

R.A. Ward

THIRD EDITION, 1869.

AN ILLUSTRATED DESCRIPTION
OF
FIRST-CLASS
ACHROMATIC MICROSCOPES,
OBJECT GLASSES,

Microscopical Instruments & Apparatus,

MANUFACTURED BY

EDMUND WHEELER, F.R.M.S.,

CORRESPONDING MEMBER OF THE AMERICAN MICROSCOPICAL
SOCIETY, NEW YORK,

**48, TOLLINGTON ROAD, HOLLOWAY,
LONDON, N.**

INTERNATIONAL EXHIBITION, 1862.

PRIZE



MEDALS

Were awarded to the Exhibitors of ACHROMATIC OBJECT
GLASSES for MICROSCOPES

MADE BY

**EDMUND WHEELER, 48, TOLLINGTON ROAD, HOLLOWAY,
LONDON, N.**

INDEX.

	PAGE.
LIST OF ACHROMATIC OBJECT GLASSES	3
FIRST-CLASS ACHROMATIC MICROSCOPES	4—11
EDUCATIONAL MICROSCOPE, COMPLETE	12
MICROSCOPICAL APPARATUS AND INSTRUMENTS	13
POCKET MAGNIFIERS, DISSECTING MICROSCOPES, ETC.	14
TELESCOPES, MICROSCOPIC OBJECTS, METEOROLOGICAL INSTRUMENTS, DISSOLVING VIEW LANTERNS AND SLIDES	15
ELECTRICAL AND PHILOSOPHICAL INSTRUMENTS FOR EXPERIMENTAL AND PRACTICAL USE	16

Any one having a preference for Microscopes, Objectives, or other Instruments by MESSRS. BECK, ROSS, POWELL and LEALAND, or any other maker, can be supplied advantageously by EDMUND WHEELER, at the manufacturer's prices.

TERMS.

All prices in this Catalogue are Net for Cash (without discount) on receipt of the Invoice.

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CATALOGUES ARE SUPPLIED WITHOUT CHARGE.

ACHROMATIC OBJECTIVES.


FIRST-CLASS ACHROMATIC OBJECTIVES.

Focal Length.	Angular Aperture.	Linear Magnifying Power with the respective eye-pieces.				Price.	Lieberkuhn's Reflectors, extra.
		A	B	C	D		
inches.	degrees.					£ s. d.	£ s. d.
3	12	13	20	35	56	2 2 0	0 17 6
2	15	20	32	55	90	2 2 0	0 15 0
1½	20	25	40	70	112	2 10 0	0 15 0
1	25	37	60	105	170	2 10 0	0 12 0
¾	30	60	100	145	270	2 10 0	0 10 0
½	75	95	153	265	420	4 4 0	...
¼	100	195	310	540	850	4 4 0	...
1/8	130	320	510	700	910	6 6 0	...
1/16	140	420	670	900	1200	8 8 0	...

All powers higher than two-thirds have the adjustment for covered and uncovered objects.

Achromatic Objectives with less Angular Aperture.

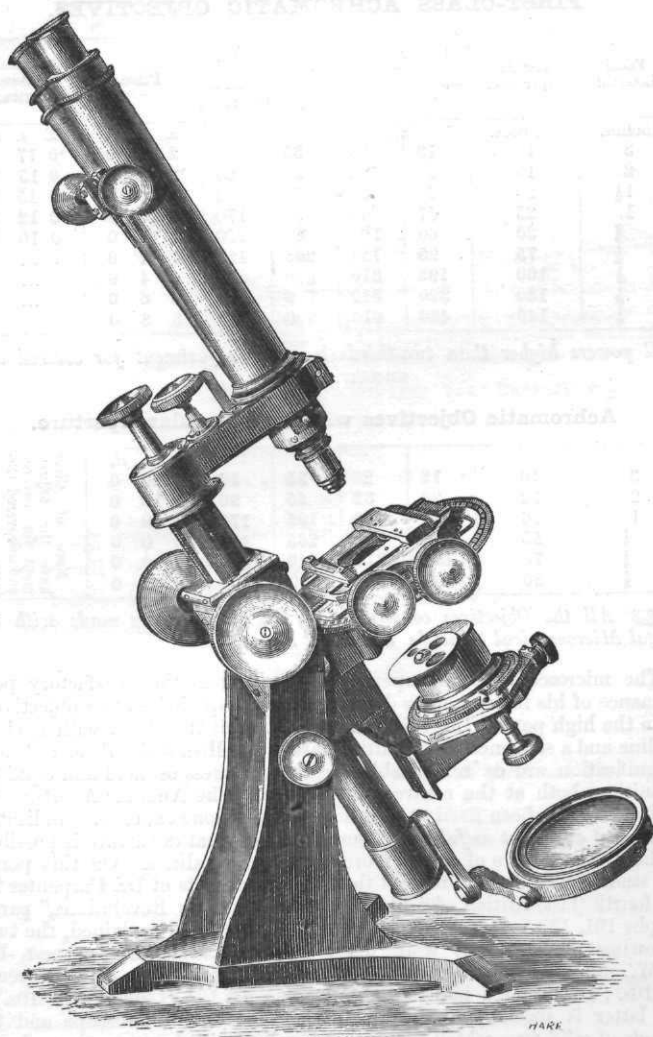
						£ s. d.	None of these have the adjustment for covered and uncovered Objects.
3	10	13	20	35	56	1 10 0	
2	12	20	32	55	90	1 10 0	
1	16	37	60	105	170	1 10 0	
¾	55	95	153	265	420	3 0 0	
½	70	195	310	540	850	2 0 0	
¼	80	195	310	540	850	3 0 0	

 *All the Objectives constructed by E. Wheeler are made with the Royal Microscopical Society's Universal Screw.*


The microscopist soon experiences how much the satisfactory performance of his instrument is dependent on the qualities of its objectives.

In the high powers these combinations exhibit the object with a clear outline and a sharpness of definition rarely excelled, while those of lower magnification are as remarkable for their flatness of field and equable definition, both at the centre and the edge. The Angular Aperture in each power has been fixed at that degree which long experience indicates as the *best and most useful*, and from which no great departure is possible without the sacrifice of much more important qualities. On this point the student will do well to read the lucid arguments of Dr. Carpenter in his fourth (last) edition of "The Microscope and its Revelations," paragraphs 131, 132. In accordance with his views there explained, the two following object-glasses were made at Dr. Carpenter's request by E. W., jun.: one a quarter-inch, with an angular aperture of 70 degrees, £2 10s.; the other a half-inch, 38 degrees, £3 10s. (Lieberkuhn, 10s.); the latter is specially applicable to the binocular microscope and to objects of *solid form* which require the quality called *penetration*. In a note, page 178, in the above-named book, the following reference is made: "*The Author feels it due to Mr. Wheeler, who has specially applied himself to carry out his views on this point, to state that the half-inch and quarter-inch constructed by him of the apertures named are at the same time excellent in quality and very moderate in price.*"

FIRST-CLASS MICROSCOPES.



MICROSCOPE STAND, A.

 Scale, One fourth of the original size.

MICROSCOPE STAND, A.

THE Binocular Microscope A, on the opposite page, is of **FIRST-CLASS** quality in every respect. The stand is firm and free from tremour under observation, even while the adjustment of apparatus may be going on. The Binocular mechanism very superior, realising both the Stereoscopic and Perspective Views of the object with remarkable ease and perfection. In addition to a rectangular motion of one inch in each direction and rotation by hand; the whole stage rotates concentrically and independently by means of a Rack and Pinion on a circular plate, graduated so as to form a Goniometer or Position Micrometer. The Secondary or Sub-Stage has adjusting screws for centering all the supplementary apparatus which it receives, and affords facilities for the manipulation and use in the most convenient and efficient manner, possessing also the means of Rotation by Rack and Pinion, with graduated divisions at the circumference. The fine adjustment is of the most delicate and perfect construction, the index reading off differences in the focal position of the Objective to the five-thousandth part of an inch, perceptible to the observer's eye.

Price of this Microscope as engraved, including four Eye Pieces, £32.

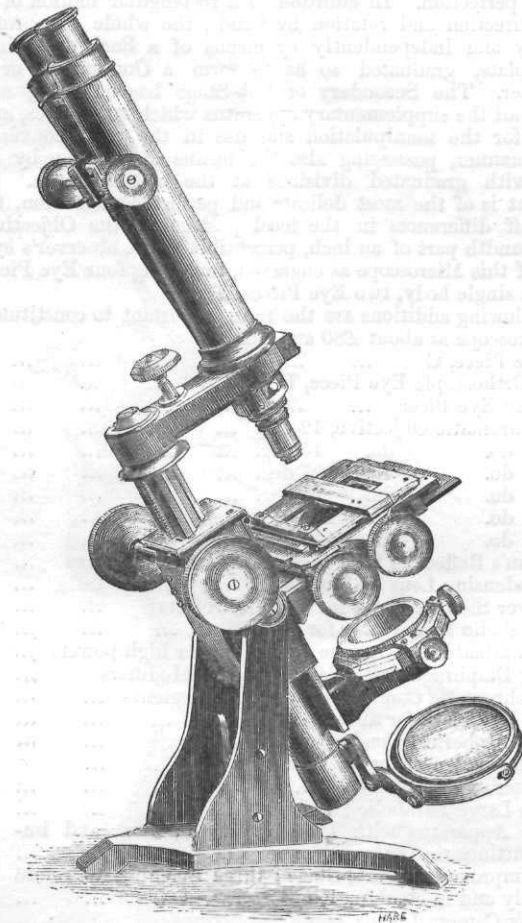
If with single body, two Eye Pieces, £26.

The following additions are the most important to constitute a First-class Microscope at about £80 and £95:—

	£	s.	d.
Third Eye Piece, C	...	0	16 0
Kelner's Orthoscopic Eye Piece, D	...	1	4 0
Micrometer Eye Piece	...	1	4 0
3-inch Achromatic Objective, 12 deg.	...	2	2 0
2-inch do. do. 15 deg.	...	2	2 0
1-inch do. do. 25 deg.	...	2	10 0
$\frac{1}{2}$ -inch do. do. 75 deg.	...	4	4 0
$\frac{1}{4}$ -inch do. do. 100 deg.	...	4	4 0
$\frac{1}{8}$ -inch do. do. 140 deg.	...	8	8 0
Lieberkuhn's Reflectors for 1-inch and $\frac{1}{2}$ -inch Objectives	...	1	5 0
Large Condensing Lens on Stand	...	1	10 0
Large Silver Side Reflector for Opaque Objects	...	1	1 0
Silver Parabolic Illuminator for do.	...	1	1 0
Beck's Illuminator for Opaque Objects under high powers	...	0	10 6
Revolving Diaphragm with Rainey's Light Modifiers	...	1	0 0
Gillet's Achromatic Condenser with improvements	...	6	6 0
Centering Eye Piece for ditto	...	0	14 0
Read's Hemispherical Condenser	...	1	10 0
Dark Field Condenser for low powers	...	0	15 0
Set of Lister's Dark Wells	...	0	12 0
Wenham's Large Parabolic Reflector	...	1	10 0
Polarising Apparatus with large Prisms in Box, and improved fittings to Analyzer	...	2	10 0
Darker's Improved Selenite Stage; three Selenites to rotate separately and in combination	...	3	10 0
Wollaston's Camera Lucida, improved fittings	...	1	10 0
Brooke's Double Arm for two Objectives	...	1	10 0
Maltwood's Object Finder in Case	...	0	6 6
Large Live Box, 12s. 6d.; Stage Micrometer, in Case, 7s.	...	0	19 6
Best Lever Compressorium, 30s.; ditto for high power, 7s. 6d.	...	1	17 6
Two Polype Troughs, 11s.; Frog Plate, 10s. 6d.	...	1	1 6
Set of Animalcule Tubes in Case	...	0	3 0
Set of Stage Plates and Cells	...	0	7 0
Stage Tweezers and Curved Forceps	...	0	12 6
Spanish Mahogany Case, Plate Glass Door, and fittings	...	6	0 0

£65 0 0

FIRST-CLASS MICROSCOPES.



MICROSCOPE STAND, B.

Scale, One fourth of the original size.

MICROSCOPE STAND, B.

THIS Instrument, as seen by the engraving, is constructed on the same general plan as A, but is rather smaller. The Stage has the usual rectangular motion and one of rotation, without Rack and Pinion. In workmanship, finish, accurate fitting, and optical qualities, it is the same as A. The Sub-Stage has a rotating cylinder, with adjustments for centering the apparatus which it receives, and provides for their use and application with freedom. The flat and concave Mirror is fitted on a double arm to facilitate the oblique reflection of light.

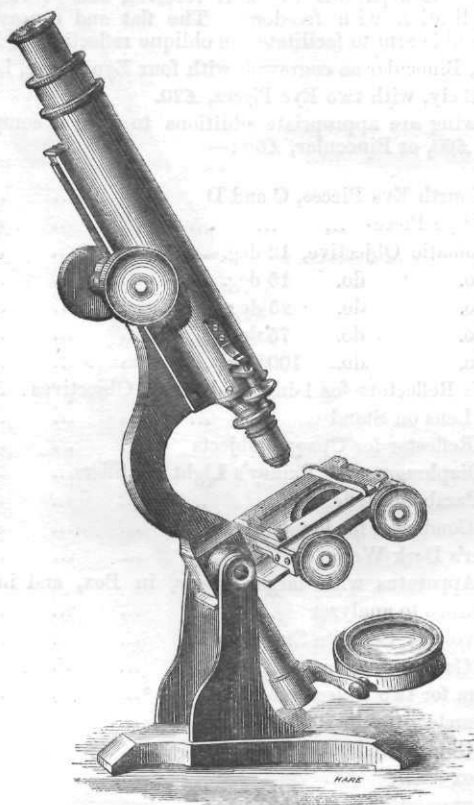
The Price, Binocular as engraved, with four Eye Pieces, is £25.

If single Body, with two Eye Pieces, £20.

The following are appropriate additions to form a complete Single Microscope, £60, or Binocular, £65 :—

	£	s.	d.
Third and Fourth Eye Pieces, C and D	1 12 0
Micrometer Eye Piece	1 4 0
3-inch Achromatic Objective, 12 deg.	2 2 0
2-inch do. do. 15 deg.	2 2 0
1-inch do. do. 25 deg.	2 10 0
$\frac{1}{2}$ -inch do. do. 75 deg.	4 4 0
$\frac{1}{4}$ -inch do. do. 100 deg.	4 4 0
Lieberkuhn's Reflectors for 1-inch and $\frac{1}{2}$ -inch Objectives	1 5 0
Condensing Lens on Stand	1 1 0
Silver Side Reflector for Opaque Objects	1 1 0
Revolving Diaphragm with Rainey's Light Modifiers...	1 0 0
Wenham's Parabolic Reflector	1 10 0
Dark Field Condenser for low powers	0 15 0
Set of Lister's Dark Wells	0 12 6
Polarizing Apparatus with large Prisms, in Box, and improved fittings to analyzer	2 10 0
Darker's Revolving Selenite Stage	2 2 0
Wollaston's Camera Lucida	1 0 0
Brooke's Arm for two Objectives	1 10 0
Stage Micrometer, 100 to 1000, in Case	0 7 0
Maltwood's Object Finder, in Case	0 6 6
Best Live Box	0 8 6
Spring Compressorium	0 15 0
Do. do. for high powers	0 7 6
Polype Trough, 5s. ; Glass Frog Plate, 5s.	0 10 0
Set of Animalcule Tubes, in Case	0 3 0
Set of Stage Plates and Cells	0 6 6
Stage Tweezers, 8s. 6d. ; Curved Forceps, 4s.	1 12 6
Mahogany Case and fittings for Apparatus	4 4 0
			<hr/> <hr/>
			£40 0 0

FIRST-CLASS MICROSCOPES.



MICROSCOPE STAND, C.

 *Scale, One fourth of the original size.*

MICROSCOPE STAND, C.

SINCE the Engraving on the preceding page was made, the Stand C has been greatly improved in many important respects. While rather smaller than B, it is of a very convenient size. Its form is similar to that originally designed by J. J. LISTER, Esq., and possesses many recommendations. The Stage, which is remarkably thin, has a rotating Object Plate, and a rectangular motion of three quarters of an inch, both in the vertical and horizontal direction. The Polarizer and Sub-Stage appliances are fixed by means of a sliding dovetail plate, with a stop to ensure their concentric position when in use.

Price of Microscopic Stand C, with two Eye Pieces, £15.

If Binocular, with four Eye Pieces, £20.

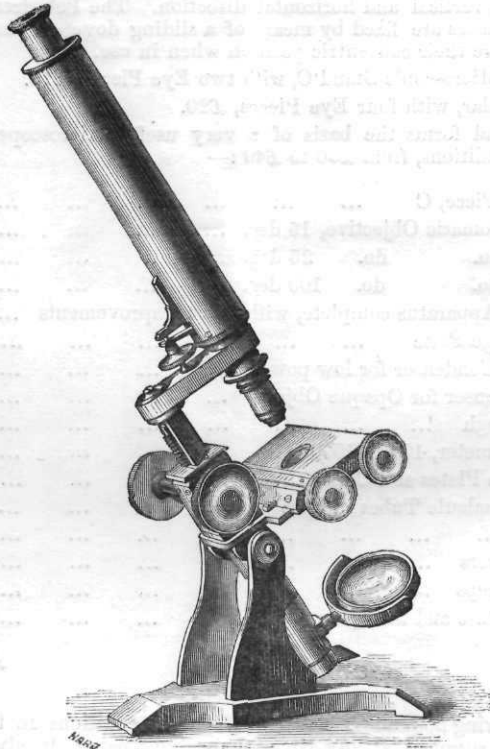
This Stand forms the basis of a very useful Microscope, with the following additions, from £30 to £40 :—

	£	s.	d.
Third Eye Piece, C	0	16	0
2-inch Achromatic Objective, 15 deg.	2	2	0
1-inch do. do. 25 deg.	2	10	0
$\frac{1}{4}$ -inch do. do. 100 deg.	4	4	0
Polarizing Apparatus complete, with latest improvements ...	2	2	0
Selenite Stage Plate	0	5	0
Dark Field Condenser for low powers	0	10	0
Stand Condenser for Opaque Objects	0	17	6
Polype Trough	0	6	0
Stage Micrometer, 100 to 1000	0	6	0
Set of Stage Plates and Cells	0	5	0
Set of Animalcule Tubes in Case	0	3	0
Live Box	0	5	0
Stage Tweezers	0	7	6
Curved Forceps	0	1	6
Mahogany Case and fitting Apparatus	2	0	0
	<hr/> <hr/>		
	£17	0	6

The following appliances constitute efficient additions to the above, that can be supplied at any time, the cabinet being already fitted for their reception.

	£	s.	d.
Fourth Eye Piece, D	0	16	0
Wenham's Parabolic Reflector	1	10	0
Webster's, or The Universal Achromatic Condenser ...	4	4	0
Wollaston's Camera Lucida	1	0	0
Lieberkuhn's Reflector for 1-inch Objective	0	15	0
Best Spring Compressorium	0	15	0
Set of Lister's Dark Wells and fittings... ..	0	10	0
Glass Frog Plate	0	5	0

FIRST-CLASS MICROSCOPES.



MICROSCOPE STAND, D.



Scale, One fourth of the original size.

MICROSCOPE STAND, D.

THE Microscope D is formed on the same general design as B, but is smaller. The Stand, as shown, has a rack and pinion, and fine adjustment for focussing. Rectangular screw and rack motion to the stage. A rotating Diaphragm (not engraved). Two Huyghenian Eye Pieces A and B. Concave and flat mirror.

Price of the Microscope Stand D, as above, £7.

If Binocular, with four Eye Pieces and Rack and Pinion, £12.

These Stands, with the apparatus below, will constitute a Microscope from £15 to £25.

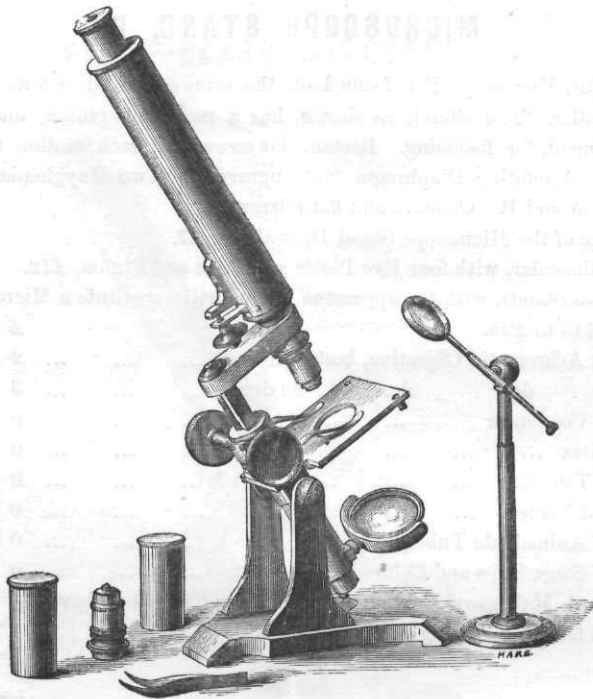
	£	s.	d.
1-inch Achromatic Objective, best, 25 deg.	2	10	0
$\frac{1}{4}$ -inch do. do. 80 deg.	3	0	0
Stand Condenser	0	12	6
Live Box	0	5	0
Stage Tweezers	0	5	0
Curved Forceps	0	1	6
Set of Animalcule Tubes, in Case	0	3	0
Set of Stage Slips and Cells	0	2	0
Polished Mahogany Cabinet, with fittings, for the above, and for the following extra appliances	1	1	0

£8 0 0

	£	s.	d.
C Eye Piece	0	12	0
3-inch Achromatic Objective, 10 deg.	1	10	0
2-inch do. do. 12 deg.	1	10	0
$\frac{1}{2}$ -inch do. do. 55 deg.	3	0	0
Lieberkuhn's Reflector to 1 inch	0	15	0
Do. do. $\frac{1}{2}$ inch	0	10	0
Neutral Tint Camera for Drawing	0	8	0
Best Polarizing Apparatus, with latest improvements	2	2	0
Stage Selenite plate	0	2	0
Illuminator for dark field	0	8	0
Stage Micrometer, 100 and 1000	0	5	0

£11 2 0

NEW EDUCATIONAL MICROSCOPE.



NEW EDUCATIONAL MICROSCOPE, E.

IN CABINET COMPLETE, AS ENGRAVED, £5 5s.

THIS Microscope has a fine adjustment for focussing. The Stand is entirely of brass, and it forms without exception the best instrument ever produced at the price; the following apparatus being fitted with it in a polished mahogany case:—

Huyghenian Eye Piece (A).

1-inch Object Glass, 16° Angular Aperture.

$\frac{1}{2}$ -inch do. 75° do.

Condensing Lens on separate Stand.

Pair of Pliers, Four Stage Plates and Cells.

It is capable of receiving the following extra appliances:—

	£	s.	d.
Polariscope, 30s.; Selenite, 2s.; B Eye Piece, 10s.; Live Box, 3s.	2	5	0
2-inch Object Glass, 30s.; Micrometer, 5s.; Spot Lens, 8s. 6d.	2	3	6
Camera Lucida, for drawing, 7s. 6d.; Stage Tweezers, 5s. ...	0	12	6

£5 1 0

MICROSCOPICAL APPARATUS, &c.

	£	s.	d.
Binocular addition to any Microscopes where practicable.			
With One extra Eye Piece, without Rackwork ...	3	10	0
With Two do. with Rack adjustments ...	5	5	0
Extra Eye Pieces, A and B, 10s. to 15s.; C and D ...	0	16	0
Erecting Eye Piece for dissecting ...	1	0	0
Improved Micrometer Eye Piece ...	1	4	0
Kelner's Orthoscopic Eye Piece, C or D, double-size field ...	1	4	0
Sorby's Spectroscope ...	£5	5s.	to 5 15 0
Bull's Eye Condenser, on stand, 7s. 6d., 12s. 6d., 17s. 6d., 21s., and	1	10	0
Webster's Achromatic Condenser ...	£1	15s.	and 4 4 0
Hall's Universal do. and appliances ...	£3	to 5	0 0
Gillet's Achromatic do. with latest improvements ...	6	6	0
Eye Piece for centering do. ...	0	14	0
Plain Achromatic Condenser, with $\frac{1}{4}$ -inch objective, central and annular stops ...	2	2	0
Reade's Hemispherical or Kettle-drum Condenser ...	1	10	0
Set of Rainey's Light Modifiers ...	0	7	6
Camera Lucida, Wollaston's ...	20s.	and 1	10 0
" " Neutral tint glass ...	7s. 6d.	and 0	8 6
Polarizing Apparatus ...	30s., 35s., and	2	2 0
Selenites, selected colours... 2s. each; best, brass mounted	0	5	0
Set of Darker's do. revolving, brass mounted ...	2	2	0
Darker's New Series of 3 Selenites, to rotate either singly or combined, showing 13 colours and complementary tints	3	10	0
Lister's set Dark Wells ...	10s. 6d.	and 0	12 6
Dark Field Condenser, with adjustment ...	8s. 6d.	to 0	15 0
Wenham's Parabolic Reflector ...	21s.; best	1	10 0
Silver Side Reflector, for opaque objects ...	1	1	0
Silver Parabolic Stage Reflector... ..	1	1	0
Beck's Illuminator, for opaque objects under high power ...	0	10	6
Amici's Prism, for oblique illumination ...	2	2	0
Nachet's do. do. do. ...	1	1	0
Rectangular do. reflection of parallel rays ...	2	0	0
Brooke's Arm, for two objectives, 30s.; for 3, 50s.; for 4	3	10	0
Stage Micrometer, ruled 100 and 1000 ...	...5s.	and 0	6 0
Maltwood's Object Finder, in case ...	0	6	6
Forceps, straight and curved ...	1s. each	to 0	5 0
Stage Tweezers, on jointed arm ...	...5s.	and 0	8 6
Glass Polype Trough, complete ...	4s., 5s., and	0	6 0
Live Boxes, for insects, &c. ...	3s. and 5s. each	to 0	8 6
Animalcule or Dipping Tubes, set of 3 in case ...	0	3	0
Frog and Fish Plate, complete in glass or metal ...	5s.	0	10 6
Glass Fish Boxes ...	0	7	6
" Stage Plates, various ...	...1s.	and 0	2 6
Spring Compressorium, 16s.; do. for high power ...	0	7	6
Best Lever do. 35s.; Inverting do. ...	21s.	and 1	5 0
Microscope Lamps for Gas Oil, Paraffin, &c. ...	5s.	to 2	10 0
Glass Shades and Stands for Microscopes ...	... 10s.	to 2	0 0

OPTICAL INSTRUMENTS.

PORTABLE MICROSCOPES, &c., suitable for the Naturalist, Amateur, &c.

	£	s.	d.
Single Pocket Magnifying Lens, in horn case	0	1	0
Do. do. higher power	0	1	6
Do. do. Ladies' Botanical	0	2	0
Double Pocket Lens, forming three powers (horn case) ...	0	3	0
Triple do. do four do. do.	0	5	0
A beautifully corrected combination of three Lenses, with Diaphragm, in tortoiseshell and silver mounting, possess- ing remarkably fine definition, and flat field of view ...	0	10	0
The same, with fine Coddington Lens added	1	1	0
Any of the above fitted with a stand for table use ... extra	0	6	0
Botanical Microscope, two powers, in morocco case ...	0	5	0
Stanhope Lens	2s. 6d. to	0	5
Coddington Lens, in silver case for watch guard ...	8s. 6d. to	0	12
Coddington Lens, in tortoiseshell or German silver ...	0	5	0
Solar Burning Glass, in horn case	0	1	6
Eye and Object Glasses for Amateurs making Telescopes, 2s. to	0	5	0

SUPERIOR POCKET MICROSCOPE FOR DIATOMACEÆ AND DESMIDIEÆ.

This instrument supplies a want long felt by the collectors of Diatomaceæ. It is light, and small enough for the waistcoat pocket, being $3\frac{1}{2}$ inches long and $\frac{1}{2}$ inch diameter. It consists of a Huyghenian Eye Piece, a $\frac{1}{2}$ -inch French Achromatic Triplet, and a glass stage on which the objects are placed. The definition is excellent—a good field and a magnifying power of 100 diameters, under which most of the genera and species of the diatomaceæ may be recognised. Price 21s.; postage 6d. extra.

READING GLASSES FOR MAPS, PRINTS, PHOTOGRAPHS, &c.

Best lenses, Ebony handles, Electrum frames.

2-inch, 3s.— $2\frac{1}{2}$ -inch, 4s.—3-inch, 5s.— $3\frac{1}{2}$ -inch, 6s.— $3\frac{1}{2}$ -inch, 7s.—
 $3\frac{3}{4}$ -inch, 8s. 6d.

DISSECTING MICROSCOPES.

One of the most simple and useful instruments of this class, consists of a Brass Stand with an upright sliding stem, carrying a horizontal arm moveable in any direction by universal joints, and fitted at one end with a cell for the reception of three lenses, of 2-inch, 4-inch, and 6-inch focus, respectively. Price 25s.

A more complete Dissecting Microscope, that has been favourably noticed by Dr. Carpenter, consists of a brass frame and legs supporting a circular glass stage plate, 4 inches diameter. Below is a mirror to facilitate the dissection of transparent objects, and above a condensing lens for such as are opaque. Three simple powers of 2-inch, 1-inch, and $\frac{1}{2}$ -inch focus are adapted to a brass arm, and their foci adjusted by rack and pinion. The price is £2 in mahogany cabinet.

Woodcut Illustrations of the above Microscopes can be supplied.

FIRST-CLASS ACHROMATIC TELESCOPES.
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