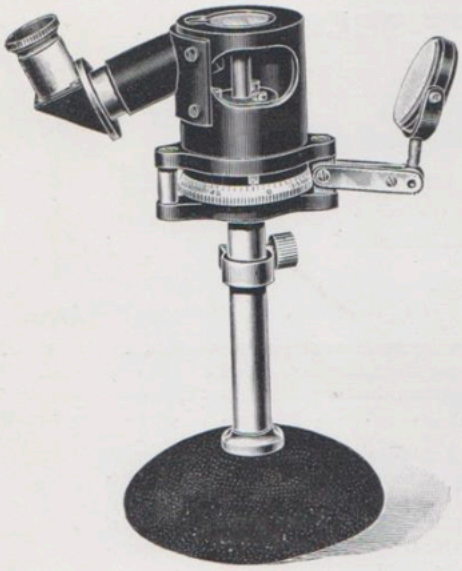
Mica-Selenite Stage. B 3762.

MICA-SELENITE STAGE.

			£ s. d.
Promic	B 3762	A film of Mica is mounted in a revolving disc fitted in a brass plate, on which the object is placed. Beneath the Mica there is a sliding carrier, containing three different Selenites, so that each one may be brought under the Mica, and the latter rotated. Thus the entire series of colours obtainable with any number of Selenite films, either separately or in combination, may be produced. It can be used on any Microscope. The effects are very fine	2 12 6
Prones	B 3763	Selenites mounted on 3 by 1 slips, 3 varieties each	2 6
Pronal	B 3764	Selenite Films, according to size, mounted in circles,	3/6 to 15 0
Pronif	B 3765	Mica Films, ditto. ditto.	3/6 to 15 0

Bi-axial Crystals, Etc. See Catalogue part 3.

REFRACTOMETERS.



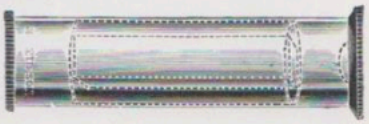
GEM REFRACTOMETER

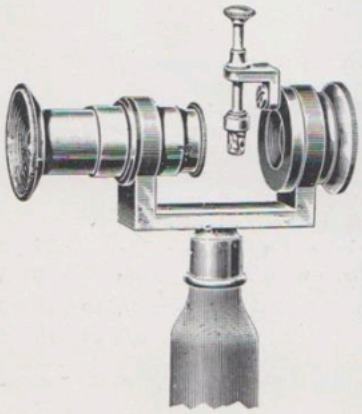
Although primarily designed to meet the requirements of jewellers and dealers in precious stones, this instrument does practically all that is necessary for the mineralogist, physicist and chemist. The refractive index of the substance under examination is read off direct on a scale in the telescope and is accurate to two or three units in the third place of decimals; the range extends from 1·40 to 1·79. To facilitate the measurement of double refracting substances the dense flint hemisphere is made to rotate on a circle divided to every 5°. The hemisphere is surrounded with a light-tight casing provided with a shutter which allows of illumination by either reflected light or light at glancing incidence at will. The large aperture at the side of the casing is for cleaning the hemisphere, which operation should be performed with the greatest care. The stand is adjustable for height.

Code Word.	No.		£ s. d.
Prefrac	3840	As described, in cabinet	20 0 0
Pretom	3841	Nicol prism to fit ocular of above . . .	2 10 0

DICHROISCOPE.

Predich 3842 This instrument is for the accurate comparison of the different colours of Dichroic minerals. It is extremely useful for distinguishing gems from coloured glass imitations **£1 17 6**

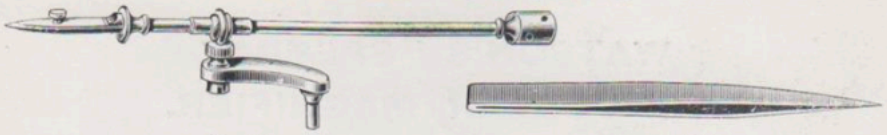




IMPROVED DICHROISCOPE.

Code Word.	No.	
Precro	3843	This improved model is provided with a revolving stage fitted with a small cup filled with wax for holding the mineral. This cup can be raised or lowered and rotated in two azimuths. It can be thrown right out of the field to allow of the careful adjustment of the object on the wax. The ocular and prism slide through a tube for focussing. **£3 15 0**

STAGE FORCEPS



B 3786. B 3787.

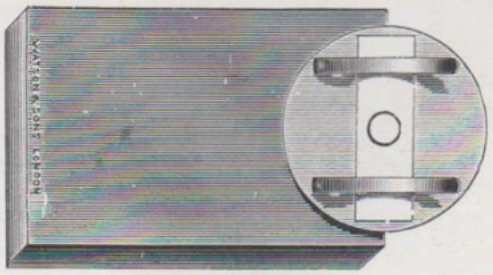
B 3785.

			£ s. d.
Procum	B 3785	**Forceps,** to fit into stage or limb of Instrument to hold objects during examination	12 6
Prodig	B 3786	Ditto, ditto, best quality	1 1 0
Produc	B 3787	Brass Hand Forceps, straight	1 6

TURNTABLES.

B 3788.

Prod	B 3788	The " Facile " Ball-bearing Turntable. An improvement on all existing patterns, Fig. B 3788. In this form the table is balanced in the ordinary way on a hardened steel pin and rotates on a dead hard steel ball, thus reducing friction to a minimum, and ensuring a smooth and steady revolution. The hand support is placed high, enabling a controlled application of the brush. The brass table is engraved with a circle which exactly encloses a 3 × 1 slip, thus giving instant centering	1 2 6



B 3789.

Prom	B3789	Turntable, ordinary pattern, as Fig. B 3789; very efficient	10 6

WATSON'S "SPEERA" BINOCULAR MAGNIFIER.

Mounted in Adjustable Spectacle Frames.

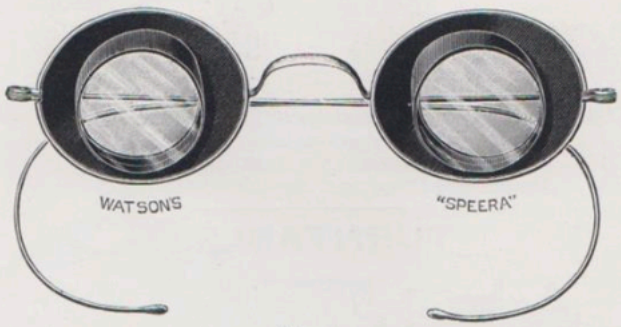


Fig. 1.

WATSON'S "SPEERA" MAGNIFIERS are a new and distinct advance on anything of the kind that has preceded them, and the outstanding features are their great simplicity, their immense utility and the comfortable methods of mounting.

The optical arrangement is free from all complications, consisting of **Achromatic** lenses set at such an angle to each other that the vision converges on the focal point. It is the first time that an attempt has been made to use Achromatic lenses in this form, and the result on trial is at once apparent. A beautifully sharp flat field, free from colour, is obtained, and there is an absence of all strain on the eyes.

The "SPEERA" Binocular Magnifiers are made in three powers, the focal lengths of the pairs of lenses being 5, 7 and 10 in., giving magnifications of 3·5, 2·5 and 1·75 diameters respectively.

Acquaintance with the numerous advantages offered by this device will lead to its constant use for many purposes, and especially for dissection, natural history work, operations on delicate structures, such as the eye, fine machine work, watch repairing, etc., etc.

It will be readily understood that to obtain correct convergence of the lenses, the eye centres must be known, and the lenses mounted accordingly. To enable this to be done with accuracy, three forms of mounting have been supplied :—

WATSON'S "SPEERA" MAGNIFIERS
(continued).

1. The fixed spectacle frame as shown page 134. If this is supplied it is necessary to know as nearly as possible the inter-ocular width, the height of the bridge above the eye centres, and if possible, the shape of the bridge.

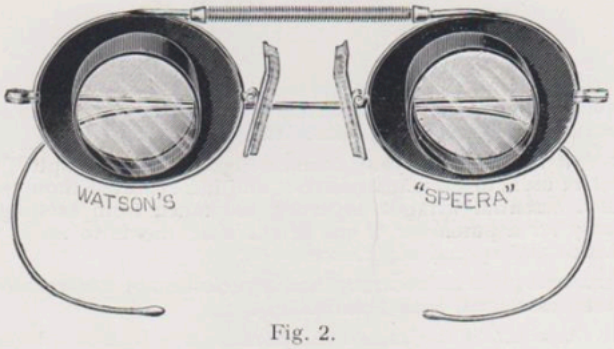


Fig. 2.

2. Where it is inconvenient or undesirable to have the fixed frame, we supply an adaptable fitting with a spring bar, as shown in figure 2. It is still desirable with this to know the width of the eye centres, but the height and shape of the bridge is comparatively unimportant, because the frame itself can be opened on the spring to the requisite amount, and the plaquets, which have cork grips, can be bent to the exact shape of the nose.
3. Where the Magnifiers are to be used by those who have to wear spectacles which correct Astigmatism, Hypermetropia or Presbyopia, it is necessary to wear the ordinary spectacle lenses in addition to the Magnifiers. For this purpose we make either of the above forms to carry spectacle lenses in addition, or we can supply the Magnifiers with an arrangement of hooked fittings to go on existing spectacles.

It will generally be found advantageous to obtain " SPEERA " Magnifiers through a local optician who will take the measurements and supply the " SPEERA " Magnifiers. This will ensure perfect satisfaction from the beginning.

Those who order direct should as a rule take Pattern 2, stating the width of their eye centres, and if they wish spectacle lenses to be included, a prescription or a pair of spectacles should be sent, when ordering.

Price of " SPEERA " Magnifiers of either magnification, in rolled gold, with spectacle frames, with either fixed bridge, or adjusted spring top bar, as illustrated in Figures 1 and 2.

Code Word:
Speera Price ... **£2.**

NOTE.—Please specify the magnifying power desired.

WATSONS' POLARIMETER.

MODEL "A."

The frequent enquiries for Polarimeters which we have received have induced us to manufacture the Model " A " instrument.

In order that the most generally useful design might be adopted, we conferred with a number of users of these instruments, and incorporated those features which were considered essential without departing too much from existing models. It is therefore easy for a purchaser of one of our instruments to use it without considerable practice and special experience.

This instrument gives an accuracy and a perfection of workmanship which has not usually been associated with Polarimeters.

They are made under the same conditions as the Watson's Microscopes, and are similar in quality to them throughout.

The foot is of the 3-claw type with a vertical pillar rising from its centre, fitted with an extending Draw-tube held in position by a clamp, so that the trough may be raised to the most convenient position. The brass trough is accurately machined to take tubes 200 mm. long, special provision being made to ensure correct alignment of the optical fittings.

Polariser.—This is fitted at one end of the trough, and consists of an ordinary Nicol prism with a removable light filter and a circular concentric half-shadow plate, ensuring a uniform and central illumination ; the adjustment of the shadow angle is provided for by rotating a milled head which moves a pointer across a divided index plate.

Analyser.—This consists of a Nicol prism mounted in a tube with a small telescope provided with a slow rotary movement actuated by a fine thread screw, the whole of which rotates in a ground coned fitting, by means of a spiral cut pinion gearing into spiral teeth cut on the outer edge of a 7¼ in. diameter circle, which allows of a full 180° movement. The outer face of the circle is divided into half degrees, every tenth degree being figured and by means of a Vernier provided with a magnifying glass, readings of two minutes can be made, and estimations of one minute or even less are not difficult. Provision is made for a sugar scale which can be divided as required, either to the scale used before the International Sugar Commission (Paris, 1900) or as used since that meeting.

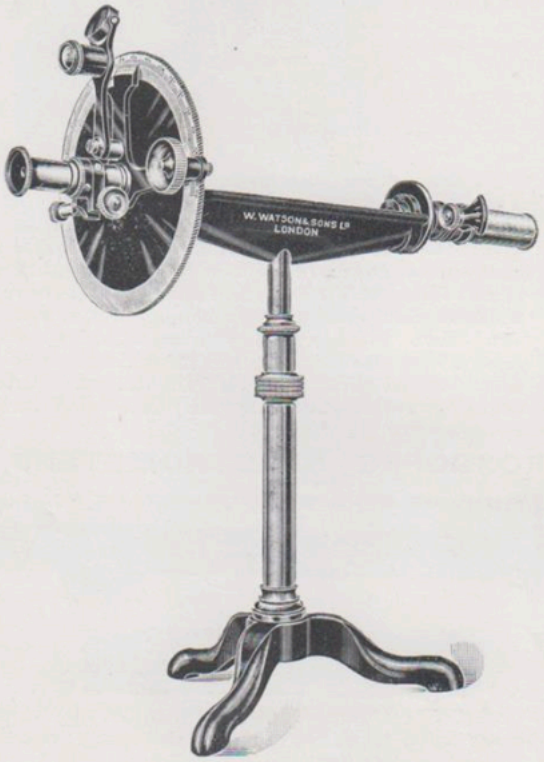
Finish.—The Polarimeters are finished in black enamel and bright lacquered brass, the enamel used being of a durable quality and not affected by the atmosphere of a chemical laboratory. The divisions of Circle and Vernier are silvered. Two Solution Tubes 20 c/ms. long are included.

Code Word :
Sugar

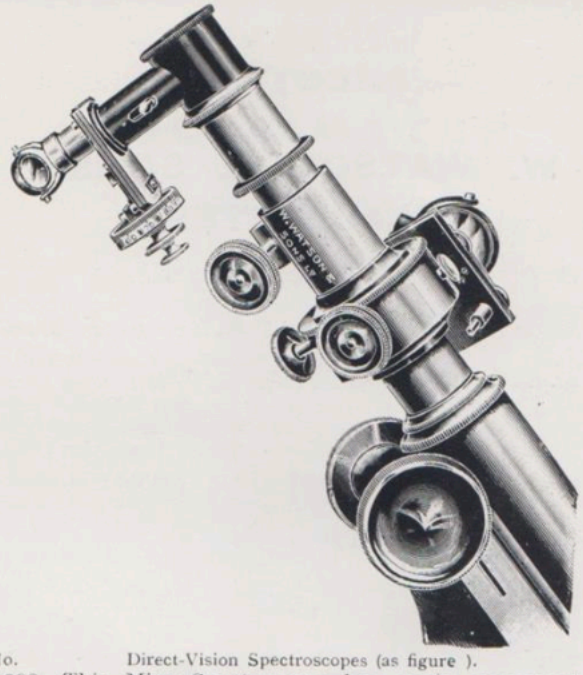
Price - £35.

W. WATSON & SONS' POLARIMETER.

MODEL "A."



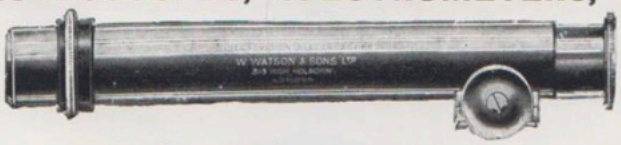
SPECTROSCOPE FOR MICROSCOPE.



Code Word.	No.	Direct-Vision Spectroscopes (as figure).	Price. £ s. d.
Mispec	B 3800	This Micro-Spectroscope has every movement for accurate direct and comparative observations. It takes the place of the ordinary Eyepiece and is clamped by means of a screw to the draw-tube top. It has rackwork to focus the spectra, adjustment to width of slit, plate to carry subjects for comparison and prism which can be turned aside when not required for showing two spectra in the field at one time. Fitted with wave length scale and divided drum. Complete in Mahogany Case with instructions for use	20 0 0

SPECTROSCOPES, SPECTROMETERS, ETC.

B 3802



B 3801

Bispec	B 3801	Pocket Spectroscope, with adjustable slit, showing many of Fraunhofer's lines, absorption bands in liquids, crystals, etc. In Morocco case . . .	3 5 0
Trispec	B 3802	Pocket Spectroscope, with achromatic lenses, and rackwork to focus, of superior quality. In Morocco case	8 8 0

A separate list is published giving particulars of Chemical Spectroscopes, Spectrometers, Polarimeters, Refractometers, Saccharimeters. Enquiries for these instruments are solicited.

WATSON'S UNIVERSAL PROJECTION APPARATUS.

IMPROVED 1922 MODEL **(or EPIDIASCOPE)**

For the projection of:

SOLID OBJECTS, Opaque.

TRANSPARENCIES—Lantern Slides—and

MICROSCOPIC OBJECTS.

WATSON'S UNIVERSAL PROJECTION APPARATUS

Is intended for use in the lecture hall or classroom. In a conveniently arranged form the apparatus combines for :—

(a) The projection of Solid Opaque Objects by incident light.

(b) The projection of Transparencies—Lantern Slides—by transmitted light.

(c) The direct projection of Microscopic Objects.

For the convenience of those who may not require the complete instrument, it can be supplied for either one or two of the purposes only.

The difficulty of projecting microscopic specimens with high magnifications is well known, and no means exist of demonstrating with a $\frac{1}{12}$ ins. Oil Immersion Objective on a large scale. It has to be remembered that the possibilities are strictly limited by the diaphragm, which at the back of such a lens is never more than $\frac{1}{4}$ in. diameter. The utmost that can be done is to pass through that small opening the most powerful light obtainable, and the design of the system has been specially studied to give the maximum effect. When a medium power objective, such as the $\frac{1}{6}$ in. and lower powers than this are used, results suitable for large audiences are obtained.

We are pleased at all times to give demonstrations of the working by appointment.

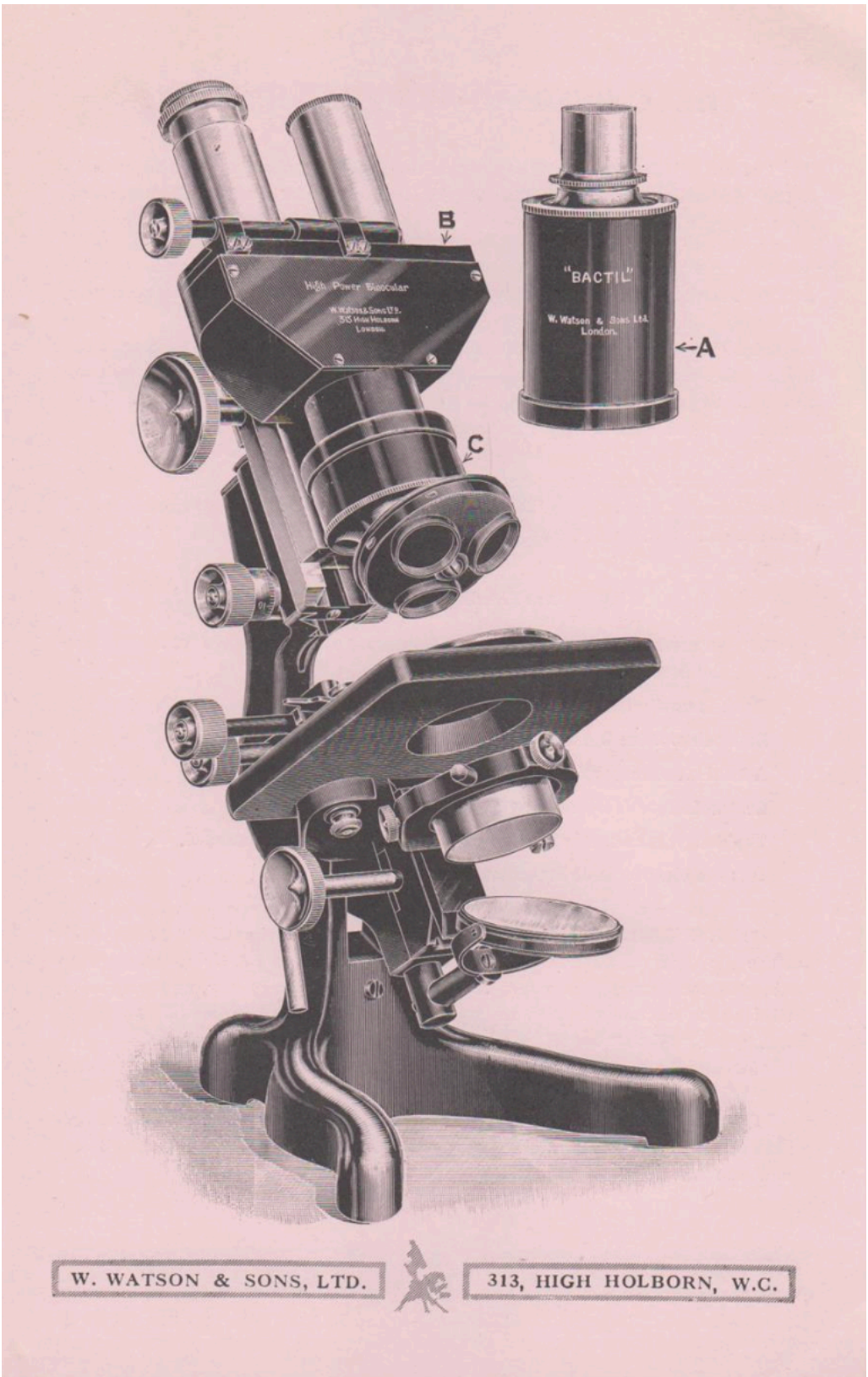
PRICE LIST.

The following prices include Arc Lamp, Resistance, and a supply of Carbons :—

		£	s.	d.
Outfit No. 1.	Complete apparatus for the projection of Opaque Objects only, with one projection lens	**75**	**0**	**0**
Outfit No. 2.	Apparatus for the projection of Lantern Slides with special additional projection lens, added to No. 1 outfit . extra	**25**	**0**	**0**
Outfit No. 3.	Apparatus for the projection of Micro. Objects, added to outfits Nos. 1 and 2, including two Objectives 2 ins. and $\frac{1}{2}$ in., and two Eyepieces . . . . . extra	**60**	**0**	**0**
	Cast-Iron Adjustable Stand	**15**	**0**	**0**
	Complete Universal Projection Apparatus	**175**	**0**	**0**

Full illustrated particulars of the above Projection Apparatus are published and will be sent post-free on application.

INDEX.



W. WATSON & SONS, LTD.

313, HIGH HOLBORN, W.C.

THE UNIVERSAL BINOCULAR BODY.

The use of the Binocular Body has in the past been restricted almost entirely to the Wenham pattern, which has not permitted of the use of higher than medium-power Objectives.

It is well known that, however good the vision may be, an object viewed with either eye singly is vastly inferior to the view obtained with both eyes simultaneously.

Binocular vision with the Microscope is no less striking. The object is seen in a manner that has never been possible through a monocular tube. It is natural to use the two eyes simultaneously, and the comfort derivable in such circumstances of microscopical work is very pronounced.

Disadvantages that have been associated with former attempts to make a high power Binocular Microscope do not exist in the Universal,as the following outstanding qualities will show.

THE UNIVERSAL BINOCULAR BODY.

Can be used with the lowest power Objective, and the highest power Oil Immersions.

There is no diminution in resolving power or definition.

Both tubes of the Binocular Body are equal in luminosity.

A brilliant stereoscopic effect is produced.

Ocular fatigue is obviated.

The design is so sturdy that no part is likely to become deranged.

It is the ideal form of Binocular Microscope.

CONSTRUCTION.—The Universal Body is intended primarily to be an interchangeable unit, which can be immediately attached to the Coarse adjustment fittings of the Microscope to replace an existing Monocular body, and *vice versa*. In this manner it can be fitted to any Microscope described in our Catalogue, excepting the " Kima " model. It is also supplied in a complete microscope, with the binocular body only, or with interchangeable monocular and binocular bodies.

The method of interchanging monocular and binocular bodies is by the provision of a separate receiving slide, on which either of the bodies can be immediately fitted and clamped.

W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.

The Nosepiece and Objectives remain in position, and are not removed with the bodies.

The inter-ocular adjustment is by means of a horizontal spiral screw, a divided scale being provided to show the exact measurements. An adjustment is fitted to the right hand Eyepiece for difference of vision, enabling those with unequal sight to obtain the best possible focus for each eye.

The prisms are of finest optical glass, of guaranteed durability.

Recommendations. The " Service " and " Bactil " Microscopes will be found particularly appropriate for use with the Universal body, or interchangeable bodies. The latter is particularly recommended for laboratory work.

PRICE LIST of the
BINOCULAR MICROSCOPE BODY.

	£	s.	d.
Universal Body mounted as an Eyepiece to fit into the body tube of any Microscope, complete with one pair of Eyepieces	10	0	0
" Service " Microscope, with Spiral Focussing Screw Underfitting, in polished mahogany case, fitted with Universal Binocular Body instead of the usual Monocular, with one pair of Eyepieces, complete in case ...	24	0	0
" Service " Microscope (as above), fitted with interchangeable monocular and Universal binocular bodies, with one pair of Eyepieces, complete in case	26	15	0
" Bactil " Microscope, with Mechanical Stage, Compound rackwork focussing and screw centring Substage, fitted with Universal Binocular body instead of the usual monocular, with one pair of Eyepieces, complete in case	39	10	0
" Bactil " Microscope, (as above), with separate interchangeable Universal Binocular and monocular bodies, the latter 37 m/m diameter, one pair of Eyepieces, complete in case	42	10	0

The Universal Body can be fitted to any Microscope described in our Catalogue, with the exception of the " Kima " model, provided that it is specified at the time of ordering, and we shall be glad to submit estimates for this purpose.

THE CASSEGRAIN
OIL IMMERSION DARK GROUND ILLUMINATOR.

MADE TO THE DESIGN AND COMPUTATION OF MR. E. M. NELSON,

Past President of the Royal Microscopical Society, and Quekett Club.

The important position that the Immersion Paraboloid has attained in numerous branches of microscopical work, particularly in the examination of living bacteria, has led to an investigation of the possibilities of:

Making the work easier, and
Improving the effect.

Mr. Edward Milles Nelson, whose work in the advancement of the technical side of Microscopy during the last forty years is known to all serious workers, has placed the result of his experimental work in our hands, and we are able to offer in his Cassegrain Dark Ground Immersion Paraboloid a great advance on any existing dark ground systems.

To appreciate it, it will be well, first of all, to review the conditions of working which prevail with all other dark ground illuminators.

(1) The Oil Immersion $\frac{1}{12}$ in. ordinarily in use has to be fitted with a funnel stop to reduce its numerical aperture to less than 1·0. As the ability of the lens to define fine detail depends on its numerical aperture, this means in effect that the efficiency of the lens is reduced in the ordinary way by about 25 per cent.

(2) Before the $\frac{1}{12}$ in. Oil Immersion Objective can be used for ordinary transparent objects, the Objective has to be removed from the Microscope, and the funnel stop taken out.

(3) Alternatively, Oil Immersion Objectives have been made with lower numerical aperture than 1·0 to obviate the insertion of the funnel stop, but such lenses are deficient in the full resolving power of the Objectives of larger aperture.

(4) There is great sensitiveness to slip thickness.

(5) A very brilliant illuminant is necessary.

All of these disadvantages the Cassegrain Immersion Paraboloid eliminates.

It gives a black background with any ordinary $\frac{1}{12}$ in. Objective of 1·30 N.A. or less. No funnel stop, therefore, is needed. It is not necessary to remove the Objective when changing the illumination.

The full efficiency for the first time, therefore, is offered of the 1·30 resolving power of the Oil Immersion lens with dark ground illumination. This feature alone may confer on the user information in his research work of untold value. It gives him something which he has not had the possibility of using before—the difference between 1·30 N.A. and less than 1·0 N.A., representing a limit of resolution in the latter case of 95,740 lines per inch with white light, compared with 117,746 lines per inch with the former.

The potential advantages are enormous.

W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.

The working distance is long, and a slip ranging from 1 mm. to 1·2 mm. in thickness can be used with equally satisfactory results.

The Cassegrain Dark Ground Immersion Paraboloid is designed on a principle which has not hitherto been employed, and another important aspect is that, unlike other existing forms, this Paraboloid is sufficiently illuminated with an oil lamp or an ordinary electric bulb, for all classes of work.

PRICE LIST of the
CASSEGRAIN IMMERSION PARABOLOID.

	£	s.	d.
Cassegrain Immersion Paraboloid, to work with any Oil Immersion Objective up to 1·30 N.A., where the mounting medium employed is water or a similar substance, or to work with any Oil Immersion Objective up to 1·40 N.A. if the refractive index of the mountant is above 1·526 ...			
Optical part only, interchangeable with the ordinary Abbe Illuminator optical part	2	15	0
Mount to fit in standard Understage or Substage, with centring screws or stop carrier	1	5	0

This latter fitting is necessary for all Microscopes which have not a centring Substage.

ELECTRIC ILLUMINATION.

For details and illustration see page 63.

	£	s.	d.
Electric light with fitting to attach to Cassegrain Immersion Paraboloid, with condensing lens, lamp, and 3 ft. flexible wire...	2	10	0

When it is desired to use the ordinary house current a resistance must be employed, and the following will suit any specified voltage or current :

Resistance for 100-125 volts	2	0	0
,, ,, 200-250 ,, ...	2	10	0
Extra Lamps ... ... each	0	1	8
Six volt battery in box with switch	1	12	6

CHANCE-WATSON FILTERS

For Photomicrographic and Visual Work.

Designed by - CHANCE BROS. & CO., Ltd., Smethwick, Birmingham

Obtainable only from W. WATSON & SONS, Ltd., 313, High Holborn, London, W.C.1

These Filters have been specially designed both for visual and Photomicrographic purposes. They are made from pot glass, thus their colour value is constant over a period of years.

The screens are being produced in ten different shades so as to cover all wave lengths from 4,300 to 7,000.

The selectivity of these Filters can be gauged from the illustration showing their performance with a Wedge Spectrometer.

In many cases an optically worked screen is unnecessary, and prices are therefore quoted for all these screens, both optically worked and unworked. Stock sizes, 2 inches square and $1\frac{3}{8}$ inches diameter, to fit Stop Carrier of Condenser Mounting.

Light Transmission. This is very important, and the attached list shows the percentage transmission with screens 2·5 to 3 mm. thick.

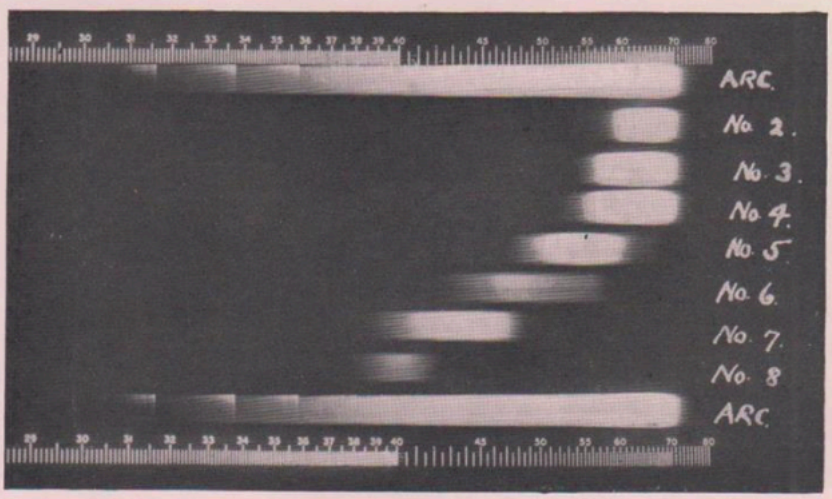
Special sizes will be supplied to order at 3s. per square inch extra optically worked ; 1s. per square inch extra unworked.

PERCENTAGE TRANSMISSIONS—Thickness 2·5 to 3·0 mm. :

Number	1	2	3	4	5	6	7	8	9	10
Colour	Ruby.	Red.	Deep Orange.	Orange.	Green.	Blue-Green.	Blue.	Violet.	Neutral.	Day-light equiv.
Wave Length										
7000	65	73	83	76	—	—	14	15	59	13
6700	60	74	78	80	—	—	—	—	27	9
6400	50	74	80	80	—	—	—	—	17	10
6100	26	60	84	83	5	—	—	—	18	14
5800	—	8	48	73	14	2	—	—	21	25
5500	—	—	3	48	34	11	2	—	21	38
5200	—	—	—	1	38	33	3	—	21	42
4900	—	—	—	—	11	40	16	—	21	61
4600	—	—	—	—	—	34	57	5	18	78
4300	—	—	—	—	—	30	79	30	26	80

CHANCE-WATSON FILTERS

For Photomicrographic and Visual Work.



PRICES.

	EACH s. d.
All colours, Nos. 1 to 10, plain glass disc, $1\frac{3}{8}$ in. diameter, to fit Stop Carrier on Condenser Mounting, not optically worked ..	2 6
Ditto. ditto. optically worked ..	4 6
All colours, 2 in. ×2 in., suitable for Photomicrography, not optically worked	3 0
Ditto. ditto. optically worked	5 0
All colours, 4 in. ×4 in., suitable for Photomicrography, not optically worked	10 0
Ditto. ditto. optically worked	15 0

Obtainable from

W. WATSON & SONS, LTD. 313, HIGH HOLBORN, W.C.