

H. W. ENGLISH

Specialists in Optics

Optical Catalogue



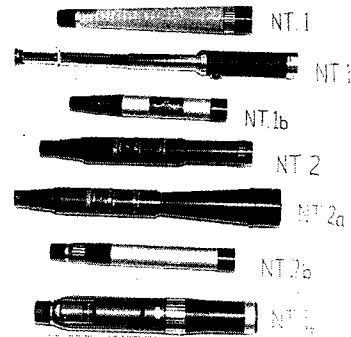
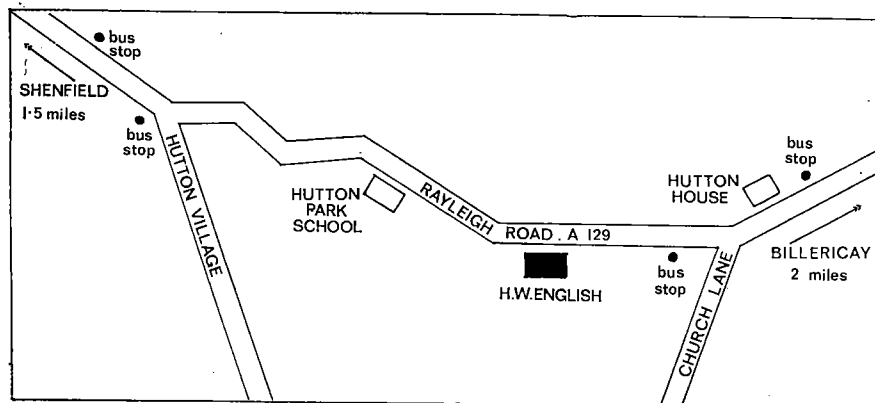
**469 RAYLEIGH ROAD, HUTTON
BRENTWOOD, ESSEX CM13 1SU**

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TERMS AND CONDITIONS OF BUSINESS

- All goods are offered subject to availability on receipt of order.
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- Wherever possible all orders are despatched within seven days of receipt. In cases where this cannot be accomplished the customer will be notified immediately.
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- All claims for loss or damage in transit must be made in writing within seven days of delivery. Do not return goods until we advise you to do so; We cannot accept responsibility for goods sent to us without our written consent.
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- All goods are cash with order. No hire purchase terms or C.O.D. Prices are applicable to U.K. only; overseas orders (including Ireland) by written quotation.
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 - 15 per cent discount for cash payment.
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- All prices shown in this catalogue **INCLUDE** value added tax at the current rate. Our VAT registration number is 246 3806 55.

Our hours of business, both shop and office, are 9 a.m. to 1 p.m. and 2 p.m. to 5.30 p.m. from Mondays to Saturdays. We are closed all day Sundays.



NT.1. 25 power. 30mm diameter objective. 1.1 degree field of view. Bloomed. Erect image. Objective focussing, closest focussing distance 10 feet. Length 12". Overall diameter 1 1/4". Weight 10 ounces. With tripod bush.

NT.1a. Variable power, 10 to 30. 30mm diameter objective. Maximum field of view 2.3 degrees. Bloomed. Erect image. Drawtube focussing, closest focussing distance 9 feet. Length (closed) 6 1/2", (open) 15 3/4". Overall diameter 1 1/2". Weight 11 ounces. Supplied with small carrying case.

NT.1b. 15 power. 30mm diameter objective. 2.5 degree field of view. Bloomed. Erect image. Drawtube focussing, closest focussing distance 2 feet. Length 9 1/2". Overall diameter 1 3/8". Weight 4 1/2 ounces. The good field of view, high luminosity, and unusually

close focussing facility coupled with an achromatic object glass of unusually high quality for an instrument in this price range make this instrument useful for a large number of purposes where expenditure must be kept to a minimum.

NT.2. Zoom 9-30 power. 30mm diameter objective. Maximum field of view 5 1/2 degrees. Bloomed. Erect image. Helical focussing, closest focussing distance 18 feet. Length 12". Overall diameter 1 1/2". Weight 12 ounces. With tripod bush.

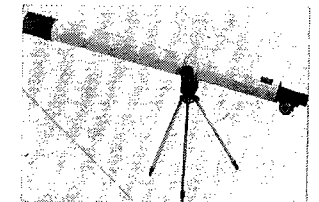
NT.2a. Zoom 15-60 power. 50mm diameter objective. Maximum field of view 3.3 degrees. Bloomed. Erect image. Helical focussing, closest focussing distance 36 feet. Length 15". Overall diameter 2 1/4". Weight 14 ounces. With tripod bush.

NT.2b. Zoom 6-18 power. 30mm diameter objective. Maximum field of view 6 degrees. Bloomed. Erect image. Drawtube focussing, closest focussing distance 7 feet. Length 10 1/2". Overall diameter 1 3/8". Weight 8 ounces.

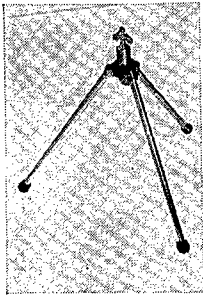
NT.4. Zoom 8-25 power. 30mm diameter objective. Maximum field of view 3.8 degrees. Bloomed. Erect image. Objective focussing, closest focussing distance 15 feet. Length 12 1/2". Overall diameter 2". Weight 19 ounces.

THE ABOVE FIVE ZOOM TELESCOPES ALL MAKE USEFUL SHORT RANGE SPOTTING 'SCOPES.

NT.3. Powers 15, 30 and 45. 40mm diameter objective. Maximum field of view 1 1/2 degrees. Bloomed. Erect image. Rack and pinion focussing, closest focussing distance 28 feet. Length 24". Overall diameter 2 1/4". Weight 36 ounces. On metal table tripod, with yoke mount.



NT.4a. Zoom 12 to 40 power. 40mm diameter objective. Maximum field of view 2 degrees. Bloomed. Erect image. Helical focussing of object lens, closest focussing distance 20 feet. Length 16 1/2". Diameter 2". Weight 1 lb 6 oz. With standard tripod bush.



NT.5

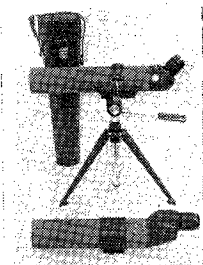
NT.5. Table tripod, metal construction. Height 9". Weight 10 ounces. With standard $\frac{1}{4}$ " screw fitting for cameras or small telescopes.

NT.6. Prismatic spotting telescope, 30 power. 60mm diameter objective. $1\frac{1}{4}$ degree field of view. Bloomed. Erect image. Eyepiece focussing, closest focussing distance 40 feet. Length 12". Overall diameter $2\frac{3}{4}$ ". Weight 22 ounces. With metal table tripod and yoke mount. This telescope is, in our opinion, the best bet where a relatively inexpensive spotting telescope of good optical quality is required.

NT.8. Powers 30, 48 and 100. 50mm diameter objective. Maximum field of view 1 degree. Bloomed. Erect image. Rack and pinion focussing. Length 25". Overall diameter $2\frac{1}{2}$ ". Weight 3 lb 7 oz. Supplied with 3 eyepieces, prism diagonal and metal table tripod.

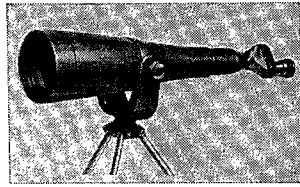
NT.8a. Telescope same as NT.8 but supplied with full length wood and metal tripod.

NT.9. Zoom 9-30 power. 40mm diameter objective. Maximum field of view 3 degrees. Bloomed. Erect image. Objective focussing, closest focussing distance 32 feet. Length $14\frac{1}{4}$ ". Overall diameter 2". Weight 2 lb. 10 oz. On de luxe metal tripod with pan and tilt head.

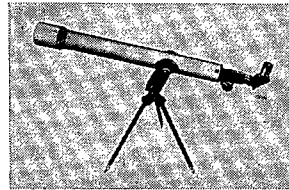


NT.11. Prismatic spotting telescope. 22 power. 60mm diameter objective. 2 degree field of view. Bloomed throughout. Erect image. Eyepiece focussing, closest focussing distance 28 feet. Length $15\frac{1}{4}$ ". Overall diameter $2\frac{1}{2}$ ". Weight 1 lb. 10 oz. Unusually sharp definition. Available either with all metal adjustable low level Tripod, or with clamp fitted with standard $\frac{1}{4}$ " screw fitting for attachment to a photographic Tripod.

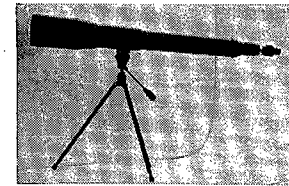
NT.11a. Specification as for NT.11, but fitted with 45 degree angled eyepiece unit. Tripod and clamp as for NT.11. A good quality leather case is also available for either NT.11 or 11a. Both NT.11 and 11a may be increased in power to 30, 40 or 50 magnification by fitting extra eyepieces, which we also stock.



NT.6



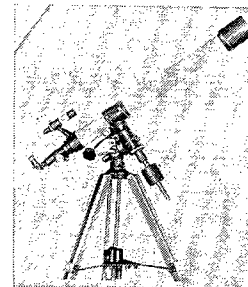
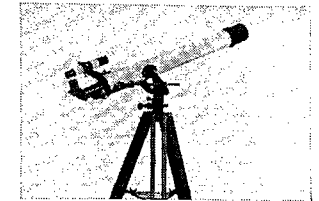
NT.8



NT.13. Zoom 30-120 power. 80mm diameter objective. Maximum field of view 1.7 degrees. Bloomed. Erect image. Helical eyepiece focussing, closest focussing distance 33 feet. Length $27\frac{1}{2}$ ". Overall diameter $3\frac{1}{2}$ ". Weight 3 lb. 12 oz. On tripod with pan and tilt head.

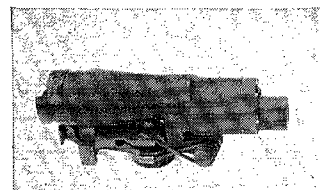
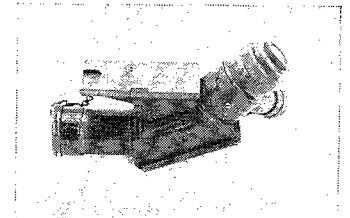
NT.13a. (not illustrated). Zoom 20 to 90 power. 60mm diameter objective. Maximum field of view 2 degrees. Bloomed. Erect image. Helical eyepiece focussing, closest focussing distance 22 feet. Length 22". Overall diameter $2\frac{1}{2}$ ". Weight 2 lb. 10 oz. On short tripod with pan and tilt head. A smaller version of NT.13, this telescope is very useful where high power is required together with light weight, at a reasonable price.

NT.14. Astro refractor. Powers 35, 70, 117, 234, 60mm diameter objective of 700mm focal length. Maximum field of view 0.8 degree. Bloomed. Inverted image. Rack and pinion focussing. Length 28". Weight 16 lb. 4 oz. Supplied with 2 eyepieces, diagonal prism, 2x Barlow, finder telescope, adjustable mount on full length wood and metal tripod complete in wooden carrying case.



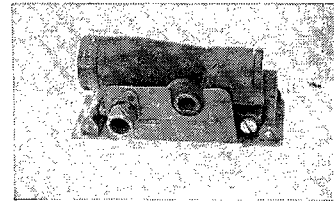
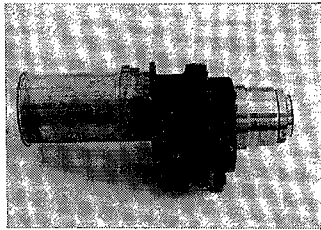
NT.15. Astro refractor. Powers 62, 124, 208, 312, 416 and 625. 77mm diameter objective of 1260mm focal length. Bloomed. Erect or inverted image. Rack and pinion focussing. Supplied with 3 eyepieces, 2x Barlow, erecting prism, diagonal prism, sun diagonal, projection screen, finder telescope, filters, on equatorial mount with setting circles and full length wood and metal tripod, complete in fitted wooden case.

T.24. Angle telescope, eyepiece at 45 degrees to line of sight. 3 power. 12mm diameter objective. Field of view 14 degrees. Erect image. Eyepiece focussing. Length $5\frac{1}{4}$ ". Weight 2 lb. 4 oz. Small cross graticule with provision for illumination. In small wooden case.



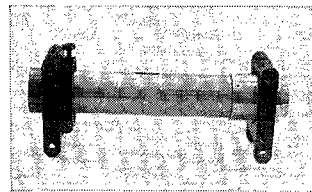
T.28. Prismatic sighting telescope. Ex-government. $1\frac{1}{2}$ power. 9mm diameter objective. 9 degree field of view. Erect image. Fixed focus. Length $5\frac{1}{4}$ ". Weight 1 lb. 4 oz. Circle and dot or small crossline graticule.

T.29. Prismatic sighting telescope. Ex-government. 1 power. 7mm diameter objective. 10 degree field of view. Erect image. Fixed focus. Length 4½". Weight 1 lb. 3 oz. In adjustable mount which can be aligned in a matter of seconds. Highly recommended. Circle and dot graticule.

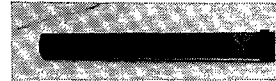


T.35. Prismatic finder telescope. Ex-government. 3 Power. 22mm diameter objective. 18 degree field of view. Bloomed. Erect image. Fixed focus. Five glass erfle eyepiece with cross line graticule. Length 8¾". Overall diameter 4". Weight 3¾ lb.

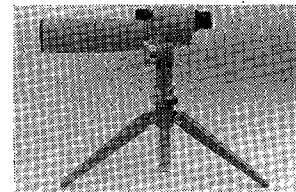
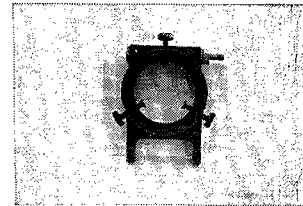
NT.16. Sighting telescope of our own construction, using both new and ex-government components. 4 power. 30 mm diameter objective, fully corrected and bloomed. 10 degree field of view. Inverted image. Wide angle Kellner eyepiece. Fixed focus. Service type graticule with circle and dot and graduated scale. Length 7½". Weight 14 oz.



T.75. Sighting telescope by Ottway, London. Ex-government. 1 power. 32mm diameter objective. 35 degree field of view. Erect image. Fixed focus. Length 15". Weight 2 lb. 10 oz. All brass construction. Cross line graticule with three rings, giving 25½ degrees divided into steps of 4¼ degrees, the whole divided into twelve equal segments. An instrument of great accuracy for any sighting or collimating purpose. In fitted wooden case.



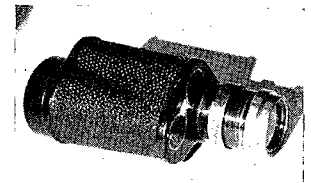
T.77. Finder telescope mounts. Specially designed adjustable mounts with four point suspension which will fit any size or shape of tube. Simple 2 hole fixing (2 BA). Fit telescopes up to 42mm outside diameter.



NT.18. Prismatic spotting telescope. Powers 16 to 36 zoom. 60mm diameter object lens of 420mm effective focal length. Maximum field of view 2 degrees. Closest focussing distance 20 feet. Bloomed throughout. Erect image. Length 10½". Weight 32 ounces. This Telescope is one of the sharpest that we have have ever tested, possessing a triplet objective, eight element zoom eyepiece and built in

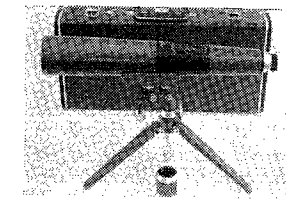
achromatic barlow lens. On shooting-type adjustable all metal low-level tripod.
 NT.18a. Telescope identical to NT.18 but single 20x power, closest focussing distance 32 feet.
 NT.18e. Interchangeable 48x eyepiece available as an optional extra for either NT.18 or 18a.

NT.19. Wide-Field Prismatic Monocular with long eye-relief. Adapted by us from the best of new and ex-government equipment, this instrument combines a wide field of view of unusual brightness with ease of use obtained by the provision of a long eye-relief which means that even the spectacle wearer may obtain the full field of view. DEFINITION AND RESOLUTION GUARANTEED TO BE EQUAL TO ANY COMPARABLE INSTRUMENT REGARDLESS OF PRICE. Power 6½. 30mm diameter objective. Field of view 8 degrees. Bloomed on internal optical surfaces. Erect image. Eyepiece focussing. Length 4½". Weight 11¾ ounces.



NT.19a. The above instrument can be supplied with the eyepiece adapted to screw directly into the filter mounts of SLR camera lenses, allowing photography by the afocal method. With a 58 mm. camera lense an effective focal length of 375 mm. is obtained, aperture f12.5. Available to fit either 49 mm. or 52 mm. filter mounts (state which size required).

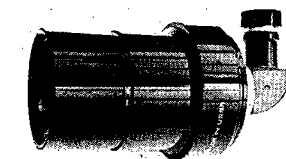
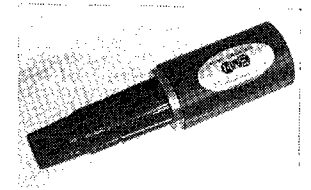
NT.20. Close focussing monocular. Identical in specification to NT. 19, this instrument can be supplied to focus at any distance from 1 foot to infinity. Merely order stating the focussing distance which you require and we will supply the monocular adjusted so as to focus at this distance. Invaluable in any form of micro-engineering, as well as product inspection and control in all branches of industry. Supplied with lugs for fitting.



NT.21. 1000 to 4000 mm. zoom telephoto lens AND 15 to 60x telescope combined. Beautifully constructed 14 element optical system gives the ultimate in telephoto power coupled with a really first class telescope. Photographic apertures f16 to f64. 60mm. diameter objective. Maximum field of view 33 degrees. Bloomed. Visual image erect. Central zoom and focussing controls, calibrated visual power and distance in feet and meters, also special calibration for infra red photography. Length 17½". Overall diameter 3". Weight 3½ lbs. Supplied with special low-level tripod, T-mount adaptor, and de-luxe attache style case, available separately.

TELESCOPE ADAPTORS FOR PHOTOGRAPHIC LENSES

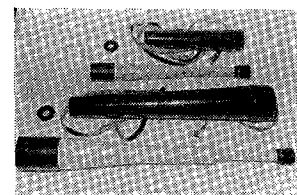
AP.1. Zoom eyepiece unit for photographic lenses, converts any lens of longer focus than 135mm into a terrestrial telescope. Power of the telescope depends on the focal length of the camera lens, for instance with a 200mm lens power is 8-25, maximum field of view 4½ degrees. Resolution of the eyepiece unit is very fine, with a good objective 1¼ seconds of arc may be exceeded with very little difficulty. Supplied ready to use in 'T' mount fitting tube—for lenses having adaptable 'T' mounts merely remove the adaptor which fits into your camera and screw the eyepiece unit directly onto the thread on the lens. For non-adaptable lenses an extra adaptor is required (male 'T' mount to female fitting suitable for your camera lens) available either from the suppliers of your camera or from us. Most fittings are available (screw types generally from stock) but there may be some delay with complex bayonet mounts.



AP.2. Angled eyepiece unit for photographic lenses; this is an alternative unit to the above providing a right angled viewing position which may be more comfortable for some purposes. The image is erect but inverted laterally. Power with a 550mm lens will be 35, field of view 2 degrees. Resolution is at least as good as AP.1. Barlow lens no. NB3 may be used to boost the power of AP.2 by a factor of 2½, producing 32x with a 200mm lens. 42mm screw fitting only.

Various other permutations are possible using our listed accessories, for instance if adaptor AD.7 is used on a good quality, long focus lens, any RAS fitting eyepiece may be added to form an astro telescope—a short extension ring may be necessary for correct focussing. Alternatively a barlow lens such as NB.1 or NB.3 may be used to provide a power boost. If AD.1 is added to AD.7 the range of possible eyepieces is extended to include any 24.5mm fitting type, also barlow lenses, erecting lenses, etc., as listed. For all telescopic purposes mirror lenses are strongly recommended due to their complete lack of chromatic aberration, very important in visual work, and using a lens of high quality such as the MTO.550 and high quality eyepieces selected from our lists, a telescope which could compare with the famous 'Questar' for image quality may be built up to the user's individual requirements. If you have difficulty deciding which eyepieces etc., would be the best to employ we will be happy to advise (by letter, please, we regret we cannot give advice by telephone).

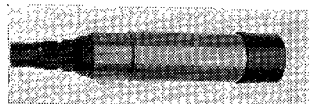
NT.24. Maksutov type reflecting astro telescope of high quality and very compact dimensions. Powers 50 and 72. 70mm diameter objective of 765mm effective focal length. Maximum field of view one degree. Inverted image. Bloomed. Eyepiece focussing. Length 8½". Weight of telescope 10 lbs. Supplied complete with strongly made altazimuth mount and adaptor bush for fitting to standard photographic tripod, plus sun projection screen and fittings. Several experts we have spoken to consider that this telescope compares very favourably with widely advertised and expensive American instruments of similar type. Resolution exceeds 1.5 seconds of arc.



NT.25 Terrestrial telescope, 20 power. 50mm diameter objective. 2 degree field of view. Bloomed optics. Erect image. Micro focussing on eyepiece plus single drawtube. Closest focussing distance 80 feet. Length closed 15", open 19½". Overall diameter 2¼". Weight 22 ounces. Finish is in good quality enamel with extensible sunshade cap. Image quality is most attractive with very fine contrast. Supplied with screw top carrying case.

NT.25a. 10 power. 30mm diameter objective 4.5 degree field of view. Bloomed. Erect image. Eyepiece focussing, closest focussing distance 20 feet. Length 12¾". Overall diameter 1.6". Weight 9 ounces. Supplied with black plastic carrying case with lanyard.

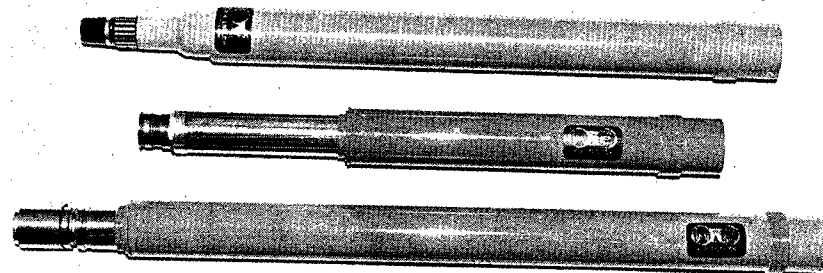
NT.25b. Zoom 14 to 45 power. 50mm diameter objective. Maximum field of view 2½ degrees. Bloomed. Erect image. Helical focussing on eyepiece plus single drawtube. Closest focussing distance 20 feet. Length closed 11", open 15½". Overall diameter 2¼". Weight 20 ounces. With tripod bush. A very useful compact instrument for field work where small size, high power, and versatility must be combined.



NT.26. Zoom Ultrascope. Powers 19-57. 48mm diameter objective. Maximum field of view 1.6 degrees. Erect image. Drawtube focussing, closest focussing distance 30 feet. Length 25". Overall diameter 2¼". Weight 2 lbs. This instrument is especially convenient as a portable terrestrial 'scope, and is also ideally suited for use as a spotting telescope for rifle, pistol or archery at all ranges.

NT.27. Terrestrial Ultrascope. 32 power. 48mm diameter objective. Field of view one degree. Erect image. Drawtube focussing, closest focussing distance 12 feet. Length 27". Overall diameter 2¼". Weight 3½ lbs. This instrument uses a lens erector system giving an eye relief of almost two inches and is thus ideally suited to all spectacle wearers, since it affords the full field of view in complete comfort even with very thick spectacle lenses. It has an RAS fitting eyepiece tube, allowing full interchangeability with any RAS eyepiece, or other fittings with the appropriate adaptor.

NT.28. Astro Ultrascope. 25 power. 48mm diameter objective. Field of view 2¼ degrees. Inverted image. Drawtube focussing. Length 20". Overall diameter 2¼". Weight 2¼ lbs. This model also has RAS eyepiece fitting, allowing full interchangeability as NT.27 above. Also the Ultrascope barlow lens may be used, giving powers in excess of 100 whilst retaining good eye relief and field of view. In fact, using eyepieces down to 4mm focal length powers up to 450 could theoretically be obtained. Although at these limits the image becomes so dim as to be practically valueless, magnifications up to 200 or more may be quite usefully employed on suitably bright astronomical subjects. This is made possible by the fine quality of the Ultrascope objective lens, originally designed for Barr and Stroud range-finding equipment to standards far above those required for civilian instruments.



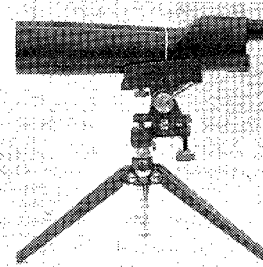
Top NT.26.

Middle NT.28.

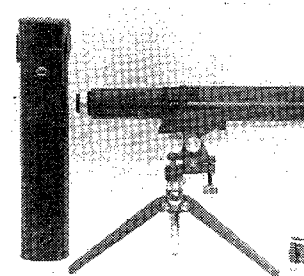
Bottom NT.27.



NT. 29.



NT. 32.



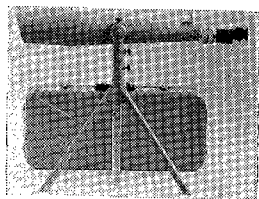
NT. 33.

NT.29. Terrestrial telescope, zoom 30-90 power. 60mm diameter objective. Maximum field of view 0.8 degrees. Bloomed. Erect image. Rack and pinion focussing, closest focussing distance 28 feet. Length 25". Overall diameter 3". Weight, complete with wood tripod and altazimuth mount, 8 lbs. A good quality terrestrial outfit at a very reasonable price.

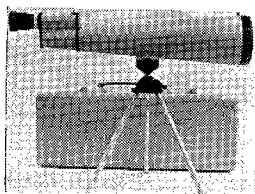
NT.32. Prismatic spotting telescope. Power 20. 60mm diameter object lens. Field of view 2¼ degrees. Fine helical focussing operating on prism unit. Closest focussing distance 13½ feet. Bloomed throughout. Erect image. Length 14½". Diameter 3½" x 2½". Weight 2.1 pounds. By using a special adaptor this telescope may be converted to 'T' mount fitting for use on a wide range of cameras as a 1215mm f20 telephoto lens. We can supply 'T' mount adaptors to suit most modern cameras—see adaptor section (page 29). Additional orthoscopic eyepieces are available which interchange to increase the power of the telescope to 30, 40, 50, or 60x.

The telescope may be attached to any standard photographic tripod, or used with the special low level spotting scope tripod, available separately. Both in terms of versatility and optical quality we feel that this unit is very good value.

NT.33. Zoom spotting telescope. Powers 25 to 50 \times . 50mm diameter object lens. Maximum field of view 2 degrees. Helical focussing on main barrel adjacent to zooming control marked in feet and metres. Closest focussing distance 20 feet. Bloomed throughout. Erect image. Length 15". Diameter 2 $\frac{1}{2}$ ". Weight 2 pounds. By using a special adaptor this telescope may be converted to 'T' mount fitting for use on a wide range of cameras as a 1700 to 3400mm zoom telephoto unit, maximum effective aperture f34. The telescope may be attached to standard photographic tripods or to the special low level spotting scope tripod, available separately. A carrying case is available for the telescope (this is tubular in shape and has room for only the telescope itself).



NT.34. Prismatic spotting telescope. Powers 30 and 60 \times . 70mm diameter object lens. Maximum field of view 1.2 degrees. Helical focussing by ring on main tube. Closest focussing distance 75 feet. Bloomed. Erect image. Length 22". Diameter 3 $\frac{1}{2}$ ". Weight 2 $\frac{3}{4}$ pounds. Supplied with adjustable low level spotting scope tripod and metal carrying case for scope and tripod together. This telescope represents good value for a 60 \times 70 terrestrial unit, due to the very sharp definition and good contrast at high power. It does unfortunately suffer from slight amounts of fine dust visible on the eyepiece unit which we have found to be impossible to effectively remove; despite this we have no reservations about the optical quality of the instrument.



NT.35. Prismatic spotting telescope. Powers 20 and 40. 64mm diameter objective. Maximum field of view 2 $\frac{1}{2}$ degrees. Bloomed. Erect image. Eyepiece focussing. Closest focussing distance (by pulling eyepiece out in retaining collar) 11 metres. Length 40 cm. Overall diameter 8 cm. Weight 1 $\frac{1}{2}$ kg. Supplied with ball and socket head with screw-in tripod legs adjustable for height to 30 cm. All in sturdy metal carrying case 40 cm \times 15 cm \times 9 cm.

EYEPIECE TYPES

The eyepieces generally available fall into six broad categories;—Huyghens, Ramsden, Kelner, Symmetrical, Orthoscopic and Erfle. Although differing in field of view and distortion factors, ANY of these types will provide satisfactory performance when correctly used, but if the object glass is defective in some way, or misaligned, or if an inferior Barlow lens or erecting system is used, NONE of them will. If your telescope, when correctly focussed, does not show clear definition at the CENTRE of the field of view, no change of eyepiece will improve matters. Furthermore, serious colour defects are unlikely to be due to the eyepiece alone unless this has been incorrectly assembled. The only occasion on which colour defects can be definitely blamed on an eyepiece is when a reflector type telescope is being used. These are normally free from colour distortion, but aberrations do often show up when large aperture mirrors are used with the cheaper types of eyepiece. Otherwise even the Ramsden eyepiece at high power shows no more than slight fringes of colour, which do not seriously impair resolution. Many people spend large amounts of money on unsuccessful attempts to improve the performance of objectives which they are unwilling to admit to be inferior. Also, much money is spent on short focus eyepieces which would be better spent on long focus types. The view through a telescope fitted with a first class low or medium power wide field ocular is infinitely more satisfying than that with any high power type.

(1) Huyghens. Sometimes marked 'H' or 'HM'. This eyepiece type has two simple lens elements. It is the most frequently used eyepiece in microscopes, due to the fact that it can be fully corrected for lateral chromatic aberration (colour fringing). It has a limited undistorted field of view, this being relatively unimportant for microscope use. It is a useful economy eyepiece for telescopes, but suffers from insufficient eye relief at focal lengths less than 8mm. (The eye relief is the distance between the rear lens and the eye of the observer). Most of the

low power eyepieces sold with Japanese astro and terrestrial telescopes are of the Huyghens type which do not fully exploit the field of view available. Replacement with true wide field eyepieces often produces a spectacular improvement.

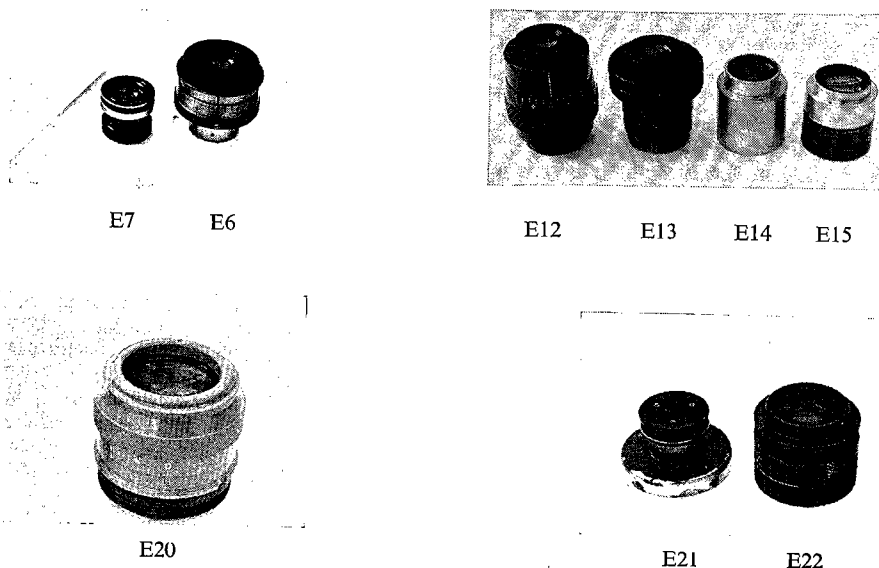
(2) Ramsden. Sometimes marked 'R' or 'SR'. Another two element eyepiece, but differently constructed so as to give a wider field of view, making it better suited to telescope use.

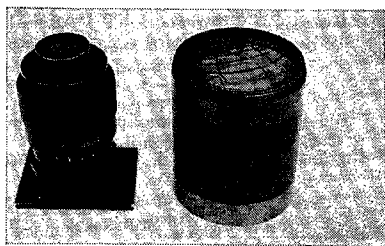
(3) Kelner. Sometimes marked 'K'. This is a three element eyepiece, having a basically similar form to the Ramsden, but employing an achromatic eyelens to give improved colour correction. The Kelner is probably the best kind of general purpose eyepiece available for a moderate outlay.

(4) Symmetrical. Ideally, this eyepiece is made up of two identical achromat lenses, but in practice most ex-government types have lenses which differ slightly. This type of eyepiece, sometimes called 'Plossl' type, gives high quality results. Since both lenses are achromatic, colour correction is very good, also field of view is wide and very flat. Of the types so far mentioned this eyepiece is the only one to offer a really long eye relief, (about three quarters of it's focal length) making for very comfortable observation.

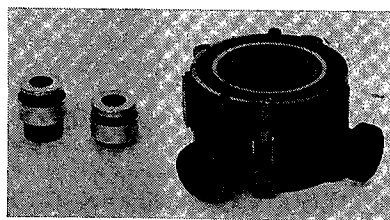
(5) Orthoscopic. Sometimes marked 'Or' or 'O'. This type is of four element construction, a cemented triplet plus a single element eye lens. It can be computed so as to give almost perfect correction of all aberrations, plus wide angle of view and long eye relief. It is an indispensable type for high power work, it's only drawback being a relatively high price.

(6) Erfle. This has five or six elements, the rear lens always having a concave outer surface. For width and flatness of field this eyepiece cannot be surpassed; it offers all the merits of the orthoscopic type except that the eye relief is somewhat less. It's main use is for moderate power work where the field of view and bright image give a really breathtaking effect.

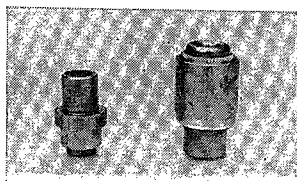




E24 E25



E28 E29 E30



E39 E38



E40 E41

SPECIALIST EX-GOVERNMENT EYEPIECES

Suitable for use with all good quality reflecting and refracting telescopes, as well as numerous special applications.

R.A.S. thread, 1¼" push in, or 24.5mm push in mounts can be fitted to the eyepieces marked* In some cases these fittings have the effect of reducing the field of view.

E.6*. 18½ mm focal length, 6 lens Erfle. Field of view 76 degrees. Weight 12 oz. In all brass focussing mount with non-rotating optics. New condition.

E.6a. as E.6, but with cross-line graticule.

E.7*. 18½mm focal length, 4 lens Kelner (Plossl). Field of view 53 degrees. Weight 3 oz In brass mount.

E.7a*. This eyepiece can be supplied with the rear mount threaded to screw directly into the filter mounts of SLR camera lenses, allowing photography by the afocal method. Available to fit either 49mm or 52mm filter mounts (state which size required).

E.12*. 31½mm focal length Kelner. Field of view 46 degrees. Weight 13 oz. In all brass focussing mount with non-rotating optics. Secondhand condition only.

E.13*. 27½mm focal length Kelner. Field of view 51 degrees. Weight 12 oz. In all brass focussing mount. Secondhand condition only.

E.14*. 31mm focal length 4 lens Kelner (Plossl). Field of view 53 degrees. Weight 8 oz. In all brass mount.

E.14a. as E.14, but with graticule having centre cross and graduations.

E.15*. 31½mm focal length Kelner. Field of view 51 degrees. Weight 8 oz. In all brass mount.

E.15a. as E.15, but with graticule having centre circle and dot and graduations.

E.20. 44mm focal length 6 lens Erfle. Field of view 60 degrees. Weight 2 lb. 4 oz. Of American manufacture, this eyepiece is used on the Mount Palomar telescope. In focussing mount. To obtain maximum field of view requires the use of a drawtube not less than 2" in diameter.

E.21. 44mm focal length single lens Kepler. Field of view 44 degrees. Weight 3 oz. In focussing mount. Good condition.

E.22. 39½mm focal length 4 lens symmetrical. Field of view 53 degrees. Weight 13 oz. In brass mount. R.A.S. thread can be fitted. Makes excellent richest field eyepiece. Secondhand condition only.

E.22a. as E.22, but turned down so as to fit into 2" push fitting tube.

E.22L. Same specification as E.32 but fitted into a new type of brass mount which reduces the total weight to only 6 ounces. Outside diameter is 43mm. New condition. Also available fitted with R.A.S. thread (E.22La.)

E.22Lg. Lightweight eyepiece as above fitted with service type circle and dot graticule having slits for illumination, in adjustable mount, Also available fitted with R.A.S. thread (E.22Lga.). Any one of the above lightweight eyepieces can also be supplied fitted with 49, 52 or 55mm filter mounts (please state which) for attachment to a camera lens for the purpose of photography through a telescope.

E.24. 45mm focal length, special 3 lens Huyghens with achromatic eyelens. Field of view 35 degrees. Weight 1 lb. 3 oz. In focussing mount. Secondhand condition.

E.25. 44mm focal length 6 lens Erfle. Field of view 49 degrees. Weight 2 lb. 4 oz. This is an exceptionally large eyepiece, having 2½" diameter eyelens but field lens only 1¼". Produces an exceptionally flat undistorted field of view. Can be supplied in pairs marked 'objective' and 'eyepiece' to give field of view of 40 degrees at 1×. Length of the pair 7". Aperture f0.8.

E.28. 50× eyepiece for Scout telescope Mark II. 25½mm focal length Huyghens. Field of view 26 degrees. Weight 2 oz. New condition.

E.29. 75× eyepiece for Scout telescope Mark II. 17mm focal length Huyghens. Field of view 30 degrees. Weight 2 oz. New condition.

E.30. Ross micrometer. Two-way movement glass gratitudes. All brass body. Weight 5 lbs. Can be supplied fitted with E.7 or E.22 eyepieces as interchangeable units. Good condition. Eyepieces extra as listed.

E.38*. 20mm focal length Ramsden. Field of view 28 degrees. Weight ½ oz. Graticule marked in Rontgens. New condition. A handy instrument eyepiece for experimental purposes.

E.39*. Bell and Howell viewfinder lens, 25mm focal length in mount. Field of view 15 degrees. Weight ½ oz. New condition. Another useful instrument eyepiece.

E.40. 31½mm focal length 5 lens erfle. Field of view 54 degrees. Bloomed. Weight 14 oz. Good condition.

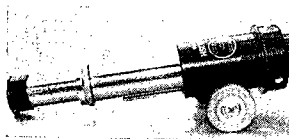
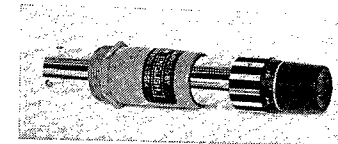
E.41. 44mm focal length, 4 lens symmetrical. Field of view 54 degrees. Weight 13½ ounces. In all brass mount. This eyepiece can be supplied with cross-line graticule GR.8 in 30 ounce all brass adjustable mount, giving about 3mm perpendicular lateral adjustment.

E.41a. as E.41 (eyepiece only) but turned down so as to fit into 2" push fitting tube.

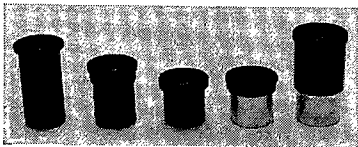
NEW EYEPIECES

The following high grade imported eyepieces have been tested by us and found to be of very high quality. We recommend them for all general telescopic and microscopic purposes.

E.37. 8-24mm focal length 6 lens zoom. Field of view 12 to 36 degrees. Weight 8½ oz. R.A.S. thread fitted as standard. Self erecting, and therefore eminently suitable for the construction of high quality terrestrial telescopes. Also suitable for astro use if the erect image does not worry you. Bloomed optics.



E.45. Self erecting terrestrial eyepiece supplied complete in rack and pinion focussing mount ready to fit into any tube having 42.5mm inside diameter. 11-22mm focal length, variable power. Field of view 20 degrees (maximum). Bloomed. Weight 10 ounces.



24.5 mm Fitting Eyepieces

Huyghens eyepieces; useful where a well-corrected medium power eyepiece is required for a moderate outlay.

- E. 73. 12.5mm focal length. 30 degree field of view. Weight 1¼ ounces. Bloomed.
- E. 74. 20mm focal length. 30 degree field of view. Weight 2¼ ounces. Bloomed

Modified Huyghens eyepieces; similar to the above but employing modified lens elements so as to produce a wider than normal undistorted field of view.

- E.82. 9mm focal length. 45 degree field of view. Weight 1¼ ounces. Bloomed.
- E.83. 12.5mm focal length. 40 degree field of view. Weight 1¼ ounces. Bloomed.
- E.86. 40mm focal length. 27 degree field of view. Weight 2½ ounces. Bloomed.

Kelner eyepieces; fine quality optics giving wide, flat field of view plus excellent correction and resolution.

- E.91. 6mm focal length, 40 degree field of view. Weight 1 ounce. Bloomed.
- E.93. 12mm focal length. 40 degree field of view. Weight 1¼ ounces. Bloomed.
- E.94. 18mm focal length. 45 degree field of view. Weight 2 ounces. Bloomed.

Orthoscopic eyepieces; offering the features of Kelner types plus much greater convenience of use due to long eye relief and large diameter eye lenses.

- E.100. 4mm focal length. 40 degree field of view. Weight 1 ounce. Bloomed.
- E.101. 6mm focal length. 40 degree field of view. Weight 1 ounce. Bloomed.
- E.102. 9mm focal length. 40 degree field of view. Weight 1¼ ounces. Bloomed.
- E.103. 12.5mm focal length. 40 degree field of view. Weight 1¾ ounces. Bloomed.
- E.104. 18mm focal length. 40 degree field of view. Weight 2 ounces. Bloomed.
- E.105. 25mm focal length. 40 degree field of view. Weight 2½ ounces. Bloomed.
- E.105a. as E.105, but fitted with cross-line graticule.

Erflie eyepieces; the ultimate wide field optic.

- E.59. 15.5mm focal length. 68 degree field of view. Weight 1½ ounces. Bloomed.

We can supply adaptors to R.A.S. thread or 1¼" push fitting for any of the above eyepieces. Only one adaptor is needed to accept all of the eyepieces.

23.5mm push fit Microscope Eyepieces. Adaptors to R.A.S. thread or 1¼" push fit are available.

- E.60. 36mm focal length Huyghens (7×). Field of view 26 degrees. Weight 1 oz.
- E.61. 25½mm focal length Huyghens (10×). Field of view 26 degrees. Weight 1 oz.
- E.62. 17mm focal length Huyghens (15×). Field of view 30 degrees. Weight 1¼ oz.
- E.63. 36mm focal length microscope eyepiece as E.60, but having additional internal reticule divided into 100 equal parts plus focussing eyelens to facilitate focussing of the reticule. This eyepiece enables accurate measurements to be made on any standard microscope.
- E.64. 31mm focal length Huyghens (8×) by Meopta. Field of view 30 degrees. Weight 1½ ounces. Bloomed.
- E.65. 38mm focal length Huyghens (6×) by Gillett and Sibert. WFC type with focussing eyelens, giving full field of view when used with spectacles. Field of view 22 degrees. Weight 2 ounces. Bloomed.
- E.65a. As E.65, but fitted with cross-line graticule.
- E.66. 31mm focal length Huyghens (8×) by Gillett and Sibert. WFC type with focussing eyelens, giving full field of view when used with spectacles. Field of view 30 degrees. Weight 2 ounces. Bloomed.
- E.66a. As E.66, but fitted with cross-line graticule.

REFLECTOR TELESCOPE MIRRORS

In common with other leading suppliers of optical instrumentation we do not quote figures as to the accuracy of our telescope mirrors, since it is practically impossible for anyone, amateur or professional, to state definitely just how accurate any particular paraboloid may be. The only worthwhile criteria are practical ones as to resolution given in actual performance. All of our mirrors are guaranteed to give a performance equal to that of any other comparable mirror on the market. In order to keep our prices to a minimum commensurate with highest quality we restrict our range to those sizes for which we find that there is the greatest demand. We will however be pleased to quote for other sizes, focal lengths and specification to special order.

AM.1. 6" diameter telescope mirror, 48" focal length, of low expansion glass worked to an extremely accurate paraboloid figure. Supplied with matching flat, both mirrors aluminized and hard silica coated.

AM.2. 8½" diameter telescope mirror, 64" focus, of low expansion glass worked to an extremely accurate paraboloid figure. Supplied with matching flat, both mirrors aluminized and hard silica coated.

AM.4. 4" diameter telescope mirror, 31" focal length, accurately figured and supplied with matching diagonal mirror, both mirrors aluminized and hard silica coated.

MIRROR MAKING KITS

These kits contain a low expansion glass blank with the correct spherical curve pre-ground on the better face, a glass tool plate, which also has the correct positive curve pre-ground on its surface, a diagonal mirror blank, sufficient pitch, netting, polishing medium etc. to complete the mirror, and full instructions. The pre-formed mirror blank and tool mean that only smoothing, polishing and final figuring need be carried out, and there is no need to check the radius of curvature of the mirror during work.

AMK.1. To make mirror 6¼" dia., 48" focal length.

AMK.2. To make mirror 8¾" dia., 51" focal length.

SURFACE ALUMINISED MIRRORS. Top grade spherical. Positive focus.

	dia inches	focus inches
AM.18.	4	13.5
AM.19.	4	3.5
AM.20.	2	4.25
AM.21.	2	20
AM.22.	1.25	0.85
AM.23.	2	0.9
AM.24.	2.5	1
AM.25.	2	2 NEG.
AM.26.	2.5	0.75 NEG.
AM.27.	1.25	2.3 NEG.

CONCAVE ALUMINIZED MIRRORS

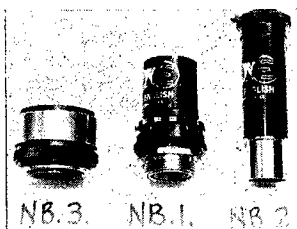
AM.6. 3¼" diameter, 2" focal length.

AM.7. 3¼" diameter, 6" focal length.

SUPER BARLOW LENSES

As a result of an unrelenting search of all possible ex-government sources we are now able once again to offer a very limited quantity of these world famous optics, in secondhand condition only. Our own tests and the glowing tributes of our customers have long ago convinced us that these are the finest barlow lenses ever to have been produced in quantity, and it is unlikely that lenses such as these will ever again be available to the general public. Unlike most commercial barlow lenses, Super Barlow lenses are not limited to one amplification factor, and power can be increased up to five times with no loss of resolution. Fully achromatic at all powers. Supplied complete with our special simplified instruction sheet 'The Barlow Lens and How to Use It'. Unmounted, secondhand condition.

SB.2. 15mm diameter, 1" negative focal length.



We also have three entirely new types of Barlow lens:—
 NB.1. The Ultrascope Barlow. This is a 4× bloomed unit fitted with R.A.S. threads and micro focussing for fine adjustment of lens position. It is simply screwed into any R.A.S. fitting telescope eyepiece mount, and the eyepiece screwed back into the barlow mount. The resulting four times enlargement of the image is virtually unaffected by chromatic aberration and of beautiful quality. Intended primarily for use with our Astro Ultrascope this unit will give outstanding results with any really first rate objective or mirror. It is also useful for astro photography when used with a camera adaptor such as AD.3.

NB.2. 4× bloomed achromatic barlow lens as above, but supplied in 24.5mm fitting tube, without micro focus control, to suit the majority of new imported instruments.

NB.3. 2½× achromatic barlow lens combination, fully coated, fitted into a mount with 42mm (Praktica, Zenith fitting) threads, male one end, female the other. This is a power booster for telescope eyepieces when used with photographic lenses. It may be used with any 42mm threaded photographic lens of good quality and relatively long focal length (135mm or longer). Mirror lenses are especially suitable. Any eyepiece may be used (with the appropriate adaptor) EXCEPT zoom eyepieces, which cannot be used with Barlow lenses.

We have recently received an enthusiastic commendation of the Ultrascope Barlow lens from the curator of a Lancashire observatory; he writes that with a 4mm orthoscopic eyepiece at a power of 2250× the barlow performed remarkably well, flare and ghosting both being minimal. Used with our eyepiece E.22 for optimum field width, he remarked upon the crisp image at any zone radius. When used photographically at f.54 he confirmed our own test results that there was no visible manifestation of lateral or spherochromatic aberration.

LENSES

The majority of these lenses are ex-government stock, in unmarked condition. Any which are in secondhand condition are marked and priced accordingly.

Lenses from new sources are marked † after list number.

Lenses marked * after diameter are un cemented.

Lenses marked ** after focus are in mount.

TELESCOPE OBJECT LENSES. ACHROMATS.

List No.	Dia. mm.	Focus inches
73	32	6½
82	45	19
88	48	18**
Lens no. 88 is the Ultrascope objective lens.		
89	50	15
93	56	25
101	75	45
102	100	47
109	30	5¼
Supplied in aluminium mount and tube 6¼" long.		
210	48	15

TELESCOPE ERECTOR LENSES

Specially corrected achromatic aplanats in screwed brass cells.

List No.	Dia. mm.	Focus inches	Cell dia.	Threaded
230	13	1¾	24mm	48 T.P.I.
231	15 (triplet)	2	24mm	48 T.P.I.
232	18	1¾	24mm	36 T.P.I.
232a	16	2	23mm	48 T.P.I.

- 232b 4½" brass tube 1½" diameter fitted with nosepiece to suit above tubes. Please state which type when ordering.
- 233 Two 4" focus achromatic doublets in separate cells which screw together to make a complete erector 2" focus and 1" diameter.
- 233a 4" brass tube 1½" diameter to fit Number 233 above. Fitted with light baffle and nosepiece to suit.

See also photographic lens number PL.27.

The above erector lenses are also suitable for macro photography in conjunction with a bellows unit or extension tubes. Shorter effective focus may be obtained by mounting two together, and greater depth of field by placing a stop cut from black card or thin metal in front of or between them.

ACHROMATS (positive focus)

List No.	Dia. mm.	Focus inches
2	32	7
7	40	3
7a	42	3½
8	39	4¼
8a	39	4¾
15	15	2** Triplet
17	22	2
18	82 *	8
46	20	2 **
47	25	4 **
53	26	5¾ **
76	25	5
77	31	5½ **
112	18	1¾ **
113	13	1¾ **
1280	30	5 **
1284	32	4
1285	48	6 **
1286	12 *	1½
1287	32	6
1296	28	4 **
1297	22	2¼ **
1298	21	2 **
1299	17	3 **
1500	14	1½ ** bloomed
1501	10	½ ** bloomed
1502	26	5½ ** bloomed
1503	53	5 **
1504†	6	2¼ ** bloomed triplet
1505†	24	4¼ bloomed
1506	34	3¼ **

Most of the above lenses can usually be supplied secondhand with some small marks and scratches, but in worthwhile useable condition, at half price.

NON-ACHROMATS

Double Convex (positive focus).

List No.	Dia. mm.	Focus inches
21	18	½
23	33	2
24	39	2
27	82	3¼
28	92	9

59	13	$\frac{1}{2}$
60	13	$\frac{1}{2}$
164	103	$\frac{1}{2}$
170 †	47	$5\frac{1}{2}$
177	38	40
180 †	44	$8\frac{1}{4}$
181 †	63	$3\frac{1}{2}$
182 †	75	$6\frac{1}{2}$
183 †	87	9
184 †	101	$10\frac{1}{2}$
185	21	$10\frac{1}{2}$
186	6	$\frac{1}{2}$
187	13	$\frac{3}{8}$
188	8	$\frac{1}{2}$ ** bloomed
2189	37	$\frac{1}{2}$ ** bloomed
2190	39	$2\frac{1}{2}$ bloomed
2191	53	$4\frac{1}{2}$ bloomed
		7

Plano-Convex (positive focus)

List No.	Dia. mm.	Focus inches
65	55	$2\frac{3}{4}$
71	18	$1\frac{1}{2}$
190 †	95	$5\frac{1}{2}$
Condenser lens for $2\frac{1}{4}$ " square film size.		
191 †	114	$7\frac{1}{2}$
Condenser lens for $3\frac{1}{4}$ " x $2\frac{1}{4}$ " film size.		
192 †	57	$3\frac{1}{2}$
Condenser lens for 35mm film size.		
198	8	1
1300	28	7
1301	11	1
1302	11	$\frac{3}{8}$
1303	15	2
Has engraved cross line on plane surface.		
197	13	$\frac{3}{4}$
30	33	2
200	25	$2\frac{1}{2}$
201	25	4
251	7	$\frac{1}{2}$
252	16	$\frac{1}{2}$
120 one each of lenses Nos. 252 and 185 in plastic mount, producing a condenser unit.		
10mm focal length f0.7.		
253	22	$1\frac{3}{4}$
254	51	7**
with four engraved lines across plano face.		
255	75	4

Meniscus (positive focus)

List No.	Dia. mm.	Focus inches
40	60	$4\frac{1}{2}$ Deep curve
66	15	$1\frac{3}{4}$
68	20	$2\frac{1}{4}$
70	14	$4\frac{1}{2}$
260	6	$\frac{1}{2}$
261 †	30	$\frac{3}{8}$ bloomed

Meniscus (negative focus)

List No.	Dia. mm.	Focus inches
34	34	4

35	17	1
36	20	3
38	12	$1\frac{1}{4}$
67	18	$1\frac{3}{4}$
69	20	2
175	50	7

Plano-concave (negative focus)

List No.	Dia. mm.	Focus inches
176	52	12

Double Concave (negative focus)

List No.	Dia. mm.	Focus inches	
39	85	4	Chipped 50p
41	20	1	
1401	10	1	** bloomed
1402	8	$\frac{3}{4}$	** bloomed
1403	6	$\frac{1}{4}$	

Rectangular Lenses, for slide viewers etc. Brand new, optical quality white glass.

RL.2. $3\frac{1}{4}$ " x $2\frac{1}{2}$ ". 7" positive focus.
 RL.3. $3\frac{1}{2}$ " x $4\frac{1}{2}$ ". Approx. 8" positive focus. One surface is flat ground glass, used as viewing screen for back protection etc.

Cylindrical Lenses

CL.1. $3/8$ " dia., 10" negative focus. In brass mount.

CLOSE-UP LENSES FOR PHOTOGRAPHY

High quality glass close-up lenses in standard screw-in mounts to add on to your existing camera lens. New and bloomed.

- 1 Dioptr positive (40 inch focus).
 CU.1. 52mm mount. CU.2. 55mm mount. CU.7. 49mm mount.
 - 2 Dioptr positive (20 inch focus).
 CU.3. 52mm mount. CU.4. 55mm mount. CU.8. 49mm mount.
 - 3 Dioptr positive (13.3 inch focus).
 CU.5. 52mm mount. CU.6. 55mm mount. CU.9. 49mm mount.
- See also ten dioptr achromatic close-up lens, page 53.

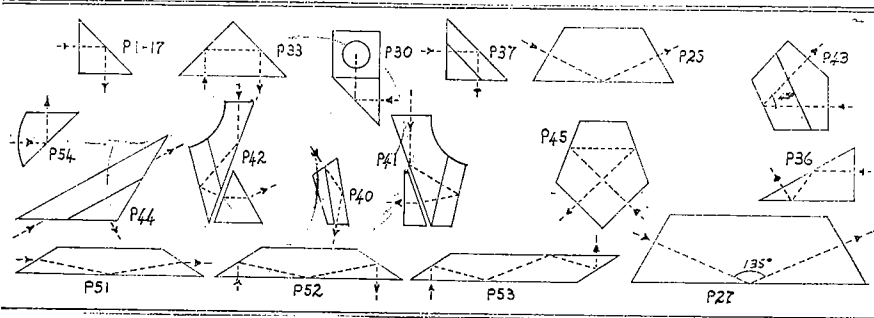


TELESCOPE ACCESSORIES

24.5mm (Swift type) push-in fitting, standard on most imported astro telescopes. These accessories have all been tested by us and found to be first class.
 TA.3. Erecting Prism. Uses two Porro prisms to enable astro telescopes to be used for terrestrial observation.
 TA.4. Sun diagonal, incorporating a 'Herschel wedge' prism, for the safe observation of the sun. (when used with a sun filter).
 TA.5. Sun Filter (not for use without the correct sun diagonal).
 TA.6. Moon Filter. Both these filters screw directly into eyepieces numbers E.51-58.
 TA.8. 2x Barlow lens. High transmission single element bloomed Barlow lens, giving two times power increase. Supplied ready fitted into correct length tube with eyepiece fitting (24.5m).

PRISMS

Mint condition unless otherwise stated.



Right Angle Prisms, $90 \times 45 \times 45$ degrees.

- P.2. $\frac{5}{8}$ " square faces. Silvered in mount.
- P.3. 18mm faces in mount.
- P.5. 25mm \times 23mm faces.
- P.9. $1\frac{1}{2}$ " square faces.
- P.11a. Elliptical prism diagonal. 2" diameter clear aperture on each face.
- P.14. $2\frac{1}{4}$ " square faces in mount.
- P.25. 60 degree prism. Truncated, faces $\frac{7}{8}$ " square in mounts.
- P.25a. 60 degree prism, as used in spectrosopes, etc. Three faces, 1" square each face. New.
- P.26. Ditto, $1\frac{1}{2}$ " square faces in mount.

Binocular (Porro) Prisms

- P.30. Ross type (2 cemented) prisms, Faces $1\frac{1}{8}$ " square. In brass mount 3" in diameter. Normal binocular type.
- P.34. $\frac{3}{4}$ " wide. Ex-government 6 \times 30 type.
- P.35. Ditto. $\frac{7}{8}$ " wide.
We can usually match most types of binocular prisms up to $\frac{3}{4}$ " wide from used stock in fair condition.
- P.36. $90 \times 60 \times 30$ degree prism. Small face $1\frac{1}{8}$ " square. Imperfect only.
- P.36a. $90 \times 60 \times 30$ degree prism, face 1" square, New.

Roof Prisms

- P.37. 90×45 degrees. $\frac{5}{8}$ " faces.
- P.38. Ditto, 1" faces. In mount.
- P.38a. Ditto, faces 25mm \times 27mm.
- P.39. Ditto, $1\frac{3}{4}$ " \times 2" faces.
- P.40. 45 degree faces. One end $\frac{3}{8}$ ", the other $\frac{3}{4}$ ".
- P.41. Pair in mounts as shown. Faces 1" \times $1\frac{1}{4}$ ". Zeiss made.
- P.42. Similar type unmounted. Produces 60 degree angle as shown.
- P.44. Faces angle 120 degrees, gives 0-180 degree coverage with complete reversal. Parallel rays only (i.e., before an object glass). Width $1\frac{1}{8}$ ". Effective aperture over the arc approximately 1" diameter. In mount with ball races.
- P.44a. 1.4" faces. In superb brass mount and flange fitting. Top grade. Bloomed.

PENTAGONAL PRISMS. CONSTANT DEVIATION

- P.45. $\frac{5}{8}$ " faces. Unsilvered.
- P.46. 1" silvered.
- P.47. $1\frac{1}{8}$ " silvered.
- P.48. $1\frac{3}{8}$ " silvered.
- P.51. Dove, or one-way reversing prism. $\frac{5}{8}$ " square \times $2\frac{3}{8}$ " long. Gives 180 degree rotation when turned through 90 degrees. In mount.
- P.52. Constant deviation. Rays return without reversal. Faces $\frac{5}{8}$ " \times $\frac{3}{4}$ ".
- P.54. Amici prism. Right angle, faces $1\frac{1}{8}$ " square. Lens focus approximately 3". Imperfect only.

BEAM SPLITTER PRISM CUBES. 50/50 transmission. Ex-government.

- P.61. 18mm.
- P.62. 35mm.
- P.63. 54mm.

OPTICALLY FLAT GLASS. Ex-government. New and unused unless otherwise stated

- PP.3. $5\frac{1}{2}$ " \times $1\frac{1}{4}$ " \times $\frac{7}{16}$ ".
- PP.11. Circular 27 $\frac{1}{2}$ mm diameter \times 7mm thick.
- PP.12. Circular 31mm diameter \times 6 $\frac{1}{2}$ mm thick.
- PP.13. Circular 40mm diameter \times 4mm thick. Bevelled edge.
- PP.14. Circular 50mm diameter \times 6mm thick.
- PP.16. Circular 45mm diameter by 6mm thick, bloomed. In brass mount threaded 2 3/16" dia. \times 32 T.P.I.
- PP.17. Circular 63mm diameter \times 4mm thick.

OPTICAL QUALITY NEUTRAL TINT FILTER GLASSES. Ex-government. New condition. Ground edges

- NF.1. $2\frac{1}{2}$ " \times $4\frac{3}{4}$ " \times $\frac{1}{8}$ ".
- NF.2. $4"$ \times $3"$ \times $\frac{1}{8}"$.
- OF.2. $5"$ \times $2\frac{3}{8}"$ \times 4mm thick.
- OF.3. $5\frac{1}{2}"$ \times $2\frac{3}{8}"$ \times 4mm thick.
- OF.4. $5\frac{3}{4}"$ \times $2\frac{3}{8}"$ \times 2.7mm thick.

OPTICAL QUALITY CLEAR GLASS. Ex-government. Ground edges

- OF.6. $5\frac{1}{8}"$ \times $3"$ \times 5.3mm.

SURFACE ALUMINIZED FLATS. $\frac{1}{8}"$ thick. Unground edges

- AF.5. $1"$ \times $1\frac{1}{2}"$.
- AF.7. $1\frac{1}{2}"$ \times $2\frac{1}{4}"$.
- AF.20. $2"$ \times $3"$.
- AF.21. $3"$ \times $4"$.
- AF.22. Circular aluminized flat, 15mm dia. \times 3.5 mm thick, edged.

LARGE SURFACE ALUMINIZED MIRRORS. Especially suitable for Episcopes, back projection, etc.

- LAM.1. $6"$ \times $4"$ \times $\frac{1}{8}"$ thick.
- LAM.2. $6"$ \times $4"$ \times $\frac{1}{4}"$ thick.
- LAM.3. $8"$ \times $4"$ \times $\frac{1}{8}"$ thick.

SEMI-SILVERED MIRRORS. $\frac{1}{8}"$ thick. 50-50 transmission.

- SM.1. $1"$ \times $1\frac{1}{2}"$.
- SM.2. $2"$ \times $3"$.
- SM.3. $3"$ \times $4"$.
- SM.4. $6"$ \times $4"$.

ELLIPTICAL FLATS. For reflector telescopes

- EL.1. 6mm thick, surface aluminized, $1\frac{1}{2}"$ minor axis.
- EL.2. 6mm thick, surface aluminized, 2" minor axis. Both these flats are of first rate quality and are recommended for all telescopic purposes.

GLASS BLANKS. Annealed plate for easy grinding. Ground edge and polished both sides.

GB.3. 4" diameter \times $\frac{1}{2}$ " thick.

GB.4. 6" diameter \times 1" thick.

GB.5. 8" diameter \times 1" thick.

GB.7. $16\frac{1}{2}$ " diameter \times $\frac{3}{4}$ " thick. Due to its fragile nature this item can only be sent at purchaser's risk. We recommend personal collection wherever possible.

BACK SILVERED MIRRORS

AM.7a. Microscope substage mirror. First grade. 2" diameter, 3" focus (positive).

AM.8. Microscope substage mirror. First grade. $2\frac{3}{8}$ " diameter, 3" focus (positive).

AM.12. $2\frac{3}{8}$ " \times $3\frac{1}{4}$ " plane mirror. First grade.

AM.13. Microscope substage mirror. First grade. 40mm. diameter. 2" focus (positive).

AM.15. Various small mirrors with ground or bevelled edges. Average size about $1\frac{1}{2}$ " \times 2". Unused, but may have minor imperfections of no practical consequence. Many uses in optical setups and experiments as well as general decorative purpose.

GRATICULES. Engraved on glass flats. Ex-government.

GR.1. Crossline. 1" diameter, in brass mount.

GR.2. Rifle sight type. Crossline and vertical, in brass mount $\frac{7}{8}$ " diameter and 1" long.

GR.3. Grating, useful for microscopy and for telescopic purposes. Divided over entire surface into $1/25$ " squares. Unmounted.

GR.4. Crossline. 33mm diameter, unmounted.

GR.5. Eccentric cross lines, horizontal line divided into millimeters at centre. 40mm clear diameter, 3mm thick. In brass mount 2" overall diameter.

GR.6. Engraved line 4mm long divided into fifths of a millimeter, plus two other scales. 26mm clear diameter, 3mm thick. In brass mount 1.8" overall diameter.

GR.7. Engraved cross lines, 45mm diameter. In brass mount 55mm diameter, 22mm long, threaded 32 T.P.I.

GR.8. Cross lines, 31mm diameter, in brass mount 46 mm diameter.

POLARIZING FILTERS

PF.5. 46mm diameter discs. Material sandwiched between glass. Total thickness $2\frac{1}{2}$ mm. At maximum extinction these produce a deep violet image.

Neutral colour linear polarizers in 0.035" thick plastic material. High transmittance type (32 per cent). Suitable for variable density filter systems using two polarizers with axes crossed (minimum transmittance 0.005 per cent) all and general purpose uses. Cuts easily with hobby knife to any desired shape.

PFT.1. $1\frac{1}{2}$ " square

PFT.2. 2" square

PFT.3. 3" square

PFT.4. 4" square

PFT.5. 6" square

Neutral colour linear polarizers in 0.030" thick plastic material. High extinction type (0.0005 per cent) transmittance 22 per cent. Specially suitable for microscopes, sextants, and instruments where extreme extinction density is required. Cuts easily with hobby knife to any desired shape. Numbers PFE.1. to 5, same sizes and prices as PFT.1. to 5.

Circular polarizers, neutral colour, in 0.030" thick plastic material. Used for suppression of unwanted reflections on tubes and screens of all types. 35 per cent transmittance.

PFC.1. 3" square

PFC.2. 6" square

Larger sizes of any of the above polarizers available to special order.

PHOTOGRAPHIC POLARIZING FILTERS

High quality glass polarizing filters in standard screw-in rotating mounts for cameras. New.

PF.85. 49mm mount.

PF.86. 52mm mount.

PF.87. 55mm mount.

PF.88. 58mm mount.

PHOTOGRAPHIC FILTERS

High quality glass filters in standard screw-in mounts for cameras. New.

Medium Yellow

CF.61. 43mm mount.

CF.62. 48mm mount.

CF.63. 49mm mount.

CF.64. 52mm mount.

CF.65. 55mm mount.

CF.66. 58mm mount.

Skylight

CF.73. 43mm mount.

CF.74. 48mm mount.

CF.74a. 49mm mount.

CF.74b. 52mm mount.

CF.75. 55mm mount.

CF.76. 58mm mount.

Soft focus filter.

CF.79. 49mm mount.

CF.80. 52mm mount.

CF.81. 55mm mount.

Medium Red

CF.67. 49mm mount.

CF.68. 52mm mount.

CF.69. 55mm mount.

Green

CF.70. 49mm mount.

CF.71. 52mm mount.

CF.72. 55mm mount.

85B Filter.

CF.77. 52mm mount.

CF.78. 55mm mount.

Cross Diffraction Effect Filter.

CF.82. 49mm mount.

CF.83. 52mm mount.

CF.84. 55mm mount.

COLOUR FILTERS

For optical instruments. First grade Optically Flat glass filters, ex-government.

F.1. 19mm dia. neutral

F.1a. 14mm dia. Neutral

F.2. 22mm dia. neutral

F.3. 28mm dia. neutral

F.3a. 28mm neutral yellow

F.4a. 34mm neutral

F.5. 38mm neutral

F.6. 61mm neutral

F.7. 60mm neutral yellow

F.11. 12.5mm red

F.13. 25mm red

F.20. 9mm red

F.24. 32mm red

F.32. 60mm yellow

F.34. 60mm neutral yellow

F.42. 34mm dark neutral green

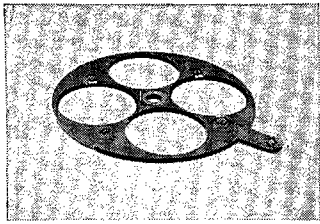
F.50. 52mm neutral

F.51. 52mm medium neutral

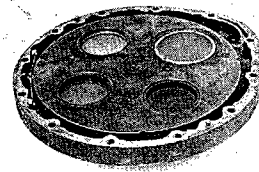
F.54. 52mm neutral yellow

F.54a. 34mm U.V.

F.55. 35mm light blue



F.52. Brass disc as illustrated, accepts filters F.50 and F.51. $5\frac{1}{4}$ " diameter.



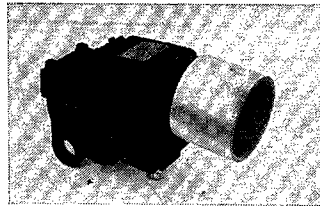
VF.1. Variable density filter unit. Optically flat filters, red, yellow and clear, 35mm dia., plus polarizing filters 40mm dia. in contra-rotating mounts giving variable density effect for control of image brilliance. Separate knobs for density control and filter selection. All brass, weight 5 lb.

This unit can be supplied with eyepiece No. E.34 in focussing mount if ordered at the same time.

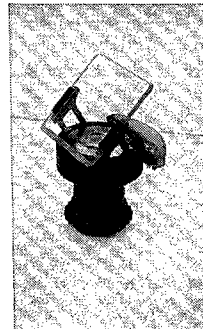
REFLECTOR SIGHTS (ex-government)



RS1



RS2



RS3

R.S.1. A small sight, consisting of a 4 lens projection system projecting an electrically illuminated image of a circle and dot graticule which is reflected back to the eye from a first class optical flat. Can be used as telescope sight or finder. The original lamps are no longer available, but can be replaced with a small torch bulb, with suitable modifications to the lamp holder and wiring. Or car type lamps can be adapted. Makes an excellent collimator for projecting parallel rays. As a break down unit it yields a three glass lens that is suitable for many purposes (See PL25), also No. 197. The flat which is approximately $\frac{1}{4}$ " thick, and about $1\frac{1}{2}$ " x 3" makes an excellent diagonal if surface silvered. The hinged neutral approx. $1\frac{1}{2}$ " dia. is suitable for astro use. Brand New and Boxed.

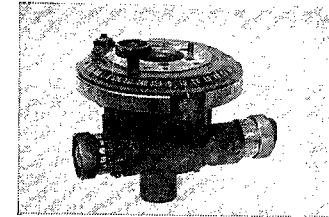
R.S.2. AMERICAN S8. Contains a $2\frac{1}{8}$ " dia. by 5" focus achro. O.G. plus S.S. mirror and lamp-house. Makes useful collimating target for parallel rays. Secondhand Condition.

R.S.3. BRITISH Mk. III. $3\frac{1}{2}$ " dia. 4 glass achromatic lens system. If dismantled yields lens No. 28. No. 40 and No. 18. Also PP.1. Secondhand condition.

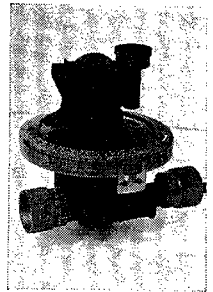
This is the famous 'Sight that saved Britain', the reflector sight used in battle of Britain Spitfires and Hurricanes. As a special offer to collectors we are able to offer a very limited quantity of these sights in specially selected fully working condition, complete with lamp and lamp housing., in the original fitted wooden case.

GEARED DRIVES. Ex-government

GD.1. 5" diameter circles, divided 0-360 degrees. One is adjustable and calibrated in opposition to the other. 72-1 geared drive fitted with micrometer and calibrated to 10 minutes of arc. Quick release lever to disengage drive is incorporated. These units are from precision optical equipment, unused but store soiled. The gears and circles are brass or gunmetal, the cases mainly steel. Weight 5 lb.

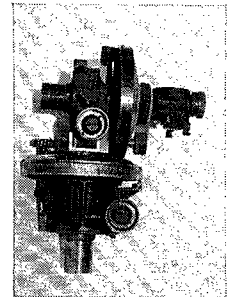


GD.2. As above, but case brass or gunmetal, larger bearing surfaces, and fitted with electric contact rings from base to moveable head. Weight 6 lb.



Both these units will accept a shaft approximately 1" in diameter. One of each of the above geared heads may be quite simply fitted together as shown to form a very useful altazimuth or equatorial head for telescopes of up to about four inches aperture. (See illustration at right).

GD.3. A similar unit to GD.1. but constructed from solid brass throughout, and slightly heavier.



STANDARD FITTINGS FOR OPTICAL INSTRUMENTS

Telescope Eyepieces.

There are two main fittings for telescope eyepieces, and three others which are occasionally used.

The two most frequent sizes are:—

(1) RAS (Royal Astronomical Society) thread. This has an external diameter of $1\frac{1}{4}$ " (31.75mm) and a thread of 16 t.p.i., (turns per inch). This size thread is used on the vast majority of British manufactured telescopes and accessories, and is in every way a most suitable and convenient fitting for the majority of normal purposes.

(2) 24.5mm push-in fitting. This has a plain tube having an outside diameter of 0.965" (24.5mm). This fitting is used on most astro telescopes produced in Japan. It is sometimes called 'Swift' fitting after the American firm which has its products manufactured using this size fitting. Many of the plain tubes used to accept eyepieces with this fitting have knurled screws, other split sleeves, to stop the eyepieces from slipping; others rely merely on a precise push fit. This fitting is satisfactory for a large number of relatively small astro (and terrestrial) telescopes, but its small size makes the provision of low power/wide field eyepieces difficult and produces a fair degree of corner cut-off with most methods of photography.

The less frequent eyepiece fittings are:—

(1) $1\frac{1}{4}$ " diameter push fitting. This has a plain tube $1\frac{1}{4}$ " (31.75mm) in diameter. Formerly the standard for American produced, as well as many British telescopes, this fitting has become less common, although it is still used on some imported Japanese equipment, intended primarily for the U.S. market. This fitting is as useful as the RAS type, but less positive due to the lack of a thread for locking and alignment.

(2) 2" diameter push fitting. This has a 2" (50.8mm) diameter plain tube. It is occasionally

used on larger telescopes to allow the provision of large, low power, wide field eyepieces—so important for the observation and photography of star fields, nebulae, comets, and similar faint objects of large angular size. It is often provided as a separate, additional fitting, only attached to the telescope (usually a reflector) when needed.

(3) Microscope fitting. This has a plain tube, 0.912" (23.165mm) external diameter. It was formally employed on a few telescopes making use of microscope eyepieces, but has now practically disappeared from use on telescopes.

Ex-government eyepiece fittings do not normally conform to any of the above descriptions, since they usually fit into purpose made mounts which are unique to the units for which they were designed. They can often, however, be adapted to fit into standard mounts (see our eyepiece lists) and even when this is not possible it is well worth the trouble of making a special mount to fit onto a particular telescope, since the quality of ex-service optics is so extraordinarily high.

Microscopes.

The British Standard sizes for microscope optics are termed RMS (Royal Microscopical Society) fittings. There is less variation than among telescope optics, but there is still some difference between manufacturers, especially as regards substage condensers.

Eyepieces. Standard RMS eyepiece (ocular) fitting is given as 23.3mm (0.9173") diameter plain tube. However, we have measured examples from manufacturers of various nationalities and most modern eyepieces appear to conform to a slightly smaller diameter of 23.165mm (0.912"). This is the size which we refer to as standard fitting.

Objectives. Standard RMS fitting is given as 19.822mm (0.7804") diameter, 36 t.p.i. thread. However, as for eyepieces the objectives found on modern instruments appear to differ slightly, although we have yet to find one which will not fit into the standard mount. Threads are always 36 t.p.i. The usual diameters are:—

External diameter of objective thread 20.2mm (0.795")

Internal diameter of mount 19.5mm (0.768")

These sizes are the ones which we refer to as standard fitting.

Substage Condenser Mounts.

The standard RMS size is given as 38.786mm (1.527") but there is considerable variation between manufacturers here. Not all makers use a plain push-in mount. Of those that do the most usual size is 37.0mm (1.456") diameter. This is the size which we refer to as standard fitting.

PHOTOGRAPHY THROUGH OPTICAL INSTRUMENTS

In general photography through instruments such as telescopes and microscopes is not as difficult as many people believe, but it does need considerable patience, a fair amount of experience by trial and error, and some basic equipment. For instance, although it is possible to use a camera which does not have reflex focussing, nor a detachable lens, the purchase of a camera with these features makes the whole procedure so much simpler, and opens up so many new possibilities that we consider it to be essential for serious work. On the other hand ultra sophisticated photographic equipment will not eliminate all of the difficulties; focussing and exposure determination at high powers is always tricky regardless of what equipment is used, and experience is the only sure teacher in these matters. There are always likely to be a fair proportion of wasted shots under any circumstances.

(1) Telescopes.

There are three methods of photography used for producing an image on film using a telescope.

(a) The Afocal method. With this the camera, complete with lens is used to take a picture through the telescope set up exactly as for visual observation. The telescope is focussed on the object to be photographed, then the camera with lens focussed at infinity is placed behind the eyepiece and the exposure made. The camera itself does not have to be physically attached to the telescope, but if this is done it makes the whole procedure rather more simple to operate. The camera lens should be set wide open, at its largest aperture setting (the largest aperture setting being that of the lowest f number).

The exposure time depends on the object being photographed. Firstly the effective aperture of the afocal system must be determined; this is done by (1) dividing the focal length of the

camera lens in mm by the diameter of the objective, also in mm, then (2) multiplying the result of this by the power of the telescope. Thus for a 6" (150mm) telescope used at 48 power, with a camera having a 50mm lens, the effective aperture of the afocal system works out at f.16. Once this has been determined for the particular combination in use, the camera shutter can be set accordingly. If the object to be photographed is in daylight a normal exposure meter can be used and the shutter speed set which corresponds to the effective aperture—i.e. if the effective aperture is f.16 as in the example above, the shutter speed to use is the one shown against f.16 on the meter. For pictures of astronomical subjects requiring generally longer exposures a great deal more trial and error in the form of trial exposures at various different speeds will be required. It will be most useful to keep a detailed note book of these experiments for future reference.

The afocal method is the only one which can be made to work using a non-reflex type camera with a fixed lens. Even so it is very easy to obtain an out of focus or misaligned picture, and the single lens reflex camera, whether fixed or interchangeable lens, offers very great advantages.

(b) The Direct Method. With this method the camera lens is removed and the camera body alone is used at the prime focus of the objective. No eyepiece is used in the telescope, thus some form of reflex focussing must be provided on the camera. The only problem with this method is that with some types of telescopes it may not be possible to place the camera body near enough to the objective (lens or mirror) to get the picture into sharp focus, thus necessitating modifications to the focussing tube or even to the objective mount. With most telescopes, however, this method works very well. It is certainly the simplest to operate and almost always gives the sharpest image resolution. Unfortunately it will not provide enough power for small astronomical objects such as planets. There will usually be some cut-off at the edges of the field of view, depending on the diameter of the focussing tube which is used. The effective aperture by the direct method is simply that of the objective itself, given by dividing its focal length in mm by its diameter, also in mm. The f number obtained is then used to set the shutter speed by the same procedures described for the afocal method.

(c) The Projection Method. With this method the primary image formed by the objective is projected onto the film using another lens or lens system. This may be a positive lens system such as the telescope eyepiece itself, or an enlarging lens, or the camera lens, or it may be a negative (Barlow) lens. In either case the projecting lens will be separated from the camera by a distance which varies according to the magnification required. The Barlow lens will give the greatest power increase for any given extension, and also probably the sharpest resolution, but the use of the eyepiece itself for projection is obviously the cheapest and simplest method. The characteristics of lens systems such as this are fully covered in our book *How to use Lenses and Mirrors*, and we will not go into more detail here.

The projection method offers the advantage of high powers and better film coverage, but since the effective aperture falls off as the power is increased, focussing is often difficult and exposures are considerably lengthened.

(2) Microscopes.

To an even greater degree than with telescopes, successful photography through a microscope depends on experience, and a great deal of practice is required to achieve really good results. Reflex focussing is an absolute necessity for the camera, and high intensity illumination plus a good substage condenser are almost as important. Basically, the first thing to master is really good visual adjustment of the instrument, providing even illumination and the sharpest possible definition. Although all three methods of photography as described for telescopes are possible with a microscope, the method most likely to give good results is the projection method using the standard microscope eyepieces. Although exposure can be determined by trial and error, there is always considerable uncertainty and especially for colour work a camera with through-the-lens metering will rapidly pay for itself in terms of film costs.

Altogether, microphotography is one of the more expensive pastimes. If a great degree of magnification is not required, less than about ten times (this can of course be increased by subsequent photographic enlargement) it is much cheaper and simpler to make use of a macro lens, with bellows unit and/or extension tubes. The photograph on page 55 shows how impressive these low power shots can be. Also, by this method both transparent and opaque objects may be successfully photographed.

TELESCOPE TUBING. Dismantled from ex-government equipment. Useful to the home constructor of telescopes and other optical instruments.

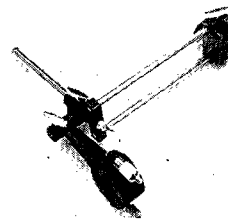
- FT.1. Brass drawtube, 4" extending to 7". 1 1/4" drawtube diameter. Inner tube is a ground in sliding fit.
- FT.2. Ditto, 6" extending to 11".
- FT.3. Ditto, 10" extending to 15".
The above three drawtubes can be supplied with RAS female thread fitted to the inside tube.
- FT.4. Brass drawtube, 4" extending to 7". 1" outside diameter. Inner tube is a ground in sliding fit.
- FT.6. Plain brass tube, 36mm inside diameter 38mm outside diameter. 9 1/2" long.
- FT.10. Hard Paxolin tube, 45mm inside diameter. Fits lenses numbers 82 and 83. Can be supplied in up to 3' lengths.
- FT.13. Brass drawtube, 4 1/2" extending to 6 1/2". 1 1/4" overall diameter. 7/8" inside diameter. Very precise sliding fit. Can be supplied with 'Swift' type 24.5mm internal fitting or with RAS female thread.
- FT.13a. Extra inside drawtube with ground in sliding fit to give 3" extra extension.
- FT.14. Brass tube 1 3/8" inside diameter with aluminium outside sleeve and flanged base, 2" x 3 3/8".
- FT.15. Light brass tube, 0.9" outside diameter, flanged one end. Flange 1.05" diameter. In two lengths, 1.4" and 1.95". Please state which length.
- FT.16. Plain brass tube, 3.28" long. 1.38" outside diameter, 1.25" inside diameter.
- FT.17. Aluminium tubing, 2" outside diameter, 1.85" inside diameter. Lengths up to 3 foot sent by post, up to 16 foot lengths available if collected.
- FT.18. Brass tube 55mm diameter x 260mm long. Collar one end 60mm diameter. Four internal light baffles. Weight 2 lb.

ADAPTORS

Please note, regarding all telescope camera adaptors, that these are only intended to attach the camera to the eyepiece mount and to assist in alignment, they are NOT intended to carry the weight of the camera, etc. Many eyepiece mounts are not strong enough for this, and for security the camera should always be separately supported, either by a support fixed to the telescope itself or on a separate stand.

- AD.1. 24.5mm (internal thread) to RAS (external thread). Used to fit 'Swift' fitting eyepiece (E.50 to 59) into RAS threaded telescope focussing mounts.
- AD.2. Microscope eyepiece (internal) to RAS (external thread). Used to fit RMS microscope eyepieces (E.60 to 62) into RAS threaded focussing mounts.
- AD.3. Pentax (42mm dia. x 1mm pitch) external thread to RAS (external thread). Used for photography by the direct objective method for telescopes with RAS eyepiece fitting and cameras having Pentax type screw thread.
- AD.5. Microscope objective (internal thread) to Pentax (external thread). Used for attaching RMS microscope objectives to extension bellows or tubes with Pentax type screw thread, thus enabling macro or microphotography to be undertaken by the direct objective method.
- AD.7. RAS (internal thread) to Pentax (internal thread). Used for attaching RAS threaded eyepieces to Pentax photographic lenses for telescopic purposes. See details on page 9.
- AD.8. Leica (internal screw thread) (39mm dia. x 1mm pitch) to Pentax (external thread). Converts Leica fitting camera or enlarging lenses to Pentax fitting.
- AD.9. Pentax (external thread) to Biolam 70 Russian microscope head fitting. Used for all methods of photography with Pentax fitting cameras through Biolam series microscopes.

- AD.10. 24.5mm (external) fitting to RAS (internal thread). Converts 24.5mm telescope mounts to accept RAS eyepieces. It should be noted that the use of RAS eyepieces on smaller tubes will often entail an inevitable decrease in the field of view.
- AD.11. 24.5mm (external fitting to Pentax (external thread)). Used for photography by the direct objective method with 24.5mm eyepiece fitting telescopes and cameras with Pentax type thread.
- AD.12. RAS (external thread) to Pentax (external thread) with RAS (internal thread) inset. Same use as AD.3 above, but RAS eyepieces can also be used allowing photography by eyepiece projection. Extension tubes will be required in addition, to give clearance over the eyepiece. Suitable eyepieces are E.7, 14, 15, and E.37 (plus E.50 to 59 if used with AD.1.).
- AD.13. Reverse camera adaptor. Pentax (external) thread to 49mm x 1mm pitch (external) filter mount thread. Used to fit camera lenses back to front in their mounts; screw into filter mount of lens. Often used for macrophotography.
- AD.14. Reverse adaptor, Pentax to 52mm filter thread. Use as for AD.13.
- AD.15. Reverse adaptor, Pentax to 55mm filter thread. Use as for AD.13.
- AD.16. Three screw holder to Pentax (external) thread. The holder has three clamping screws enabling it to be fitted over any eyepiece or tube having a diameter of 20 to 40mm. Used for photography by the direct method (adaptor on eyepiece mount and camera) or the projection method (adaptor on eyepiece itself and camera with extension tubes).
- AD.17. Three screw holder to Pentax (internal) thread. As above, but used with AD.13, 14 or 15 for photography by the afocal method. This combination may also be used for photography through our microscope units T.68 and 69.
- AD.18. 'T' mount to external microscope tube fitting. This adaptor may be used for all methods of photography through microscopes having RMS size microscope tubes. It is especially useful for cameras having odd-sized or bayonet fitting mounts, since adaptors to 'T' mount are usually readily available.
- AD.20. 1 1/4" push fitting (external) to 24.5mm (internal). Converts 1 1/4" telescope eyepiece mounts to accept 24.5mm fitting eyepieces.



AD.21. Universal camera adaptor. This unit is designed to allow any camera having a standard tripod bush to be fitted to any instrument with an eyepiece tube up to 45mm diameter. Three adjustable tracks allow positioning of the camera, either with or without lens, to be either horizontal or vertical at any distance up to 7" from the clamping collar. This is a substantially made piece of equipment of great versatility, described by 'Amateur Photographer' magazine as 'an exciting acquisition and well worth while'.

- AD.22. 'T' mount adaptors for cameras. Enable the following cameras to be fitted to 'T' (Interflex T-2) mount lenses and accessories;
Alpha, Argus, C-mount, Canon, Exakta, Topcon U, Icarex BM, Konica, Konica AR, Leica-flex, Leica, Minolta, Miranda, Nikon, Nikkormat, Olympus Pen, Olympus OM-1, Pentax/Praktica (screw), Petri FT, Rolleiflex SL-35, Yashica Pentamatic, Zenith 3M.
Please state which camera fitting you require when ordering. Other camera fittings are frequently available to special order—price by quotation.
Interflex T-2 mounts are said to be compatible with the following lens systems;
Soligor, Vivitar, Photax, Paragon, Sigma, Palar, Aicoset, Promura, Prinz Galaxy, Hanimar, Optomax, etc.

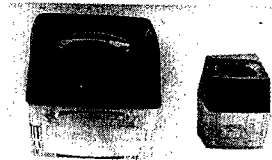
- HM.11. 5× Achromatic Magnifier. Of ex-government origin, this four element unit gives a virtually distortionless field of view 2" in diameter when used as a magnifier close to the eye. Colour distortion is completely eliminated. This has been found to be a really superb viewer for 35mm slides, since when it is used close to the eye the entire film frame may be viewed practically free from all distortion with an image size equivalent to a six foot wide picture viewed at eight feet distant. In brass mount, total weight 6 ounces.
- HM.12. Pocket folding magnifier with 10× and 20× two-element lenses. All metal mount.
- HM.13. Pocket folding magnifier with three single element lenses, 3×, 4× and 5×, which may be used separately or together, giving powers 3, 4, 5, 7, 8, 9 and 12×. All metal mount.
- HM.14. Pocket folding magnifier with triplet 8× lens for minimum distortion. All metal mount.
- HM.15. Pocket folding magnifier with 8× and 15× two-element lenses. All metal mount.
- HM.16. Illuminated magnifier, 2¼" diameter lens, 3× magnification. Ideal for map reading, document work, etc., uses two SP.11 batteries.



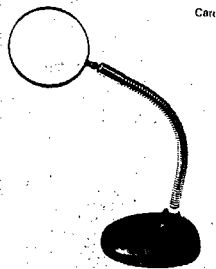
HM.17. Folding linen tester, 10 × magnification, ½" square aperture with ¼" scales.

HM.18. Ditto, 6 × magnification, 1" square aperture with ¼" scales.

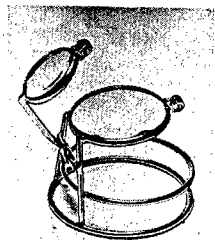
STAND MAGNIFIERS



MG. 1 and 2.



MG.4



MG.7.

- MG.1. Beck 4× aspheric bright field magnifier. Acrylic mount facilitates intense illumination of the object being observed — no extra illumination needed in daylight.
- MG.2. Beck 8× achromatic bright field magnifier. Higher power version of MG.1., fully colour corrected.
- MG.4. Stand magnifier with swan-neck flexible arm. 2½" diameter lens.
- MG.5. Stand magnifier with heavy duty swan-neck flexible arm. 4" diameter lens.

MG.5a. ditto, 4½" diameter lens.

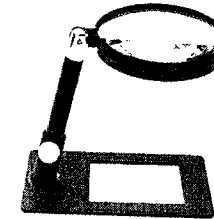
MG.5b. ditto, 5" diameter lens. Both of these tend to be slightly top heavy, but they do have the advantage of an exceptionally large field of view.

MG.6. Single lens stand magnifier/eyeglass. 3.3 × magnification, wire mounted.

MG.7. Double lens stand magnifier/eyeglass. 10 × magnification, wire mounted.



MG.9.



MG.11.



MG.12.

MG.9. Double lens watchmaker's eyeglass. 10 × magnification. Plastic mounted.

MG.10. 60mm lens supplied with a swivel top, handle, and flat base with locking screw, designed so as to be useable either as a hand magnifier without the base or as a stand magnifier with the base attached.

MG.11. As above, but with 100mm diameter lens.

MG.12. 10 × stand magnifier, or lupe, in black plastic mount with clear base to allow illumination from the side. Clear field of view 28mm in diameter.

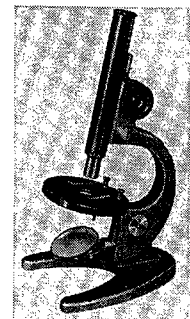
MG.80. Single lens watchmaker's eyeglass, plastic mounted, 4" focus, 2.5x magnification.

MG.81. ditto, 3" focus, 3.3x magnification.

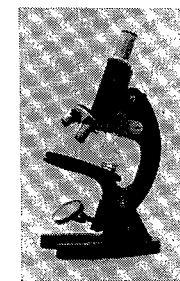
MG.82. ditto, 2½" focus, 4x magnification.

MG.83. ditto, 2" focus, 5x magnification.

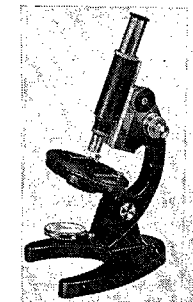
MICROSCOPES



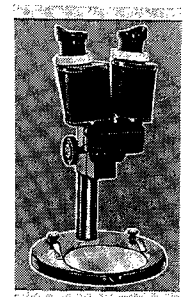
NM.3.



NM.5.



NM.6.



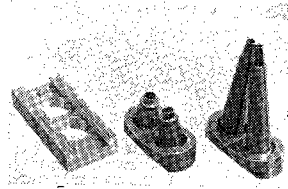
NM.7.

NM.3. Full size. Height 11½". Weight 3 lb. 12 oz. With 2 objectives, 2 eyepieces, all standard fitting and fully corrected. Powers 80, 120, 200, 300. Rack and pinion focussing. Four position aperture control. 55mm diameter mirror/white plate. In wooden case.

NM.5. Full size. Height 12". Weight 9 lb. 4 oz. With 2 objectives and 3 eyepieces, all standard sizes and fully corrected. Powers 50, 100, 125, 200, 400, 500. Rack and pinion focussing with coarse and fine adjustment. Five position aperture control. Double sided mirror. In wooden case.

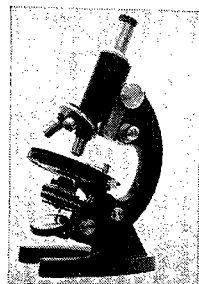
NM.6. Full size. Height 12". Weight 6 lb. 3 oz. With 2 objectives and 3 eyepieces, all standard sizes and fully corrected. Powers 56, 80, 120, 200, 300. Rack and pinion focussing with coarse and fine adjustment. Three interchangeable diaphragms. Double sided mirror. In metal case.

NM.7. Stereoscopic binocular model. Height 12". Weight 5 lb. Magnification 8.75. Field of view 25mm. Working distance 140mm. Rack and pinion focussing. In wooden case.



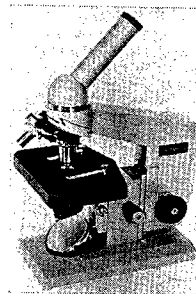
NM.7a. High power conversion kits for the NM.7 stereo microscope. Consists of two matched pairs of 3× and 10× stereo objectives and a conversion block, all engineered to high mechanical and optical standards. The working distance of the 3× objectives when fitted to the NM.7 microscope is approx. 60mm, that of the 10× is approx. 20mm. To convert, remove the 4 small screws holding metal cover on NM.7 objectives, and the two centre screws holding the objective block. Attach the conversion block by means of the two centre screws supplied with it, then

slide in the 3× or 10× objectives as required. Powers now available with the existing 12× eyepieces are 36× and 120×. The original mounted objectives may be speedily refitted by reversing the procedure should the need for the original power arise. Should intermediate powers be required we can supply a pair of eyepiece adaptor bushes (NM.7b) which allow eyepieces E.65 and E.66 to be used in place of the NM.7 eyepieces, E.65 giving powers of 18 and 60, and E.66 giving 24 and 80. For those who only require slightly higher power with NM.7 whilst still retaining the long working distance given by the standard objectives, we can supply adaptor bushes (NM.7c) to accept the 24.5mm fitting eyepieces on page 14 such as E.102 for 14× or E.100 for 24×.



NM.8. Full size. Height 12½". Weight 9 lb. 2 oz. With 3 objectives, 3 eyepieces, all standard sizes and fully corrected. Powers 30, 50, 60, 75, 100, 150, 198, 630, 945. Abbe condenser with variable aperture diaphragm and swing mount filter holder. Rack and pinion focussing with coarse and fine adjustment. Round stage with revolving and centering adjustment. Double sided mirror. In wooden case.

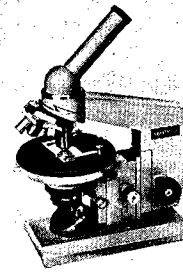
NM. 10-12



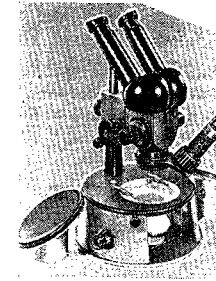
NM.10. Full size microscope with inclined rotatable monocular head. Fitted with quadruple nosepiece, rack and pinion focussing substage, abbe condenser, variable iris diaphragm and swing mount filter holder. Coarse focussing adjustable plus fine adjustment with safety ratchet and 0.002mm engraved divisions. Blue and ground glass filters. Double sided substage mirror. Supplied with two eyepieces and two objectives giving powers 80, 120, 400 and 600. Supplied in fitted wood case.

NM.11. Specification as for NM.10, but supplied with three eyepieces and three objectives giving powers 56, 80, 120, 140, 200, 280, 400 and 600.

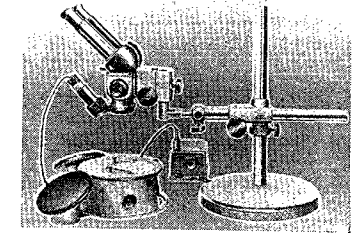
NM.12. Specification as for NM.10, but supplied with higher power optics, three eyepieces and three objectives giving magnifications 56, 80, 120, 280, 400, 630, 900 and 1350.



NM. 13-14



NM.16.



NM.17.

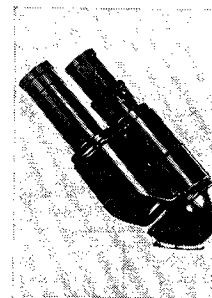
NM.13. Specification of stand same as NM.10, but fitted with circular rotating, centring stage. Supplied with two eyepieces and two objectives giving powers 56, 120, 280, 600.

NM.14. As NM.13, but supplied with three objectives and two eyepieces giving powers 56, 120, 280, 600, 630 and 1350.

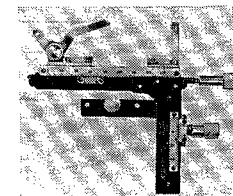
NM.15. Specification as for NM.10, but supplied with special square stage and narrow base, so as to fit into compact metal case supplied, suitable for field work. Supplied with three eyepieces giving powers 63, 90, 135, 140, 200, 280, 300, 400, 600.

NM.16. Stereoscopic Binocular Microscope. The revolving indexed drum on the main body of the instrument carries objectives in matched pairs with powers of 0.6, 1, 2, 4 and 7 times; pairs of 6, 8 and 12.5 times eyepieces are provided, giving total magnifications in fifteen steps from 3.6 to 87.5. A single 8× micrometer eyepiece having combined scale and crossline graticule is also provided for fine measuring work. The clear working distance remains constant at 64mm for all powers. Maximum field of view is 42mm. The circular base and lighting unit (with rheostat) provided with the microscope can be arranged to give either reflected or transmitted illumination for a very wide range of specimens. The base is supplied drilled and tapped to accept mechanical stage NMA.2 should this be required. Rack and pinion focussing is provided and the binocular head is adjustable for interocular distance and fully reversible. The entire unit is supplied in a very substantial timber and metal storage box.

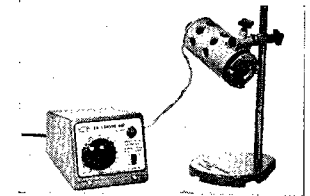
NM.17. Stereoscopic Binocular microscope identical in all respects to NM.16, but supplied on a large universal stand having a vertical column 15¼" high and a horizontal arm 13¼" long, adjustable by a rack and pinion movement.



NMA.1.



NMA.2.

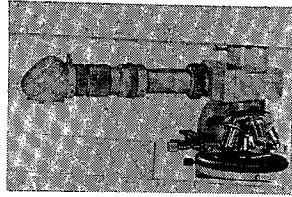


NMA.3.

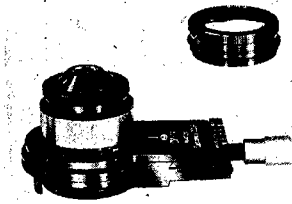
NMA.1. Binocular head. Fits microscope NM.10-15. With matched eyepieces ×7 and ×10. Variable interocular adjustment. In wooden case.

NMA.2. Mechanical stage. Fits microscope NM.6 and NM.10—15. Scales and verniers reading to 0.1mm, with movements of 30mm in the vertical and 80mm in the horizontal directions.

NMA.3. High intensity lamp unit, for use with any microscope. Gives sufficiently high intensity for phase contrast or dark field microscopy, as well as providing perfect (Kohler) illumination for all normal purposes. 8 volt 20 watt lamp, with rheostat controlled step-down transformer. Two element lens, iris diaphragm and filter holder.

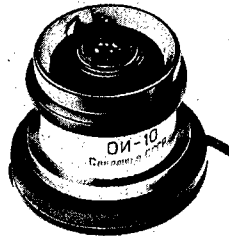


NMA.4. Projection and camera lucida attachment for microscope NM.10—15, used with high intensity lamp NMA.3. Also used as drawing attachment, when the observer sees simultaneously the object being drawn and the pencil. May be used with either monocular or binocular head. In wooden case with full instructions.



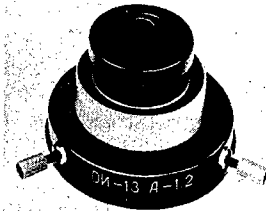
NMA.5

NMA.5. Aplanatic Condenser. Numerical Aperture 1.4, in 37mm substage mount with iris diaphragm and filter holder. Rotating rack and pinion mount allows oblique illumination. Supplied with low power additional condenser N.A. 0.03, all in fitted wooden case.



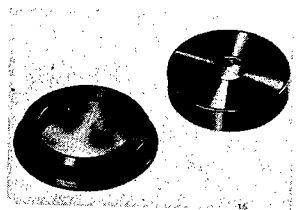
NMA.6

NMA.6. Light and Dark Field Condenser. Light Field N.A. 0.6, Dark Field N.A. 0.7. 37mm diameter substage mount. Supplied in fitted wooden case.



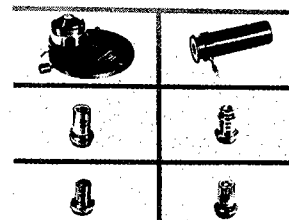
NMA.7

NMA.7. Dark Field Oil-immersion Condenser. N.A. 1.25. May be used with both dry and oil-immersion objectives. 37mm diameter centring substage mount with iris diaphragm. Supplied in fitted wooden case.



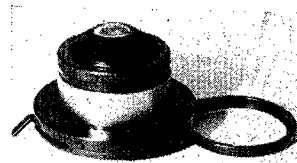
NMA.8

NMA.8. Polarizer and Analyser. Two glass mounted discs, polarizer fits into filter holder of microscope condenser, analyser, fits over eyepiece.



NMA.9

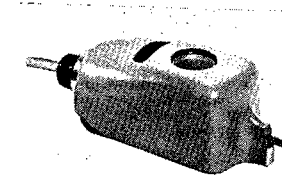
NMA.9. Phase Contrast Apparatus. Consists of four special objectives, $\times 10$ (N.A. 0.30), $\times 20$ (N.A. 0.40), $\times 40$ (N.A. 0.65), and $\times 90$ (N.A. 1.25), special condenser unit 37mm



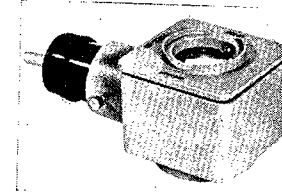
NMA.10.

diameter fitting, N.A. 0.9, with four diaphragms, plus one clear aperture or normal illumination, and auxiliary telescope for setting up the condenser. The apparatus is designed for a tube length of 160mm and cover glass thickness of 0.17mm. Phase contrast is especially advantageous for the study of biological specimens due to the great clarification of cell structure which it confers. Supplied in fitted wooden case with green filter.

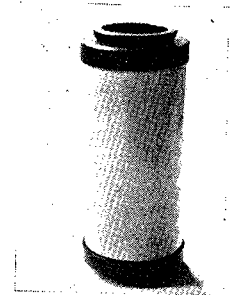
NMA.10. Abbe condenser. Numerical aperture 1.2, in 37mm diameter push mount with iris diaphragm and filter carrier.



NMA.11.



NMA.12.

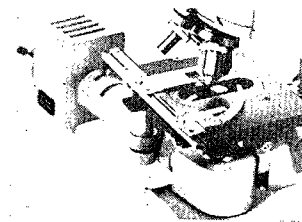


NMA.13.

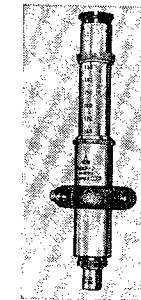
NMA.11. Substage lamp. Fits into microscopes NM.10—15 in place of substage mirror mount. Supplied with 15 watt mains bulb and six feet of cable.

NMA.12. Substage lamp. Fits into base of microscopes NM.10—15 after removal of mirror mount. Supplied with 15 watt mains bulb and six feet of cable.

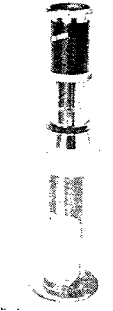
NMA.13. Camera adaptor for microscopes NM.10—15. Fits in place of monocular or binocular head. Accepts any 42mm thread fitting camera.



NMA.14.



NM.20.



NM.21.

NMA.14. Substage high intensity illumination attachment for microscopes NM.10—15. This unit fits onto the base of the instrument after removal of the substage mirror, and provides ideal lighting conditions with the minimum amount of fuss. Uses separate step-down transformer (supplied with the unit). Size of the unit $4'' \times 4\frac{1}{2}'' \times 13\frac{1}{2}''$.

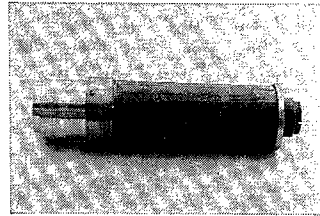
NM.20. Measuring microscope, designed for the accurate measurement of small component parts. Uses standard size (RMS) eyepiece and objective. Variable magnification by means of extendable graduated drawtube. Objective magnification $3.7\times$. Eyepiece magnification $7\times$. Graticule finely divided into 100 divisions. Weight 12 oz. In wooden case with full instructions.

7010. Adjustable stand with magnetic base for attaching NM.20 to any ferrous workbench or machine surface. See also HM.89b page 31.

NM.21. Brinell microscope, designed for accurately measuring the indentations produced by a Brinell hardness testing instrument; in addition, however, it is also useful for a wide range of measuring and counting tasks. Supplied in a sturdy wooden case the microscope unit has a flanged base with a helical focussing movement controlled by a knurled ring; magnification is 24 times and field of view 9mm in diameter. The eyepiece may be focussed

over a range of 8 dioptries on to a reticule divided into 130 equal divisions each equivalent to 0.05mm. The microscope is ideal for the examination and measurement of any surface feature up to 6.5mm in size.

T.68. Microscope unit adapted by us from ex-government components. Power $8\times$ ($12\times$ with object lens reversed) working distance about 3", length 9". Optical performance up to our usual high standard. A useful unit for engineers, watchmakers, and for any purpose requiring plenty of working distance below the objective and wide field of view.

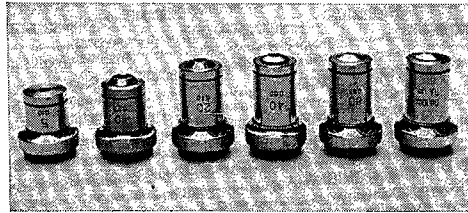


T.69. Similar unit to T.68 but in simple telescopic tube giving powers variable between 32 and 52. Indispensable in many commercial applications.

Either T68 or T69 can be fitted with a graduated graticule having a centre cross.

MICROSCOPE OBJECTIVES. Standard (RMS) fitting

These objectives have been extensively checked by us and are in our opinion of first rate quality, representing value well above that indicated by the asking price.



MO.1.	$\times 5$	N.A. 0.10
MO.2.	$\times 10$	N.A. 0.25
MO.3.	$\times 20$	N.A. 0.40
MO.4.	$\times 40$	N.A. 0.65
MO.5.	$\times 60$	N.A. 0.85
MO.6.	$\times 100$	N.A. 1.25

(Oil Immersion)

MO.7. Cooke-Baker $40\times$ N.A. 0.7 in fully sprung mount.

MO.8. Meopta $60\times$ NA. 0.85 in mount with correcting collar for adjustment to varying cover slip thickness.

MICROSCOPE EYEPIECES. Standard (RMS) fitting

See eyepieces list numbers E60-63 under eyepiece section.

MICROSCOPE SLIDES

A new range of high quality microscope slides, boxed in dozens. Available in the following types:—

MS.1. Insects.	MS.8. Bacteria.
MS.2. Animals.	MS.10. Structure of Blood.
MS.3. Micro-organisms.	MS.11. Plants.
MS.13. Plain Slides. $3'' \times 1''$, per hundred.	
MS.14. Cavity Slides. $3'' \times 1''$, per ten.	
MS.15. Cover Glasses. Square or round, per hundred.	
MS.16. Canada Balsam. 12cc bottle.	
MS.18. Microscope slide library boxes. Accept 100 standard size slides. With numbered index.	
MS.20. Cedarwood oil. 12c.c. bottle.	
MS.24. Dissecting kit, comprising scalpel, spatula, scissors, tweezers, dissecting needle and $4\times$ magnifier all in plastic wallet.	

CHOOSING BINOCULARS

The ideal way is without doubt to select your own after making direct comparison with others of different types. In order to do so you need a shop which carries a very wide range of different types (with a wide price range for each size and power), a patient assistant who can offer expert guidance in the light of experience, and above all a good view over open country to check with.

We have all these facilities, including an eight mile view with all intermediate distances and plenty of test objects.

From 25 years experience in selling binoculars we have learned that there is no particular instrument, however good or expensive, which will satisfy everyone. From this it is obvious that there is no real alternative to personal selection as outlined above. The buying of binoculars on approval is clearly no answer; we find that the average customer needs to compare some eight or ten binoculars before he is sure of which he prefers; to do this by any method other than direct personal selection by comparison is time wasting, expensive, and is unlikely to prove successful. We do not sell binoculars on approval, because every new binocular sold by us is just that; genuinely new, it has not been in the possession of any other purchaser.

Remember the essentials; a good selection, a good price range, and most important a good viewing range. If you cannot find anyone offering these facilities then come to us. WE CAN. Our opening hours etc., can be found in our terms of business at the beginning of this catalogue. Our showrooms, set in the most attractive part of the Essex countryside, are well worth a visit by car if only for the sake of a day out. Also remember that our special 15 per cent discount offer applies to all personal callers. See terms of business for details.

If a personal call is out of the question we recommend that you study the various notes below about binocular specifications then choose the model which you consider appropriate for your purpose from our ENGLISH SUPERSCOPIC or ENGLISH HYPERSCOPIC ranges, which we confidently state will please the most fastidious of users, since they combine both high quality and reasonable price. We know of no other range of binoculars on the market which offers the same quality at such low prices.

Now a few words about the specifications of binoculars.

First and foremost ALL the binoculars we stock are PRISMATIC binoculars; this is important, as non-prismatic binoculars (sometimes called Galilean, or field glasses) can be made to look like the real thing, and specifications can even sound similar, but the instruments themselves can never give the same performance. They are in fact a completely different type of instrument.

The next factors are the magnification and light grasp of the instrument. These are usually expressed in the form of two sets of figures, i.e., 10×50 . The figure or figures before the 'x' sign gives the magnification, or power. A $7\times$ binocular will make objects 700 yards away appear to be 100 yards distant; a $10\times$ binocular will make the same object appear to be at 70 yards, and so on. The figures after the 'x' sign gives the diameter of the front (object) lenses in millimeters (there are about 25 millimeters to an inch). This does not mean very much on its own, but can best be interpreted by dividing by the power. Thus a 10×50 gives a figure of 5. This is the diameter of the exit pupil in millimeters; the larger the exit pupil the more useful the binocular in conditions of poor light.

It is not true to say, however, that binoculars with a large exit pupil always give a brighter picture. This is because the eye itself has a variable aperture which limits the amount of light which can enter. The size of this aperture under normal bright daylight conditions is about 3.5mm diameter. Thus all the light from a 10×50 having an exit pupil of 5mm will not pass into the eye, some of it (about half) will be wasted. In fact the image seen through the 10×50 will be no brighter than that seen through an 8×30 (exit pupil 3.75mm diameter) under these conditions. No decrease in brightness will be observed until a binocular is used whose exit pupil is less than 3.5mm diameter (i.e. 20×50 , exit pupil 2.5mm diameter). Thus under normal daylight conditions ALL of the most common popular sizes of binoculars (8×30 , 8×40 , 7×50 , 10×50 and 12×50) give the same brightness. Note also that even very large binoculars such as 20×70 give the same brightness, the extra size of the object glasses being offset by the high power. However, since the brightness falls off in direct ratio to the

SQUARE of the exit pupil diameter, even in sunlight conditions a 20×50 is only about half as bright as an 8×30 , a 30×50 only a quarter as bright.

Being variable, the pupil of the eye opens up considerably under conditions of dim light. This is where a binocular such as the 7×50 really comes into its own since now the eye can receive all or most of the exit pupil which it supplies. For the popular range of binocular sizes, 8×30 , 8×40 , 7×50 , 10×50 and 12×50 , the relative brightnesses are in the ratios of 14, 25, 51, 25 and 17 respectively. Thus under really dim conditions, a 7×50 will be twice as bright as either 8×40 or 10×50 , three times as bright as 12×50 and about $3\frac{1}{2}$ times as bright as 8×30 . Furthermore it will be $8\frac{1}{2}$ times as bright as 20×50 and seventeen times as bright as 30×50 .

A very popular misconception is the one that the diameter of the object lens in some way determines the field of view; this is not so with prismatic binoculars. The factors determining the field of view are the type of eyepiece and the size of prism used. These are fairly standardized on all binoculars at any given price; also as the power increases the field of view drops in direct proportion, so the maximum field of view with any given type of binocular will be obtained with that having the lowest power. Binoculars of normal angle of view are adequate for all general purposes, high priced wide angle binoculars are only required for special purposes, in particular for the observation of fast moving objects. A real wide angle binocular will have the field of view marked in degrees (or sometimes in feet at 1000 yards), and by comparison with a normal binocular this will be found to be appreciably greater. The normal angle of view of binoculars is approximately as follows; the figures in brackets, are feet at 1000 yards. 8×30 $7\frac{1}{2}$ degrees (390), 8×40 $7\frac{1}{2}$ degrees (390), 7×50 7 degrees (370), 10×50 $5\frac{1}{2}$ degrees (260), 12×50 $5\frac{1}{2}$ degrees (260). The purchaser should make sure that he really needs the extra angle of view, for the cost will be about double that of a similar model with normal angle. Also wide-angle binoculars are not generally popular, and form only a small proportion of our sales, since the rather large eyepieces necessary are not found to be comfortable in use by many people, who also find the weight and bulk of these instruments excessive. The diameter of the object lens does, however, affect the resolution of the optical system, since the resolving power of a lens is a function of its diameter. This does not mean that ANY binocular having a large object lens is necessarily superior to another having a smaller one, but for two binoculars of the same quality of manufacture the one with the larger object lenses is likely to give better resolution of fine detail REGARDLESS OF POWER. Another popular misconception is that bloomed lenses are some indication as to the quality of an instrument. In fact it costs very little to bloom the outside lenses of a pair of binoculars during manufacture, and some of the lowest quality glasses on the market are bloomed (or coated as it is sometimes called). The factor governing the performance of a lens is the accuracy and precision of its manufacture, and no amount of blooming will improve a poorly made lens to any material degree. On the other hand, given good optical quality, blooming will undoubtedly improve the performance of a binocular by reducing unwanted reflections from the lens surfaces, and increasing contrast and general clarity.

It is perhaps worth mentioning that all the new binoculars which we sell are bloomed, but some of the ex-government ones are not.

The final choice of binocular can only be made by the customer since one person will consider nothing less than a 50mm object lens, on grounds of fine resolution and ease of viewing, while another will have nothing larger than 8×30 on grounds of weight and portability. The different aspects on which your choice must be made are as follows:

- (1) size and weight
- (2) power (magnification)
- (3) image brightness.

Aspect (1) is going to be of premium importance wherever the binoculars have to be carried continually over adverse conditions of terrain, for instance serious bird watching, hiking, hunting and horse riding. For these purposes the 8×30 and 8×40 sizes are most likely to be satisfactory. Also, ladies generally favour these small sizes for all uses because they find the larger models cumbersome.

For special purposes such as target spotting, archery, site inspection, etc., where a detailed view of some special feature is desired, power and large objective size are likely to be para-

mount importance. Brightness is not so vital since most of these activities are curtailed under dim conditions, but do not choose a higher power than is absolutely necessary. 10×50 or 12×50 favourite sizes here, up to 20×50 maximum if really good lighting can be assured at all times. A firm tripod mount is most helpful for these special purposes.

For yachting there is very little choice; 7×50 is almost universally used due to its superiority under adverse conditions. For all marine uses it is unequalled. The same applies to night use. The 7×50 is the only night glass in general use, since it admits rather more light to the eye than it can see unaided, thus allowing the observation of objects at night which would be scarcely visible to the unaided eye; no other size of binocular will allow this, from which it follows that the 7×50 will obviously be the only choice for the astronomer and sky watcher. There are times when a really large 15×70 or 20×70 of good quality can be very useful, but this must be firmly tripod mounted whereas the 7×50 may be comfortably hand-held.

For sports use, including football and horse racing, power should be kept reasonably high 10×50 or 12×50 being a good compromise, or 8×40 if size is to be kept to a minimum. For general purposes, holidays and as a general standby in the car, 8×30 and 8×40 are the two most usual types due to compact size and low weight, although many people find that they can accommodate the extra bulk of 7×50 or 10×50 and gain the better resolution afforded by them.

NEW BINOCULARS

After intensive study of all the available instruments over a period of several years we have found a manufacturer who can supply binoculars of sufficiently high quality and uniformity to meet our very stringent demands. As a consequence we are proud to announce two completely new ranges of binoculars, each of which offers superlative value for money. Do not be misled by the relatively low price of these instruments into assuming that they are of inferior quality; a typical customer's reaction is that of a gentleman from Malta, who wrote recently:

"Yesterday I received my binoculars intact; it quite surpassed my expectations. A long-distance view was crystal clear, the instrument is not excessively heavy and the adjustments are really fine; in fact it suited perfectly my tastes".

ENGLISH SUPERSCOPIC

These binoculars have lightweight alloy bodies of German pattern, with central focussing mechanism of high strength and smooth action plus independent right eyepiece focussing. Optics are from high grade glass, accurately ground and centred so as to give high definition with minimum distortion. Lens systems fully achromatic and hard coated on all air-to-glass surfaces, collimated and aligned so as to eliminate eyestrain and fatigue. Each binocular is supplied complete with four plastic dust covers good quality black carrying case, shoulder strap for case, neck strap for binocular, presentation box and FIVE YEAR GUARANTEE.



ENGLISH SUPERSCOPIC 8×30
ENGLISH SUPERSCOPIC 8×40
ENGLISH SUPERSCOPIC 7×50
ENGLISH SUPERSCOPIC 10×50
ENGLISH SUPERSCOPIC 12×50
ENGLISH SUPERSCOPIC 16×50
ENGLISH SUPERSCOPIC 20×50

ENGLISH HYPERSCOPIC

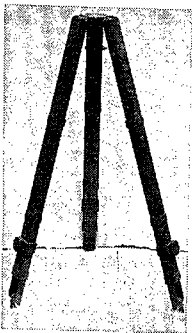
These binoculars have one-piece duralumin bodies of American pattern giving extra strength and durability with superior quality central focussing adjustment plus independent right eyepiece focus. Fully coated optics of extra fine quality, giving haze and colour free image of maximum possible brightness and clarity together with very low coefficients of distortion and aberration. Optical alignment of extreme accuracy with all components firmly clamped to minimize risk of accidental shock damage. Sealed optics ensure freedom from interior moisture or dirt. Each binocular supplied complete with two pairs of lens covers, good

HDT.6. Two section 'U' channel legs with retractable hard rubber feet, legs lockable at any extension by quick-action thumb locks; three way struts to centre section. Enclosed 17" centre column with pan and tilt head and swing over camera platform. All movements lockable. Divided scales on vertical and horizontal axes. Weight 5 lb. Height open 57" (max), length closed 27". A beautifully constructed tripod of unusual rigidity.

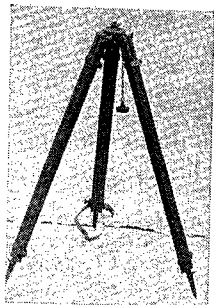
HDT.7. Three section 'U' channel legs with retractable hard rubber feet, legs lockable at any extension by quick-action thumb locks. Spring loaded three way struts to centre section which can also be locked at any angle by thumb locks. Enclosed 15" centre column with pan and tilt head and swing-over camera platform. All movements lockable. Divided scales on vertical and horizontal axes. Weight 6 lb. Height open 66" (max), length closed 24". The variable angle struts enable this tripod to be spread safely over a very large base area, making for exceptional security in use.

All these photographic tripods make really first class mounts for binoculars when used with bino. mount B.11. The great increase in clarity and ease of vision affected by a really steady tripod must be seen to be appreciated.

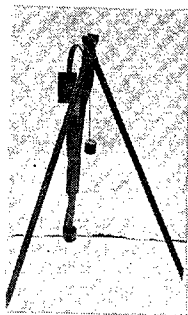
TRIPODS AND INSTRUMENT STANDS Ex-government



TPD.1.



TPD.3.



TPD.4.

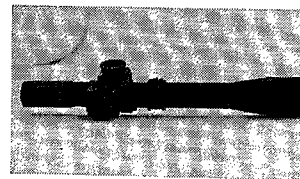
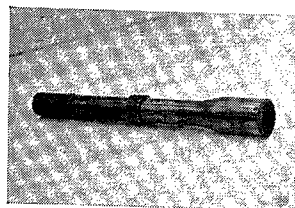
TPD.1. Aluminium, heavy duty. 3' 3" extending to 5'. Weight 12 lb. The most rigid of all the ex-government tripods, this will carry up to 2 cwt.

TPD.3. Wood type, medium weight (11 lb.). Swivel ball head. Suits directors, list number T.40, as well as general purposes. Good condition.

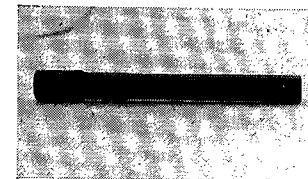
TPD.4. Wood type, non-extending, 3' high. Pan and tilt head of brass. Weight 4½ lb. Originally intended for 'scout' telescopes but will suit many other types. Maximum diameter of clamp about 1½". Brand new with leather caps and sling.

TELESCOPIC RIFLE SIGHTS Ex-government

T.29a. No. 42 Mk. I. Power 3×. Objective 19mm diameter. Field of view 10 degrees. Erect image. Fixed focus. Length 11". Weight 1 lb. Single cross wire. Good condition. Having a ten element optical system comprising no less than five cemented achromatic doublets this unit is of a quality infrequently encountered among civilian equipment. By virtue of its 7mm exit pupil size and 3" eye relief T.29a makes an excellent finder telescope both on account of its fine, wide field of view and also its ease of use.

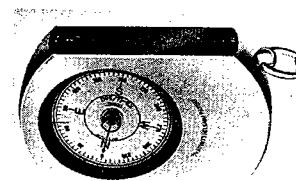


T.30. No. 32 Mk. I. Same specification as T.29a but with full adjustment for elevation and windage. Cross wire and post graticule. Weight 1½ lb. In good condition. Also available in rusty condition, optically and mechanically sound but graticule needing attention.

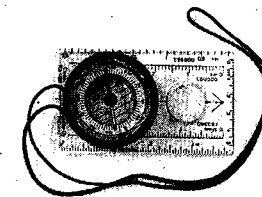


T.31. M.45. Power 1½×. Objective 15mm diameter. Field of view 7½ degrees. Erect image. Fixed focus. Length 9". Weight 10 oz. Circle and dot graticule.

COMPASSES



PC.2.



PC.3.



PC.5.

PC.2. Suunto KB.14. Optical Reading Compass. Accurate to ¼ of one degree, this is a modern liquid compass of very robust and compact design, using optical superimposition for dial reading. Overall dimensions 3" × 2" × ⅝". Weight 4 oz. Supplied with leather case and nylon neck cord.

PC.2a. As PC.2 but plastic body instead of aluminium.

PC.3. Orienteering compass. The highly damped movement of this useful pocket compass gives an action similar to that of a liquid filled model; mounted on a perspex base with magnifier and scales for map reading.

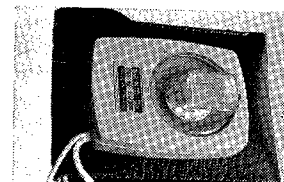
PC.3a. Larger model.

PC.4. Lensatic compass; designed to resemble the traditional forces type marching compass in appearance, but constructed from light weight plastic, using a lens instead of a prism for viewing the compass card, and not liquid filled.

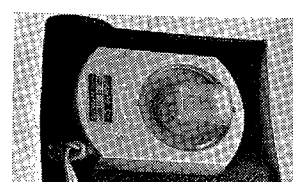
PC.5. Modern Prismatic compass of high quality. Suitable for use under all conditions, these have been tested in Northern Greenland, the Sahara Desert and the Himalayas. 360 degree dial, accurate within a third of a degree, with oil damped jewel movement, luminous index for night use, circular bubble for levelling, built in tripod mounting screw for non-magnetic tripod, and divided scales for map measurement. Supplied with good quality leather case.



PC.6.



PC.7.



PC.8.

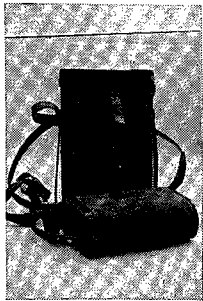
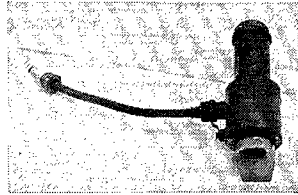
PC.6. Smaller economy version of PC.5. 360 degree dial with oil damped jewel movement and luminous index for night use. Body marked with divided scales for map measurement. Supplied with good quality leather case.

PC.7. Optical Hand Bearing Compass with prismatic sighting system for rapid and accurate reading with two scales (the bearing ahead and reverse bearing). Fitted with self generating long life tritium capsules for use in twilight or total darkness. The compass may also be read by viewing the card from above. High strength plastic body, with carrying case and neck cord.

PC.8. As PC.7 but aluminium body. Has the additional feature of a cotangent table printed on the back of the compass for speedily locating one's position where the landmarks are visible and the angle is narrow.

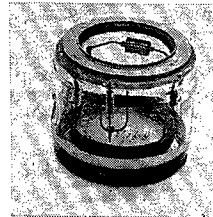
INFRA-RED EQUIPMENT Ex-government

T.60. Type 5c/3157. Comprises object glass, image converter cell and eyepiece mounted as one unit and includes H.T. lead. Unused. Sent at purchaser's risk only).

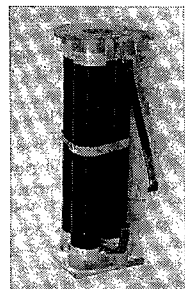


T.61. Monocular, Tabby equipment Mark 1. A self contained unit with built in H.T. supply. For the detection of infra-red sources or extended images lit by infra-red light. Inverted image. Eyepiece focussing. Size 8" x 5" x 2 1/2". Complete with solid leather case and shoulder straps, untested.

T.63. Image converter cells for the above equipment, tested O.K.



DUE TO EXTREMELY FRAGILE NATURE OF THESE UNITS THEY CAN BE SENT ONLY AT CUSTOMER'S RISK, AND WE ACCEPT NO CLAIMS FOR DAMAGE IN TRANSIT.



T.64. Zamboni piles, as used in T.61, untested.

We regret that we cannot supply any further information on the operation of the above Infra-red equipment. This can sometimes be obtained at a good public library.

The equipment was fully described in the October 1948 issue of the magazine *Electronic Engineering*.

NEW PHOTOGRAPHIC EQUIPMENT

- PA.1. Ball and socket head for photographic tripod.
- PA.2. 20" fabric covered cable release with stop.
- PA.3. 10" metal covered cable release with stop.
- PA.4. 20" ditto.
- PA.5. 20" Heavy duty ditto.

- PA.6. Neckstrap with safety hooks.
- PA.7. Adjustable neckstrap, 24"-42".
- PA.8. Flash bracket.
- PA.9. Folding flash bracket.
- PA.10. Heavy duty ditto.
- PA.11. 36" Flash extension lead.
- PA.12. Blower brush-large.
- PA.13. Blower brush-small.
- PA.14. 8mm film splicer.
- PA.15. Film changing bag, for daylight loading.
- PA.16. Anastigmat enlarging lens, 35mm f3.5.
- PA.17. Ditto, 50mm f4.5.
- PA.18. Ditto, 75mm f4.5.

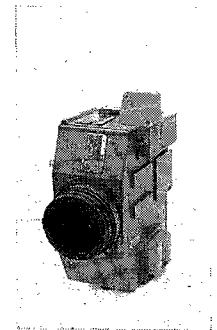
All three lenses above have 39mm (Leica) screw mounts.

- PA.19. Rubber lenshoods. To fit filter mounts 40.5, 43, 46, 49, 52, and 55mm dia. plus 30mm bayonet (state which size required).
- PA.20. Metal lenshoods. To fit filter mounts 40.5, 43, 48, 52, 55, 58 and 65mm dia., (state which size required).

F.46

EX-GOVERNMENT CAMERAS

F.46. Aircraft Camera. Fitted 5" focus f4.5 wide angle lens. Takes 2 1/4" roll film. Frame size 2 1/4" x 7 1/4". Unused in transit case with magazine.



PHOTOGRAPHIC LENSES

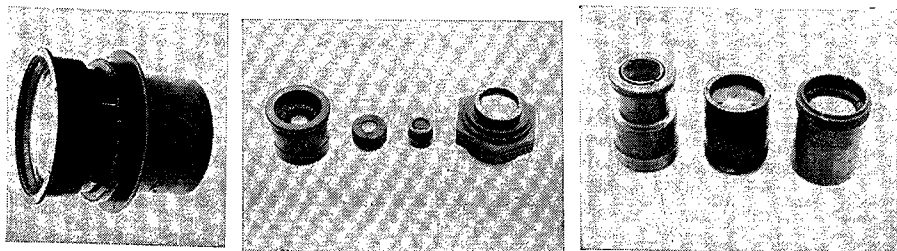
In connection with photographic lenses a few words of explanation may perhaps be helpful. It is popularly believed that any lens giving a larger image size than normal when used with a camera is a telephoto lens, and that any lens giving a wider angle of view is a wide angle lens. Neither of these is necessarily true. For instance a 50mm lens designed for use on a 35mm film camera would give a fairly large image if used on 8mm film size, but it would still not be a telephoto lens. A true telephoto lens is one having a larger effective focus than back focus; these terms are fully explained in our book 'How to use Lenses and Mirrors' but the effect of this is that a telephoto lens is more compact physically than a normal lens. It will not necessarily give better results than a normal lens of the same focal length, but it will definitely give the identical same image size.

Similarly if a 50mm lens from a 35mm film camera is used for 2 1/4" square film size it will give a fairly wide angle of view, but the picture will probably fall off towards the edges of the film because it is not a wide angle lens. A wide angle lens in the true sense is one which will cover a larger film size than normal. Thus 50mm is the normal focal length for 35mm film size, and any lens of shorter focus than this will have to be a wide angle type if it is to cover the frame properly. There is a further point to consider; lenses of short focal length are usually impossible to use in cameras because they interfere with their mechanical working. For this reason wide angle lenses for single lens reflex cameras are usually of the retro-focus type (see 'How to use Lenses and Mirrors'). Just any lens of say 35mm focal length will not necessarily work on your camera as a wide angle lens.

In short, if you wish to obtain a larger image size you do not necessarily need a telephoto lens; any 500mm photographic lens will give an image size ten times larger than a 50mm one, but a telephoto type will be more compact. On the other hand although any 25mm photographic

lens will give double the field of view of a 50mm one, it may not be of any practical use due to limitations of covering power and back focus.

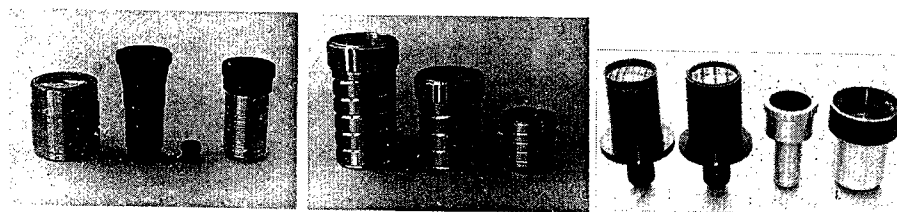
These generalizations are only applicable to lenses focussed at or near to infinity; if it is focussed at close distances a lens will cover a much greater film size than that for which it was designed. Thus for macro work on 35mm film we can use lenses designed for 16mm film sizes or less with no ill effect. Lenses used under these conditions are sometimes mounted back to front; the reason for this is obvious if you visualize a lens as it is used normally with the object at a much greater distance than the film. If these conditions are reversed it is natural that the lens also will perform better reversed.



PL2

PL3 PL4 PL5 PL6

PL9 PL10 PL11



PL25-29

KPS 5 KWS 6

PL30-33

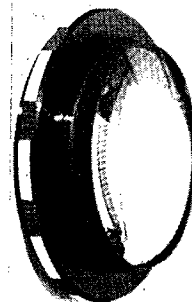
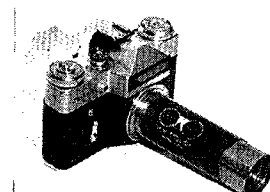
PHOTOGRAPHIC LENSES. Ex-government. No iris unless stated

- PL.2. Aldis 20" focus f6.3 wide angle. This lens will cover any size film up to 24" diameter circle. New condition with iris.
 - PL.3. Aldis 1.1" focus f2.0, projection anastigmat. New condition.
 - PL.4. 1" focus f3.5.
 - PL.5. 1½" focus f4.0.
 - PL.6. 1½" focus f2.0 4 glass anastigmat, gives exquisite definition over a 1" diameter circle. With screwed flange for focus adjustment.
 - PL.9. 5" focus f6.3. Back focus 3". For 35mm or smaller film sizes.
- Lenses PL.9, 10 and 11 are especially useful as long focus projection lenses for 35mm film size, giving a long throw without undue extension of the projector—a real advantage for light shows and special effects where a small, bright picture is required at a good distance.
- PL.10. 8" focus f5.6. Back focus 4". For 35mm or smaller film sizes.
 - PL.11. 10" focus f7.0. Back focus 6". For 35mm or smaller film sizes.
 - PL.25. 35mm focus f1.2 wide angle. 3 element. Originally used in point source projection system. Adaptable for many other applications. 30mm clear aperture, in plain sleeve. No iris. Covers film size 35mm × 24mm for back projection or table viewer, giving 40" picture with screen 42" from the lens. As a photographic lens it will cover 8 or 16 millimeter film with excellent definition and possibly half frame 35mm without serious fall-off at the edges. It will cover full frame as soft focus portrait lens at full aperture if used reversed. Serves as good achromatic condenser for half frame enlargers. As a magnifier it gives 6× magnification

with flat field free from distortion and field of view of 35mm. Makes an excellent screen magnifier. Can also be used as a projection eyepiece on telescope or microscope. All the above at full aperture f1.2; improved results are obtained by adding stops for photographic use.

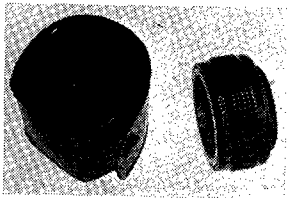
- PL.27. 18mm focus f1.4 projection lens for 8mm film size. Four coated elements in brass mount 22½mm diameter with focussing thread × 34mm long. Supplied with 22mm long plastic light guard.
- PL.28. Projection lens, 9mm. focus, f1.9 four element. Bell and Howell. Size 0.35" long × 0.47" over the thread, 0.40" over the barrel. Ideal for 8mm editors, micro-projectors, microscope objectives, etc. This lens has proved invaluable to several of our customers as a high quality optic in various applications, including closed circuit T.V. work. It should be borne in mind that this type of lens fitted with a variable iris and special purpose mount usually costs ten to twenty times our price if purchased direct from a manufacturer.
- PL.29. 20mm f1.5 four element bloomed projection lens. High quality 8mm optic.
- PL.30. Isco 10mm f1.4, for 8mm projection. Threaded barrel 22mm diameter. New.
- PL.31. Isco 16mm f1.3, as above.
- PL.32. Technor 15-25mm f1.5 zoom, for 8mm projection. Barrel as PL.30. New.
- PL.33. Rank Aldis 50mm f1.6 for 16mm projection. 42.5mm diameter plain barrel. New.
- PL.34. Carl Zeiss 150mm f4.5 copying lens, new with bloomed optics in 47.5mm diameter barrel. Covers up to about 6" circular field. Good adaptable unit for a variety of photographic tasks.
- PL.35. Copying lens, 9" (225mm) f5.6 bloomed optical system in 69mm diameter plain barrel. Covers approx. 12" circular field. Very high quality unit, secondhand but very good condition.
- PL.36. Copying lens, 185mm f4.5, 8 element optical system with iris stopping down to about f32. Covers approx. 9" diameter at any magnification but is specifically designed for 1:1 when coverage is approx. 18" diameter. Ideal for episcopes or large format enlargers or projectors. Barrel diameter 67.5mm × 90mm long. Front element adjustable so as to give fine control of focus and edge definition. Secondhand condition, optically sound.
- KPS.5. 85 or 100mm anastigmat projection lens, f2.8. Diameter of mount 42.5mm. Please state which focal length required.
- KWS.6. Wray anastigmat projection lens, 85mm f2.8. Diameter of mount 35mm.

VL.2. 135mm f5.6 fixed aperture photographic lens. Push focus from three feet to infinity. Lens resolution (central) 160 lines per mm. Weight 8 ounces. 42mm screw thread to fit Zenith, Pentax, Praktika etc.

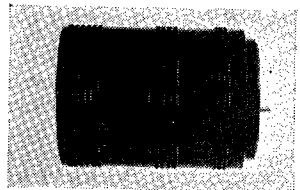


CU.10. Ten diptre Achromatic close up lens. Of two element colour-corrected construction (not to be confused with non-achromatic single element close-up lenses) this lens is available in either 49, 52 or 55mm filter mounts to screw straight onto the front of SLR standard lenses. All normal systems remain in operation, no bulky tubes or bellows need be carried in your outfit, and no corrections are necessary when making the exposure—this means an effective speed increase of up to two stops compared with other methods of obtaining equivalent magnification. The ease of focussing compared with other methods of close-up photography must be experienced to be appreciated. A picture taken with the lens was featured in the August 25, 1976 issue of 'Amateur Photographer' magazine, wherein Ronald Spillman AIPP commented 'the H. W. English plus ten close-up lens shows no fall off in definition at the corners', BUT he also made the assumption in the same article that ALL close-up lenses must be stopped down to about f11 to obtain good edge definition THIS IS NOT THE CASE WITH OUR

CU.10. Test shots of square grids show negligible edge fall off when the lens is used at f5.6 on a 55mm standard lens. Also pin cushion distortion very noticeable on other close-up lenses of high power, is practically absent. Many customers have expressed delight at the fine results they have been able to obtain, and this lens has proved to be one of our best selling lines of recent times. Please state which fitting required when ordering.



PA.24.



PA.25.

If you wish to obtain more power than is available from a standard lens, more magnification may be achieved by fitting the close-up lens to a prime lens of longer focal length, for instance a 135mm telephoto; but this will require to be stopped down more than a standard lens for good results. Another way of obtaining higher magnification is to add a teleconverter; the inevitable loss of speed has to be tolerated, but good results may be achieved, especially using close-up flash technique. We can supply a good quality multicoated 2x teleconverter in 42mm screw fitting (auto), catalogue number PA.24. By the use of close-up flash techniques you may progress by degrees to even higher magnifications; for these automatic extension tubes may prove useful. In all cases automatic operation of the lens iris is essential, since all work must be undertaken stopped well down for depth of field and under these conditions accurate focussing at close distances is very difficult.

PA.25. Three piece extension tube set, Pentax (42mm screw) fitting with automatic iris coupling. Nicely made and finished.

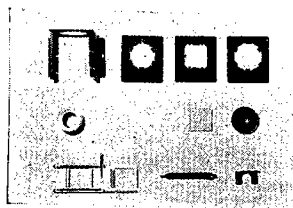
For a really full discussion of all forms of close-up photography we recommend reading 'Handbook for Scientific Photography' and 'Field Photography' by Alfred Blaker. Although expensive (they should be obtainable from your public library on special request) these books are unusual in that they express views not normally encountered in photographic books and contrary to the current dogma of camera magazines, especially stressing the importance of an open mind, and the assets of experimentation and painstaking methods in order to achieve first class results.

Another of our lines which has proved very popular with the photographer is item HM.11, page 32. This can be used very effectively for viewing 35mm colour transparencies, the quality of image rendition being in our opinion unbeatable.

SLIDE PROJECTOR KITS

for 35mm film size (2" x 2" slides)

TYPE KP.1. Latest type optics with 85mm or 100mm f2.8 anastigmat projection lens to choice (please state which). Supplied with instructions. Lamps and holders are extra.



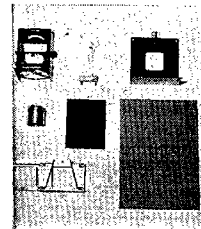
Recommended lamps, new and boxed:

- KL.6. 12 volt 100 watt Tungsten Halogen (Iodine Quartz).
- KL.6a. Lampholder for above.
- KL.7. 12 volt 50 watt ditto.
- KL.7a. Lampholder for above.
- KL.8. 24 volt 150 watt ditto.
- KL.8a. Lampholder for above.

- KL.9. 24 volt 250 watt ditto. (This lamp may require blower cooling).
- KL.9a. Lampholder for above.
- KL.10. 240 volt 150 watt.
- KL.10a. Lampholder for above.
- KL.11. 12 volt 100 watt.
- KL.11a. Lampholder for above.

All parts available separately as follows:

- KPS.1. 2 1/4" diameter surface aluminized glass reflector.
- KPS.2. 2" diameter aspheric condenser lens.
- KPS.3. 1 3/4" square heat filter.
- KPS.4. 2 1/4" diameter plano-convex condenser lens.
- KPS.5. 85mm or 100mm focal length f2.8 anastigmat projection lens (please state which focal length required). Diameter of barrel 42.5mm.
- KPS.5a. 85mm lens as above but fitted with an additional lens so as to give 50mm focal length. The 50mm lens gives acceptable definition but is not as sharp as the standard lenses.
- KPS.5b. Additional lens ONLY for above, for existing 85mm lens. Unmounted.
- KPS.6. Two way spring loaded double slide carrier.
- KPS.7. Lamp housing complete with slip in mounts for optics plus lamp bracket and adjusting lever. Kit plans and instructions are available separately at 10p each postpaid.



TYPE KW.1. Back projection kit by Wray Optical. Screen size 8" x 6". Designed for a £200 projector the quality of this kit may be taken for granted; it gives a brilliant picture even in daylight with pin sharp definition from edge to edge. Complete with plans and instructions. Kit includes lamp and holder.

Parts supplied as follows, available separately.

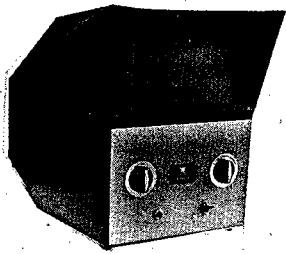
- KWS.1. 49mm diameter aspheric condenser lens in mount.
 - KWS.2. 55mm diameter plano-convex condenser lens in mount.
 - KWS.3. 48mm square heat filter in mount.
 - KWS.4. 35mm diameter glass reflector in mount.
 - KWS.5. Metal housing for the above parts.
 - KWS.6. 85mm f2.8 anastigmat projection lens.
 - The above parts are all interchangeable with Wray 'Moth' and 'Firefly' projectors.
 - KWS.7. 4" x 3" surface aluminized mirror.
 - KWS.8. Special screen, size 8 3/4" x 6".
 - KWS.9. Slide carrier and bracket, not Wray but of comparable quality.
 - KWS.10. 12 volt 100 watt Tungsten Halogen (Quartz Iodine) lamp, equivalent to A1/209 and A1/215.
 - KWS.11. Lampholder for above.
- Suitable transformers (NOT included in the kit) to run the above lamp are available. Plans and instructions are available separately price 10p each postpaid. Plans for kits KP.1 and KW.1 are priced 15p per pair post paid if ordered together.

TYPE KW.12. Special Kit for light shows, liquid wheels and spots. Use with tungsten halogen lamps from 50 to 250 watts to give large brilliant evenly illuminated circle of light. Condenser system as for kit KW.1, but supplied with 100mm focal length f2.8 unmounted acromatic lens and without heat filter.

For devotees of stereo photography we have an offer of special interest; we can supply parts KWS.1 to 6 in **MATCHED PAIRS**, two of each part. These parts are ideal for stereo use—being of very slim design the condenser units may be positioned so as to give approximately $2\frac{1}{2}$ " between centres.

BACK PROJECTION 35mm FILM-STRIP VIEWERS WITH SOUND ON TAPE

These are British manufacturers' surplus stock, unused in original cartons. Screen size is $8" \times 5\frac{1}{2}"$, overall size of the machine $15" \times 15" \times 10"$. Weight 34 lbs. Special cassette



accepts up to 30 feet of 35mm filmstrip (still NOT cine) plus 3" reels of standard recording tape. Synchronization of sound track with film frame is fully automatic on forward, backspace or rewind. Remote operation of advance by footswitch. 12 volt 100 watt Tungsten Halogen lighting with built-in transformer.

Modern high efficiency projection optics with 85mm lens. Lid lifts off to allow normal front projection onto any size screen. Each machine includes footswitch, clip-on earpiece, lamp and instructions for use.

These machines were originally intended for sale as audio-visual teaching aids as well over £200 each.

Carriage is by B.R.S. at purchasers risk only, Callers may see the machines they purchase demonstrated on sound and vision, but we cannot allow any extra discount on this line. We can also offer the machines complete but **UNTESTED**. Carriage extra as above.

We frequently receive enquiries concerning the optical devices known as (Camera Obscura' and 'Camera Lucida'. Many customers seem to confuse the two, others assume them to be identical or variations of the same principle; this is not so.

The camera obscura is in essence an extremely large camera, wherein the observer, instead of taking a photograph, actually sits inside and views the image formed by the lens upon a screen. In practice the 'camera' is usually a smallish room, blacked out, with the lens in the roof and a mirror system projecting the image onto a table surface. Since the large aperture, long focus lens and mirror system required is extremely expensive there is very little demand nowadays for the camera obscura. If it is required for some purpose to view an extensive area in all directions from a fixed position our T.44 and T.45 dial sights (catalogue page 45) will perform the task adequately, and at much less expense, since they may be rotated through 360 degrees whilst the eyepiece, and thus the observer, remains in a fixed position.

The camera lucida is a general term for any kind of optical device where the image from an optical instrument is made to appear superimposed upon a drawing surface, for the purpose of drawing by hand. This may be achieved in several different ways, the simplest being by means of a beam splitter prism (P.61, catalogue page 22), which is positioned as close as possible to the eyelens of the instrument in use. The usual procedure is to have the axis of the instrument horizontal and to look from above, down through the prism, onto the paper which is placed on a table below the instrument. If this position is not possible it is feasible to have the instrument at any angle, with the paper pinned to a board which is placed at a convenient relative position. It is usually necessary to re-adjust or adapt the instrument so as to allow the eye to simultaneously focus comfortably upon the image and the paper. Also the brightness of the image and the illumination of the paper should be carefully balanced for best results.

The subject of transferring views onto paper or canvas for purely artistic purposes is also frequently mentioned to us. The simplest way of achieving this is by means of a piece of semi-silvered mirror (SM.3. or 4) or even neutral filter (NF.1 to NF.4) as on page 22 of catalogue. The mirror of filter should be supported at an angle of roughly 45 degrees above the paper and viewed from above. For best results, as with camera lucida, the illumination of the paper should be balanced with that of the scene or object to be drawn.

In both cases above the resultant drawing will be laterally inverted—that is, reversed from left to right. Usually this will be unimportant, but if it is of vital consequence that the drawings be

laterally correct it may of course in either case be done initially onto thin paper and then reversed by turning the paper over and redrawing onto a new sheet, using a piece of glass over a bright light to enable the original to clearly show through.

Various devices have been manufactured in the past to allow drawings to be made directly which are laterally correct; these have all been difficult to obtain and consequently expensive, but we consider their chief drawback to be awkwardness in use. We have found them very tricky to manipulate and consider the methods which we have outlined to be preferable in practice.

Artists also frequently write to us complaining that when they use 35mm colour transparencies as references when painting the slides are ruined by prolonged heating in the projector—also the use of a screen necessitates working in relatively poor light. Their usual request is for a back projection viewer with an extra high power cooling system and a screen which is clearly visible in bright daylight conditions. The back projection viewer (page 56 of catalogue) answers this purpose very well. All that is necessary is to fit in place of the filmstrip carrier one of our 35mm slide carriers, KWS.9; it is even possible, if the user is indisposed to perform the necessary modification, to purchase a spare magazine for the machine and to merely tape the required slide in position over the picture aperture. Slides may then be left in position indefinitely without any effect other than the eventual slight bleaching of the dyes due to light intensity, which is unavoidable. For this purpose our untested units are admirable since any possible faults in the electronics system do not affect the optical system, high power blower or lighting—all of these are guaranteed to be OK.

It should be noted that replacing the filmstrip carrier with a slide holder is not recommended for normal domestic use since the lid of the machine has to be removed in order to change the slide—an inconvenience which will be of no consequence to the artist.

PUBLICATIONS

"HOW TO USE LENSES AND MIRRORS"

The book with all the answers to most of the questions about optics

"How to use Lenses and Mirrors" has been written for people who want to design their own optical equipment. It is not limited to photography, but covers the whole field of optics, including telescoping and microscopy.

The authors have had many years of experience in solving optical problems and have devised a simple aid to calculation which only requires a knowledge of primary school arithmetic.

This overcomes the need for chapters on general lens theory, which must normally be understood before lens problems can be solved."

Practical Photography

'The compact volume adopts a special "computerized" approach to reader understanding of the operation of commonplace optics in all probable combinations and for a wide variety of purposes'.

Sky and Telescope

'The approach is very different from that made familiar by the normal school textbooks; the object is essentially practical, and the reader is led in easy steps through the stages involved in the relevant optical calculations.'

The British Journal of Photography

How to Use Lenses and Mirrors, by H. W. and C. R. English, 112 pages, 100 illustrations, NOW AVAILABLE IN SOFT COVER EDITION—THE BEST VALUE OPTICS BOOK ON SALE ANYWHERE. THOUSANDS ALREADY SOLD—INDISPENSABLE TO ANYONE SERIOUSLY INTERESTED IN ANY BRANCH OF OPTICS.

HOW TO USE EX-GOVERNMENT LENSES AND PRISMS. No. 1 (illustrated).

Contains valuable information concerning the optical layout and general construction of TELESCOPES, BINOCULARS, ENLARGERS, PROJECTORS, EPISCOPES, MICROSCOPES, RIFLE SIGHTS, CONDENSING SYSTEMS, EYEPIECES AND MAGNIFIERS and general information on lenses and prisms with particular reference to EX-GOVERNMENT TYPES offered in our lists and elsewhere.

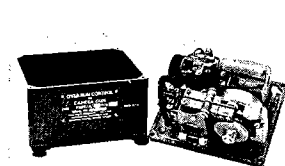
HOW TO USE EX-GOVERNMENT LENSES AND PRISMS. No. 2 (Illustrated).

Published as a supplementary to No. 1, with more optical gen. Details for making 8mm., 9mm., 16mm. projectors and enlargers. Projectors for 2×2 slides. Stereo Viewers. $40 \times$ Terrestrial Telescopes and a $35 \times$ prismatic scope. Using Ex-Government lenses, etc.

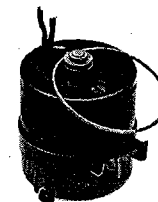
LARGE SCREEN STEREO WITHOUT VIEWERS. In fact any type of stereo without viewers. Our booklet "STEREOSCOPIC REPRESENTATIONS OF THREE DIMENSIONAL SCENES". With sample pictures describes a unique system which offers a simple and complete solution to the problem of viewer-less stereo. Sample 16mm. Kodachrome Cine Loops for demonstrating the above system.

MOTORS

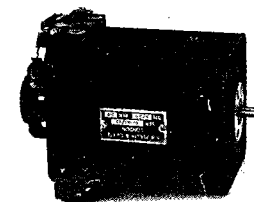
- EM1 High power miniature geared motor with electric clutch by Teddington Engineering; 24 volt D.C., final speed approx. 4 r.p.m. The motor itself is normally 6 volt series wound split-field type, but a second two-section commutator is connected across a centrifugal switch which is in series with the normal motor terminal; in parallel with the switch is an 80 ohm resistance which is normally shorted out by the centrifugal switch. As the speed of the motor rises the switch opens, leaving the 80 ohm resistance in circuit, this action maintaining a virtually constant speed and maximum torque. The terminals marked 2 and 4 on the motor are the normal connections for 24 volt D.C. operation with speed control; terminal 2 and the one directly below it are the connections to run the motor from 6 volt supply, without speed control. The lowest operating voltage with the speed control in circuit is approx. 8 volts. The clutch operates on 24 volts D.C.; lowest operating voltage for this is 18 volts. The current on the clutch is 0.5 amps, that on the motor 0.3 amps. The motor may be reversed by interchanging the armature connections which entails unsoldering the leads and fitting a DPDT reversing switch; in reverse the speed control is inoperative. The gearbox size is 1 1/4" cube, using steel and gunmetal worm gears running in six ball races. The motor itself is 1 1/4" diameter x 2 1/2" long and is detachable, with it's own two ball races, from the gearbox. Extremely powerful for it's size, the motor will lift a 14 lb. weight attached to a string wound onto it's 3/8" pulley. If the weight is increased beyond this limit the clutch automatically disengages. Supplied brand new and boxed in sealed die-cast case.
- EM2 Small motor. 24v. D.C. Fitted pulley and wire belt, size approx. 2" cube. Speed approx. 5,000 rpm. Fitted speed governor. Ex-equipment.
- EM3 Small motor approx. 2" x 2" x 2 1/2". 3,000 rpm. Brand new. Ex-Government.
- EM6 Rated 19v. D.C. Runs from 12v. Size approx. 3" x 3" x 9". Ex-Government. Shunt wound. Powerful and quiet. Suit small grinders etc.
- EM8 John Oster Motor. 24v. A.C. or D.C. Size 7 1/2" x 3" x 3". 2 geared take offs 3 1/2 and 12 rpm. Plus cam operated push rod system. A very versatile motor for the inventor. Precision built. Brand new.
- EM11 Synchronous. 230v. 50c. A.C. 20 revs. per hour. Fitted switch contacts and adjustable arm.
- EM12 6 to 24v. D.C. reversing. Ali. case. 3/8" spindle. Very powerful and quiet. Suit large fans. Size 6" x 5". Brand new.
- EM13 115v. A.C./D.C. with V pulley on 1/4" spindle. Suit sewing machines etc.
- EM15 Parvalux geared, 120v. D.C. 70rpm at 7lbs./ins. Single 3/8" spindle. New.
- EM16 Ditto. With double spindle. New. Spare gears to suit above available. Complete with ball races.
- EM19 Servo motors. 24v. D.C. Size approx. 3" x 3" x 3".
- EM20 Geared Motor, 100-125 volts AC 60 cycles. 60rpm approx. Run from 230 volts with 8000 ohm 2 watt resistance in series. Spindle 1/8" x 1/2" long. These are LOW POWER, 2 watts, where considerable power is needed use EM.18.
- EM21 24 volt DC motor, 6000 r.p.m., 0.96 amps. Weight 2 lb.
- EM22 Gyro Motors. From tank stabilizer units, these 24 volt D.C. motors may be run up to 10,000 r.p.m. or more. Fitted with a heavy balanced flywheel, size is 3 1/2" long x 2 1/2" diameter, weight 3 1/2 lbs. In one-way gymbal mount.
- EM23 Synchronous motors, Smiths, 1 rev./2 hours, 200-250 volts AC. Very powerful, cannot be stopped by hand.
- EM24 Fan motors, 230 volt AC. Size 2 1/2" x 3" x 2". Weight 2 lbs. Spindle 4.5 x 25mm.
- EM24a PVC fan blades to suit, 3 1/2" diameter.
- EM25 Fan motors, capacitor run, 230 volt AC, 18w. Size 3 1/2" x 3 1/2". Weight 3 1/2 lbs. 1/4" spindle.
- EM26 Pullen motors, ex-govt. 24 volt DC, size 2" x 2" x 3". Plenty of power on 12 volts, reversible. Built to last.



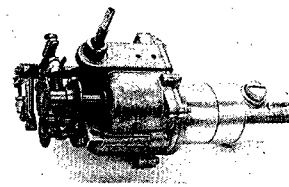
EM1



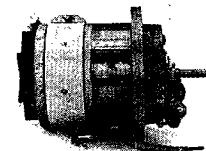
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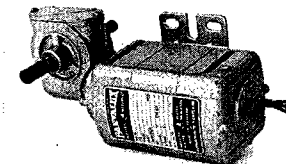
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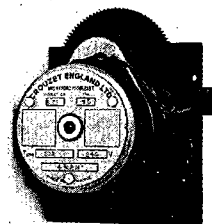
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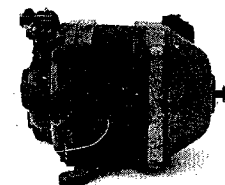
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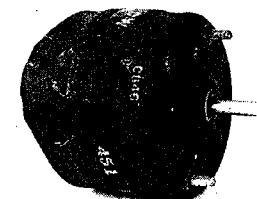
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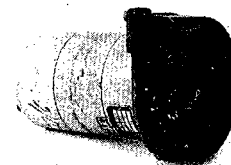
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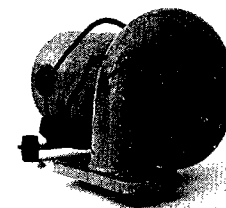
EM19



EM21



MB3



MB8



V.17

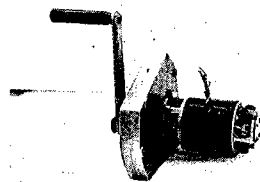
- EM27 Crouzet motors, 110 or 230 volt AC, 50 Hz. 1 rev. per hour. $\frac{1}{4}$ " spindle. New.
 EM28 Smiths synchronous motors, 200-250 volt, 50 Hz., 4 r.p.m. self starting. 3" overall diameter. Spindle 3.5 x 12mm long. New.
 EM29 Reversible geared motor, type 2b mk. 1. 6 volt DC 30ma (will run from batteries) approx. 2 r.p.m. Motor reverses if polarity is reversed. $\frac{1}{4}$ " spindle 20mm long. Also fitted to the spindle (easily pushed off) is a plastic cam operating three miniature SPDT micro switches, with connections brought out to a terminal block. Heavy duty steel gears plus one fibre, capable of driving large telescopes up to about eight inch aperture. British made by Walter Jones, London. Size of motor and gearbox $3\frac{1}{2}$ " x $2\frac{1}{2}$ " x $2\frac{1}{2}$ ", in useful strong metal case with hinge and clip size $5\frac{1}{2}$ " x 4" x $3\frac{1}{2}$ ".

MOTOR BLOWERS

- MB1 24v. D.C. small lightweight. Size approx. 3" x 2".
 MB3 24v. D.C. or A.C. Outlet 1" x $\frac{1}{2}$ ". Size approx. 5" x 3".
 MB8 80v. A.C./D.C. $1\frac{1}{2}$ " Outlet. Powerful blast. New.
 V17 Spirit levels. Precision type as used on Surveying instruments. 5" long in brass twist action weatherproof case. For adjustable mounting. Brand new.
 V18 Technical balance, for weighing small objects or quantities of chemicals with precision. Complete unit including box of 17 accurate weights. Supplied packed in cardboard box and liberally coated with grease which should be thoroughly removed before assembly and use.
 BW1 Box wood Scale rules. 6 and 12". First grade by Hall Harding, Armstrong etc.



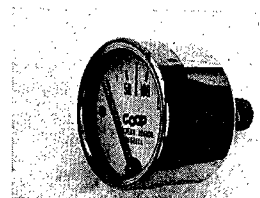
ACM.1



EM.22



RV.1



CP.2

TRANSFORMERS

- TR1 12v. $1\frac{1}{2}$ amp centre tapped. New. 230v. input.
 TR2 Auto-transformer. 1,000 watt or 10 amp max. 0-115-205, 225, 245. New.

AMMETERS. AC - DC

- ACM1 6" dial Flush mounting. Switchboard meters 15 amps, 30 amps or 50 amps. State which. Brand new and boxed.
 FL1 FLEXIBLE DRIVES, 23 feet long. Similar to heavy duty speedometer drives; used for remote control in aircraft. Ref. No. 9/2668. New and boxed.

LAMPS

- L1 24v. 80w. Ex-Government. SBC. DC. Special offer to clear.

HAND GENERATORS

- EM22 Ex-survival equipment. Rated 28v. 0.175 amp and 300v. at 40 m.a. As L.T. generator with H.T. brushes removed will charge up to $1\frac{1}{2}$ amps at 6v-24v. Or will run from 24v. as geared motor at approx. 30 rpm. Complete with handle. Aluminium gear case and gears.
 RV1 Ex-RAF rotary vane fuel pump, with integral 24 volt electric motor. Brand new and boxed.

CONTACT MICROPHONES

- CM1 Low impedance. Size approx $1\frac{1}{2}$ " x $\frac{1}{2}$ " x $\frac{1}{2}$ ". Electro magnetic. Can be used singly to pick up from any vibrating surface, or alternating magnetic field. Boxed in pairs.
 CM2 American carbon type throat microphones. With neck band lead and plug.

PRESSURE GAUGES

- CP2 0-150. $1\frac{1}{2}$ " dia. New.
 CP3 Ditto 0-160 calibrated lbs. and Kgs.

EXTRA ITEMS

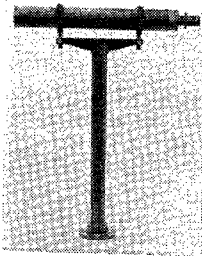
- X.1. PARALLAX BARS, TYPE PB.2, with micrometer adjustment. Complete in case with spare flats and graticule.
 X.2. PERSPEX CIRCLES, 9" diameter, divided 0-360 degrees in 5 degree intervals. Domed approx. $\frac{1}{2}$ " with pointer attached to centre. Marked N, E, S and W.
 X.3. ROSS BINOCULAR EYECUPS, plastic.
 X.6. 25 x 105 German Binoculars.
 The object lens for this famous binocular is a triplet of approx. 15" focus, consisting of a bi-convex lens of $6\frac{1}{2}$ " focus spaced $\frac{1}{2}$ " from a plus and minus combination in contact, focal lengths 33" and 10" respectively, diameter 4". Regret we have no front elements but we can offer the two rear elements.
 The correct front elements were sold some years ago by Charles Franks of Glasgow, as condenser lenses 105mm dia. x $6\frac{1}{2}$ " focus. We would like to hear from you if you purchased anything from them answering this description and which you no longer require.
 X.7. SURGEONS' SKIN GRAFTING KNIVES. With roller guide. Brand new ex-govt. $7\frac{1}{2}$ " blade.
 X.11. DIVIDED CIRCLES. Brass. Engraved figures white against black. $6\frac{1}{2}$ " diameter. Centre clear plastic 5" diameter. Engraved centre line with 4 x 10 degree angles converging to centre. Paint will clean off leaving engraving on brass. Ex-government.
 X.12. GEAR TRAINS. Ex survival equipment auxiliary to hand generator list no. EM.20. Comprise 5 reduction gears with speed control driving cam operated double-pole change over switch and stepped wheel operating three switches to give automatic S.O.S. signal in morse code.
 X.13. 28V 1000 ohm single pole change-over RELAY, cut out for above unit.
 X.14. X-RAY CARD. Kodak. One side white, one side cream darkening on exposure to light. White side ideal for artwork etc. Unmarked. 72 sheets 24" x 11".
 X.15. GRINDING WHEELS. Carborundum aloxite. 12" dia. x $\frac{3}{4}$ " wide. 1" bore. New and boxed.
 X.16. INSPECTION LAMPS. Ideal for cars. Eight foot cable with lampholder pulls out and returns to spring loaded drum.
 X.17. AIRCRAFT COCKPIT LAMPS. Red glass. Adjustable angle and light control.

- X.18. LUCAS 12V IGNITION COILS. Standard type. Unused. Useful spark generators.
- X.19. DRUM CAMERA BY NASH AND THOMSON. Medium speed (up to 1200" per sec.) on 37" long by 70mm wide film or paper. Shuttered drum type with variable format (1mm x 25 to 20mm x 70). Cassette load. 24V d.c. electrically driven with provision for TB and phasing marks on film and slave camera. Each camera is complete with 2 drum cassettes, 2 control boxes and through the lens focussing device with four Dallmeyer lenses focussing from six inches to infinity. Lenses 3", 6" and 12" focus, with iris to f.32. Lenses as new and bloomed. Cameras may require attention but in generally good condition. Complete in 3 transit cases.
- X.20. CARL ZEISS PHOTO THEODOLITE, complete with 38cm f5 Tessar, 12 plate holders 7½" x 5½", screen and micro focussing. Auxillary stroboscopic equipment, etc., in five large transit cases. General condition good but may require some attention.
- X.21. HONEYWELL BROWN ELECTRONIK CHART RECORDERS. 230V a.c. 50cps. Condition as new but untested.
- X.23. LARGE DOUBLE WOUND TRANSFORMER. 150 to 250V input in 25V steps. 50 or 55V 20 amp output. Steel cased.
- X.24. ENGLISH ELECTRIC 1.25 h.p. 230V a.c. MOTOR coupled to 115V 517 watt d.c. generator. On base with easy glide casters and cover. Brand new.
- X.25. LARGE 18" DIA. ROTATING HEAD. Cross slotted and divided 0-36 in 5 min. intervals. Driven by four speed gearbox. Provision for 25 electric leads to head through silver slip ring system. Size overall approx. 3 feet x 2 feet. Weight about 2 cwt. Mainly aluminium. In good order except that internal motor of approx. ¼ h.p. is missing.
- X.26. PRESSURE GUAGES. 4" dia. 0-50 lbs. Chrome rim. New.
- X.27. SWITCH. Push on-off. 230V 2A. One hole fixing for thin sheet metal or approx. ¼" panel. State which preferred.
- X.28. ORION MICRO SWITCH, 250V 10A complete with roller type lever.
- X.30. TELEPHONE MAGNETOS. Various types with handle.
- X.31. WAFER SWITCH. 6 bank 12 position.
- X.32. LEDEX SWITCH for remote control, 24V d.c. 5 bank carrying about 10 x single pole, three position units plus on-offs. Impulse motor adaptable for many uses, turning liquid wheels for light shows, etc.
- X.33. CRATER SWITCH. 260V 16A 6 bank, type LRC/4/Z36a. New.
- X.34. LARGE ROTARY SWITCH, two bank 20 way, carry 20 or possibly 40 amps. Size about 5" dia., brass copper and stainless steel, laboratory equipment. Brand new.
- X.35. REVOLUTION COUNTERS. Mechanical. Three figure.
X.35a. Four figure by Veeder.
- X.36. ACCUMULATOR CUT-OUTS. Aircraft type. 24V 60A. New.
- X.37. STANDARD AMPMETERS, 0-250 amps in wood case. Ex-govt.
- X.38. MAZAK PLUGS AND SOCKETS. Offered to model makers etc. for casting metal. Melts easily, strong and tough, moulds well in plaster, turns easily and cleanly. Complete with brass ferrules and insulating cores in most cases but offered only as scrap.
- X.39. H.F. CHOKES, UHF to all wave. New.
- X.40. 5 COIL ALL WAVE CHOKE on panel with .01 mica condenser.
- X.41. UHF COILS, set of 7, all different with dust cores or rotary air spaced trimmers, unused. No data.

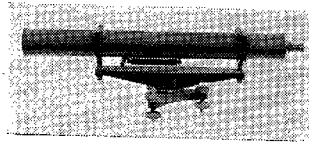
- X.42. TRENCH LOUDSPEAKERS, Tannoy re-entrant type. In case with transformer and switch.
- X.43. TANNOY LOW PRESSURE SPEAKERS, less horn, 15 ohm. Checked O.K. Complete with protective screw cap. WARNING; do not stick your finger in as the diaphragm is extremely delicate and will be damaged on contact. We will not exchange such damaged units.
- X.44. DITTO, faulty, offered for the very large ring magnets, weight about 10 lbs.
- X.45. TOGGLE SWITCH, 4 pole change over, centre off. Long toggle with luminous tip. American war surplus. Ideal for motor control, 10 amp contacts. Voltage unmarked but in constant use in our workshops for reversing 230V single phase and 440V 3 phase motors.
- X.46. POWER UNIT TYPE 392. 230V 50cps. 700V d.c. smoother output at 70ma rating but will stand 100 or more. Unused with two valve rectifiers, in steel case with large block condensers. Sldylock fuses in front of panel may be damaged or missing.
- X.48. HEATING ELEMENTS, 230V 1000W, Flat type wound on mica, size approx. 9" x 2".
- X.49. DITTO, coil type mounted in ceramic. 230V 2000W. Suitable for blowers. Terminal connections could be paralleled for 115 or 60V for control gear etc. Size approx. 6" x 2" x 2".
- X.50. TRANSFORMERS, brand new. 200-250V 50cps input, 12V 10A, 28V 3½A and 28V ½A outputs. Screen primary with fly leads. Size approx. 3½" x 4" x 4½".
- X.51. TRANSFORMER, 230V AC, 8V 10A output, centre tapped.
- X.52. UNISELECTOR SWITCHES, new (a) 8 bank 25 way
(b) 6 bank
(c) 4 bank
(d) 8 bank 30 way, ex-equipment, as new
(e) Banks of six wired in parallel
- Various types of secondhand selectors offered without guarantee as they may require slight attention or adjustment. A genuine DUD returned as received will be replaced on payment of carriage cost.
- X.53. AERIAL CHANGEOVER RELAYS, old type with input and output sockets, unused.
- X.54. SMALL RESISTORS, suit transistor equipment. 10, 47, 330, 470, 560, 820, 2.2K, 3.3K, 5.6K, 15K, 22K, 68K, and 470K ohms.
- X.55. 500 OHM SUB MINIATURE POTS.
- X.56. METAL RECTIFIERS, new ex-govt.
(a) 12-24V 5A full wave bridge type.
(b) 24V 10A f.w.b.
(c) 12V 1½A f.w.b.
(d) 12V ½A f.w.b.
(e) 230V 5A half wave, centre tapped. Use two for 110V f.w.b. or four for 230V f.w.b.
(f) 230V 60MA h.w.
(g) 110V 60MA h.w.
(h) Type R.M.1., centre cell h.w.
- X.57. EX-GOVT. CO-AXIAL SOCKETS, 10H/528. Plugs to fit.
- X.58. VOLUME CONTROLS, 3500 ohms wire wound.
- X.59. 1000 OHM WIRE WOUND POTS, screw adjustment.
- X.60. ASSORTED VOLUME CONTROLS AND POTS, mainly morganite. Unused ex-govt.
- X.61. TOGGLE SWITCH, single pole changeover, Bulgin or similar.
- X.62. PLUGS AND SOCKETS, 5 pin. Type 10H/13078 and 9.

- X.63. SMALL 2 PIN FLAT TYPE PLUG AND SOCKET, 2 amp. Ref. 10H/4206 and 5C/1951.
- X.64. BULGIN BRASS PANEL LAMPS. MES fitting. Green and Red.
- X.65. EX-GOVT PLASTIC PANEL LAMPS with removeable metal blackout shades which are rusty. MES.
- X.70. MOTOR SWITCH. 24V d.c. motor geared down to 6 to 1 to drive various cam operated switches connected to 6 co-ax. sockets. Suit small light displays.
- X.74. METERS for parts, experiment or repair. Mainly 2" flush type, 50A, 20A, 20V and 40V. Cases or glasses damaged but in most cases movements O.K. but not guaranteed. Contain shunts, wire wound precision resistors, magnets, fine springs. These small and intricate parts and movements are often seen in jewellers' shops and stores encapsulated in clear plastic as novelty ornaments and selling at several pounds each. Chance to make a fortune or lucrative and interesting hobby.
- X.75. MAGNETS only as above.
- X.76. MINIATURE LEAD-ACID BATTERIES. Rechargeable, by Williard U.S.A. Ready charged, only needing to be filled with acid. Size 85mm x 35mm x 22mm. One 6V and three 36V in hermetically sealed can with instructions.
- X.82. SMALL ROTARY TRANSFORMER, 18V d.c. input, 150V 100Ma output.
- X.83. FIRE ALARM BELLS, large twin gong, 230 V a.c. Poor condition but serviceable.
- X.84. ASH DENTAL BURRS, nos. 6 and 9.
- X.87. TELEPHONE HANDSETS, ex-govt., new and boxed, type YA/6451.
- X.94. PRECISION ALTIMETER, system Paulin, 5" diameter. Mirror scale micro adjust, in leather case.
- X.95. 2½" DIAMETER PLASTIC GRATICULES as used in the Magniray hand magnifier. Metric scale, 10th, 15ths, inches and inch metres.
- X.97. POLAROID RED FILTER, 20mm dia. in plastic eyecup 32mm dia., threaded 24mm. In canvas bag, by Polaroid U.S.A. Ex-govt., optical glass.
- X.98. INFRA-RED LENS WITH FILTER in brass mount 5" long x 2" dia approx. Lens 32mm dia x 100mm focus.
- X.100. LAMPS. S.B.C., 24V double filament 6-18 watt frosted internally silvered.
- X.101. LAMPS. S.B.C., double contact, frosted, 24V 80W.
- X.102. LAMPS. S.B.C., double contact, 12V 10W.
- X.103. LAMPS. M.E.S., 6V 1.8W.
- X.104. LAMPS. M.B.C., 12V (marked IIV) 12W.
- X.104a. Lamps, MBC, 6.3 volt, 1.6 watt. Small tubular. U.S.A.
- X.105. LAMPS. Large Horizon, for aircraft flood lights. 230V 2000W.
- X.106. LAMPS, special fitting for Aldis signalling lamps.
- X.107. LAMPS, G.E.S., 240V 1000W tubular, A1/57.
- X.108. LAMP HOLDERS. M.B.C. with bracket.
- X.109. LAMP HOLDERS. S.B.C., d.c. batten type brass.
- X.110. LAMP HOLDERS. S.B.C., d.c., brass. Pendant type minus cord grip.
- X.111. OHMITE VITREOUS RHEOSTATS. 350 ohm 25W.
- X.112. WIRE AND CABLE. Single PVC covered, per 10Q yards.
 (a) 7/0076.
 (b) Co-ax. Screened, PVC covered. 14/026, o.d. 3mm.
 (c) Twin screened, PVC covered, o.d. 7mm, 4/0076.
- X.114. AMERICAN GEARED DYNAMOTOR with three low speed take offs and one high speed (4000 r.p.m.) with 5 cam operated switches. Rated 18V 3.7A d.c., Runs well on 12 volt. Very useful ex-govt. motor.
- X.118. D.E. box spanners. EX GOV. ¼ and ⅝" Whit with lever.
- X.119. Ditto. ½" and 9/16 S.A.E.
- X.120. AIR SPEED INDICATORS. 60 to 400 M.P.H. Soiled.
- X.121. G60 Wavemeters. 180 to 230 mcs. In ali case complete with 10 mc crystal but less valves.
- X.123. Master Contactors. Precision Spring driven Clock giving 2 pulses per sec in sound proof case with heater and thermo control for 24v.
- X.127. RELAYS. 24v DC 30a.
- X.128. Phone adaptors. High to low impedance. Fitted standard plug and jack. soiled but guaranteed.
- X.130. ELECTROSTATIC VOLTMETERS. by E. Turner. as New. 2½" 0-750 v.
- X.131. Ditto. 3½". Various types from 750 volt. All flush type by E.T.
- X.132. Ditto 3½" flush. 0-1 ma, 0-100 micro-amp and 0-250.
- X.139. Binocular cases, 8 x 30 size, real black figured hide, with strap.
- X.142. 15 x clip-on pocket telescope, blue anodised finish.
- X.147. Nickel Supra 15 to 60 x 60 two draw telescope, with fine focus control. Superlative quality instrument.
- X.170. Dial mechanism with turns counter. Ex-govt.
- X.170a. Colvern pots to suit above, 500 ohm or 100K.
- X.171. 18 way plugs and sockets, ex-govt.
- X.172. DIN plugs, one 3 pin, one 5 pin, with 5 foot screened lead to each, other end unconnected.
- X.173. Gyro motor, 24Volt 400 cs., by Sperry. In aluminium housing with gymbals and lock-up device. Weight approx. 9 lbs.
- X.174. Aerial rods, eight aluminium sections from approx. 1" dia to approx. 3/8", spring loaded to automatically extend to full height of about eight feet when released. Length collapsed approx. 12".
- X.175. Fan motors, brand new, Radlon type RC. 18. 220/230 volt A.C. 50/60 cycles, 0.21 amps. ¼" dia. spindle.
- X.175a. Four bladed aluminium fans, 5½" dia., to suit above motors, ¼" fitting.
- X.176. 7" Elliptical loudspeakers for car radios, etc. 8 ohm.
- X.177. Dynamic microphone inserts. 15 ohm coil, 15mm or 27mm diameter. Brand new, suit high fidelity purposes.
- X.179. Mains relays, 250 volt AC, 2 x SPDT, 5 amp. C/O.
- X.183. Heavy duty buzzers. 3, 6 or 24 volt. Size 1½" x 1½" x 1½".
- X.184. Pressure guages, 1½" diameter, 0-30 lbs and metric.
- X.185. Ditto, 0-160 lbs.
- X.186. Ex-govt. webb instrument cases, made for instrument stands. 3 feet long by 6½" diameter, with shoulder straps. Suit sportsgear.
- X.187. Digital indicators, 12 volt, gives 22mm high numerals from 0 to 9. New, British.
- X.188. Delay switches, 0-90 minutes, double pole, 15 amp.
- X.189. Ditto, 0-20 minutes.
- X.190. Mercury switches, two 10 amp insulated tubes on chrome plated back plate, one hole fixing.
- X.191. Ditto, 5 amp, glass tube only.
- X.193. Dosimeters, ⅜" diameter x 4½" long. Contains 40 x microscope unit with graticule, optical glass lenses. 85p each. Microscope section only, ready to use.

- X.194. Master contactors, clockwork, runs for several days giving two impulses per second. Ex-govt. in soundproof case with heater and thermostat.
- X.195. Switches, push on-push off, 250 volt 2 amp. One hole fixing.
- X.196. Morse keys, ex-govt. standard type, £2.50 each. Smaller type.
- X.197. Planimeters, by Otto Kempter, German war surplus.
- X.198. Beam compass by C. Riefler. Three pieces plug together giving 17", 30" or 43" beam. German war surplus, complete in case.
- X.199. Ex-govt. collimating telescope, 4 × 30, with focussing eyepiece and rack and pinion focussing objective; integral cross line graticule.
- X.202. Standard ammeters, 0-250 amp, 6" dial, in oak case.
- X.203. Transformers, 230 volt to 29 or 34 volt, 5 amp.
- X.204. Transformers, 230 volt to 12 volt, 15 amp.
- X.205. Aircraft landing lamps, ex-govt., types J or K, with 24 volt motor. Secondhand condition, £8.50H each.
- X.205a. Spare motorized section, unused.
- X.208. Battery charger, 12v 1 amp, with leads and battery clips.
- X.209. Piano hinges, brass, 12" × 1".
- X.221. Infra Red filters; 4½" diameter Glass discs, domed for fitting to spotlamps, etc.



X.222.



X.223.

COLLIMATING TELESCOPES; constructed for the testing of precision aircraft sextants, these are offered in their original, unadapted form for the convenience of any commercial user requiring a collimating or sighting instrument of the highest quality; alternatively they are also ideal for adaption to superlative astro or terrestrial telescopes, for which purpose we are able to supply RAS eyepiece conversions, stopping rings, etc. Available in two types:—

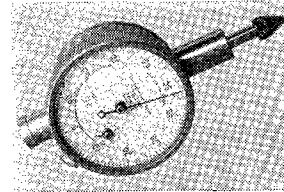
X.222. Fully corrected, cemented objective lens 43 mm diameter × 17½ inch focal length. Sighting eyepiece fitted with aluminized cross-slit reticule. Mounted on high accuracy cradle mount, and constructed entirely of brass, total weight 14 lbs, with pillar stand 22" high and flange base.

X.223. Fully corrected, air spaced objective lens 80 mm diameter × 36 inch focal length. Sighting eyepiece with precision divided reticule and illumination slit. Mounted on high accuracy cradle mount and constructed entirely of brass, total weight 37½ lbs, with adjustable 12" diameter base fitted with three heavy adjustment screws and double instrument levels.

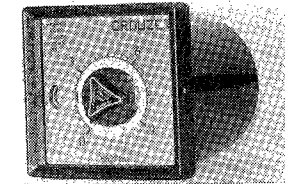
X.224. Dial indicators by John Bull. Made in England by British Indicator Limited. Dial 40mm overall diameter. Total travel 8mm. Dial divided to 0.01mm with revolutions counter. Adjustable bezel.

X.225. Crouzet interval timer and switch unit. 240 volt AC. 4½" square × 6" deep. Range one third of a second to nine hours in six ranges, manually selected by internal sliding gear change. Operates four S.P.D.T. switches handling up to 10 amps at 230 volts. All connections are clearly marked and brought to rear of unit for connecting in various modes as per instruction sheet supplied. Ideal for darkroom use (with auto reset) or time lapse photography (with auto repeat) from one third sec. to 1 hour, obtained by using pulse terminal 16 and 17 to short out push switch M.1 in function 4 mode (this application is not given on the

circuit sheet which gives five different modes of operating the unit). Connections for switching enlarger, lights, or other apparatus are left to the discretion of the user, since the various possibilities with this very versatile unit are too many to enumerate in detail. We regret that we cannot enter into detailed correspondence concerning these units, and if the customer is in doubt as to his wiring ability from a circuit diagram we would advise not to purchase. Brand new and boxed.



X.224.



X.225.

X.226. Clear plastic tube, 3mm bore, 250 ft.

X.227. Orange plastic tube, 1mm bore, ¼" outside diameter, 300 ft.

X.228. Plummer and Kershaw reflecting mirror lens, focal length approx. 6". Covers approx. 8" diameter. Lens diameter 35mm. 3 lens elements and 1 flat mirror. Excellent definition, original purpose unknown. Brand new.

X.229. 230 volt AC motor and gears. Ex prepayment meters. Many gears including worms and differentials.

X.230. Compass correctors, ex-government type 6A/1032.

X.231. Nickel-Cadmium rechargeable penlight cells, 'AA' (HP.7) size as used in many popular flashguns and pocket calculators. May be fully recharged from flat in 14-16 hours using the special charging unit plugged into household 230 volt AC supply.

X.232. Charging unit for 'AA' size cells as described above. Accepts cells 2 or 4 at a time. Pilot lamp built in to indicate correct operation.

X.233. 7 × 50 Spectacle wearers' binocular. This is one of the very few binoculars which allow the FULL field of view to be seen with comfort by a person wearing spectacles—very important if the eyesight correction contains a considerable astigmatism quotient, as is the case for many people. This instrument is certainly the least expensive quality glass which we have so far encountered to fulfill this purpose. A nicely finished BCF compact pattern binocular with folding rubber eyecups and independent right eye adjustment it features a special rapid focussing centre bar mechanism with integral tripod bush socket. High resolution coated optics, field of view 7.3 degrees and closest focussing distance 25 feet. Weight 28 ounces. Supplied with good quality case, lanyard, etc.

X.234. 8 to 20 × 45 Zoom Monocular with camera attachment. This high quality instrument features an unusually flexible range of powers with the exceptionally wide field of view AT 20 × MAGNIFICATION of 58 metres at 1000 metres (174' at 1000 yards). It is supplied with an adaptor ring which screws on in place of the eyecup, allowing attachment to the filter mount at the front of a reflex camera for use as a telephoto type lens. Effective focal lengths with 50 to 58mm standard lenses are then approx. 400 to 1000mm. Fully coated optics with focussing objective lens calibrated in feet and metres. Closest focussing distance 14 feet. Weight 15 ounces. Supplied with carrying case, lanyard, etc. The camera adaptor ring supplied is for attachment to cameras having a 49mm size filter thread mount—for adaptors to other sizes see adaptor section of catalogue.

X.235. Siemens high speed relays. S.P.C.O., platinum points, fully adjustable contacts and tension. 24V or 3V with series resistor removed. Weatherproof metal box with rubber covered external terminals. 145 ohm coil.

X.236. Small hand pumps, plunger operated. One eighth inch inlet and outlet. Handy for drawing off liquids from inaccessible places. Output marked 'supply'. Size approx. 2" × 4".

X.237. 5 B.A. × ⅝" steel round head screws.

X.238. Geared motors, similar to EM.16. Various sizes and voltages, AC and DC, various speeds. (Too late for classification, callers only.)