Astronomical
Instruments
Optical Equipment
Observatory Domes
Observation Ladders
Rising Floors

Identification Numbers

The various items listed and described in this catalogue bear numbers for their identification as to design and equipment which are part of the system of our workshop and despatch departments. These identification numbers should be quoted on all orders, in addition to the respective codewords, as this will materially assist in their prompt and correct execution.

Identification No.	Page	Description
14 70 50 — 14 71 53	96	Magnifying lenses
51 10 01 — 51 10 02	57	60-mm. (2⅜ in.) tube mountings
51 10 21 — 51 10 23	10	60 „ (2⅜ in.) telescope on table stand
51 10 61 — 51 10 62	57	60 „ (2⅜ in.) tube mountings
51 10 41 — 51 10 73	12	60 „ (2⅜ in.) travelling telescopes
51 13 01 — 51 13 02	57	80 „ (3⅛ in.) tube mountings
51 13 21 — 51 13 23	10	80 „ (3⅛ in.) telescope on table stand
51 13 41 — 51 13 63	14	80 „ (3⅛ in.) altazimuth telescopes
51 13 44 — 51 13 64	20	80 „ (3⅛ in.) comet finders
51 14 24 — 51 14 79	22	80 „ (3⅛ in.) look-out telescopes
51 16 01 — 51 16 02	57	110 „ (4⅜ in.) tube mountings
51 16 21 — 51 16 43	16	110 „ (4⅜ in.) altazimuth telescopes
51 17 31 — 51 17 61	22	110 „ (4⅜ in.) look-out telescopes
51 18 31	22	110 „ (4⅜ in.) bin. look-out telescope
51 20 01 — 51 20 02	57	130 „ (5⅛ in.) tube mountings
51 20 21 — 51 20 43	18	130 „ (5⅛ in.) altazimuth telescopes
51 21 31 — 51 21 51	22	130 „ (5⅛ in.) look-out telescopes
51 22 31	22	130 „ (5⅛ in.) bin. look-out telescope
51 23 61	22	240 „ (9½ in.) look-out telescope
51 28 31 — 51 28 83	24—26	80 „ (3⅛ in.) equatorial telescopes
51 30 31 — 51 30 63	26—28	110 „ (4⅜ in.) equatorial telescopes
51 31 31 — 51 31 33	28	130 „ (5⅛ in.) equatorial telescopes
51 32 31 — 51 32 33	30	150 „ (5⅞ in.) refractors
51 33 31 — 51 33 33	30	200 „ (7⅞ in.) refractors
51 35 65	6, 42, 124	650 „ (25⅝ in.) refractor
51 36 16	36	160-mm. (6¼ in.) astrograph
51 36 34	37	340 „ (13⅜ in.) Lippert astrograph
51 37 20	21	200 „ (7⅞ in.) comet finder
51 37 21	40	Photographic double refractor
51 37 30	39	300-mm. (11⅞ in.) refractor
51 37 36	41	Triple photographic refractor
51 38 26	44	260-mm. (10¼ in.) reflecting telescope
51 38 30	43	300 „ (11⅞ in.) reflecting telescope
51 39 10	47	1000 „ (39⅜ in.) reflecting telescope
51 39 12	49	1220 „ (48⅛ in.) reflecting telescope
51 39 40	45	400 „ (15¾ in.) reflecting telescope
51 39 72	48	720 „ (28⅜ in.) reflecting telescope
51 40 01 — 51 41 14	57	Stands for altazimuth telescopes
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51 43 11 — 51 43 21	52	Slow motions
51 43 31 — 51 43 61	52	R. A. and declination circles
51 43 71 — 51 43 91	54	Clocks
51 44 11 — 51 44 16	54	Electric seconds control
51 44 18 — 51 44 19	54, 58	Incandescent lamp, accumulator
51 44 31	56	Driving gear
51 47 11 — 51 47 21	58	Lighting arrangement
51 47 22 — 51 47 33	60	Revolvers
51 47 41 — 51 47 47	61, 111	Erecting prisms
51 47 61 — 51 47 71	62	Finders
51 48 11 — 51 48 25	62	Eyepiece and zenith prisms
51 48 41	66	Binocular eyepiece
51 48 61 — 51 48 91	66	Dark glasses and absorbing wedges
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51 64 91	108	Eyepiece sliding sleeve
51 64 95	108	Dynameter
51 66 05 — 51 67 40	109	Orthoscopic eyepieces
51 69 09 — 51 70 60	110	Kellner eyepieces
51 72 06 — 51 73 25	110	Monocentric eyepieces
51 73 51	111	Eyepiece microscope
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Business Terms

The prices of the instruments specified in this catalogue are strictly net for prompt cash and do not include the cost of packing and carriage from the works. Respecting payment we beg to refer to the enclosed price list. The cost of packing amounts to about 5% of the list price of an instrument. Dates of delivery are approximate only and should not be regarded as binding upon us.

When placing an order, the reference title of this catalogue **"Astro 30"**, the **codeword** and the identification **number of the** required item should be quoted.

All orders (excepting those of our regular business friends) should be accompanied by a remittance.

Goods are forwarded at the cost and risk of the consignee and are insured under our open policy, the cost of insurance being charged to the consignee. In the absence of special instructions, goods ordered from abroad are despatched by the most advantageous route, every precaution being taken to ensure safe transit and prompt delivery.

Small instruments are packed and forwarded ready for use, whilst large telescopes are dismounted before packing. We are prepared to provide fitters for the erection of the latter, subject to arrangement.

The prices of the telelescopes include the apparatus and accessories given at the head of each page. **The illustrations do not necessarily represent the equipment of the instrument as specified in the catalogue.** In most cases the instruments are shown equipped with additional accessories which are not included in the stated price and which require to be ordered separately.

Parts of instruments to be sent to us for repair, exchange etc. should be provided with a label (tied or stuck on) bearing the following particulars:

Astro 30. Name and Address of sender: .....

Date of covering letter: .....

Carl Zeiss · Jena

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Preface

This catalogue supersedes our former

Catalogue "Astro 8" of Astronomical Telescopes and Accessories, 3rd Edition, as well as the **Price Lists "Astro 20, 23, 25".**

The present catalogue comprises astronomical telescopes with their accessories and optical equipment including objectives up to 200 mm (8 in.) in diameter. Reference will also be made to instruments of larger dimensions or of special design; and some large instruments installed by the firm are shown in illustrations. Special quotations or tenders for these instruments and their erection will be furnished on application.

In the specifications of telescopes, due prominence has been given to apochromatic objectives, since the owners of even comparatively small telescopes have not failed to appreciate their advantages. To meet rising requirements the equipment of the telescopes has been appropriately extended or modified.

In the section dealing with accessory apparatus special attention has been paid to astro-photographic devices, whilst the astro-optical equipment has been made to include units designed for larger telescopes.

The section devoted to observatory domes furnishes more detailed information, and a variety of designs adapted to satisfy a wide range of requirements is shown by a number of illustrations.

The prices of all items described in the catalogue are given in a separate list appended to the catalogue.

Tables of dimensions and weights of the instruments will be found on pages 128 to 137.

The catalogue also contains particulars respecting magnifiers, focussing microscopes, measuring instruments for astrophotographic work, and surveying instruments.

Attention may be called to the following additions:

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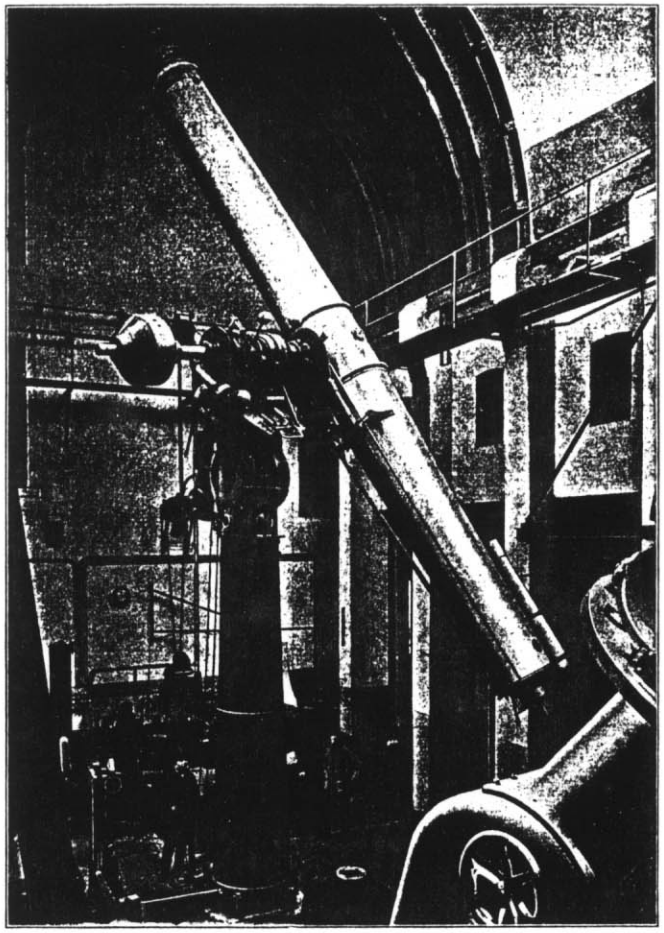

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Fig. 1

Erecting Shop for Astronomical Instruments

Zeiss Works at Jena

Erecting the Great Refractor for the Observatory at Berlin-Babelsberg
Diameter of objective 650 mm. (25⅝ in.), focal length 10.5 m. (34½ ft.)

Price: On application. Code word: *Asechome.* Identification Number: 51 35 65

Astronomical Telescopes

The **prices of the telescopes** include their complete mechanical and optical equipment together with the accessories required for the intended purpose, including a case and suitable appendages for protection against atmospheric influences. Details of design and accessories shown in the illustrations, but not expressly named in the synopses of parts included in the price, are supplied to order only and priced separately.

In the **mechanical construction** of the telescopes special care has been taken to select material best adapted to meet the stresses and working conditions affecting these parts. Any desired departure from the standard design of our telescopes and the substitution of other than the usual materials are subject to special quotations.

In the **optical equipment** the type of the objective with which the various telescopes may be provided is indicated by one of the three letters E, A, B, which symbolise the three types as follows:

The **E-objectives are two-lens telescope combinations** made of silicate glasses and calculated on the Fraunhofer formula. Their relative aperture is 1:15.

The **A-objectives are two-lens apochromatic telescope combinations** made from glasses without secondary spectrum. Their relative aperture is 1:17.5.

The **B-objectives are three-lens apochromatic telescope combinations** made from glasses without secondary spectrum. Their relative aperture is 1:15.

Further particulars respecting the correction of the three types of objectives will be found on pages 104—107. Some hints on the choice of objectives and telescopes according to the visibility of astronomical objects are given in the tables on page 118.

The eyepieces supplied with the telescopes are:

Huygens or **Kellner Eyepieces** having focal lengths from 60 mm. (2⅜ in.) to 12.5 mm. (½ in.) inclusive for the lower magnifications,

Orthoscopic Eyepices of 9 to 5 mm. (⅜ to ³⁄₁₆ in.) focal lengths for the higher magnifications.

If required, the telescope can be provided with eyepieces of other focal lengths or of a different type than those stated.

In the case of each telescope the magnification, the field of view in angular measure, and the diameter of the exit pupil are given for each of the eyepieces included in the specification.

These numbers determine the resolving power, the field of view, and the light transmitting power which each eyepiece gives in conjunction with the telescope. Detailed information on the calculation and significance of these numbers will be found on page 108.

For eyepieces differing in focal length or type from those supplied with a telescope the figures may be taken from the tables of magnification, field of view and exit pupil on page 117.

The figures given in the catalogue relating to eyepiece magnifications should be regarded as approximate only, as the focal length of the objective, which partly determines these figures, varies within narrow limits according to the constants of the glass which happens to be available at any time for the production of an object glass. The actual magnifications obtaining in each individual telescope are engraved on the eyepiece caps. These figures deviate in general only by a few units from the corresponding figures in the catalogue.

Respecting the choice of a telescope according to the nature of the proposed investigation see page 118

With each type of telescope a few accessories, expressly specified in each case, are included in the price of the telescope. That of a telescope without one or the other of these accessories can be ascertained by deducting the prices of the latter. At the end of the specification for the various types will be found a list of other accessories which can be used with the respective instruments and readily adapted to such as have been supplied on a previous occasion. When ordering accessories in the latter case it is sufficient to quote the factory number (i. e. the number on the drawtube) of the telescope.

For storing the telescopes a suitably fitted wooden box is supplied with the instrument in every case where this is stated. The eyepieces and accessories are accommodated in a separate polished wooden box or leather case, unless it is deemed more convenient in the use of the instruments (as in the case of small telescopes) to keep these parts in the telescope case. The stands of the smallest telescope models are included in the telescope box, whilst the other portable instruments are provided with a canvas case for the tripod head.

As far as it is necessary, the instruments are tested and adjusted by actual observations of celestial objects, both during construction and after completion, in spaces specially fitted for this purpose (Erecting Shop, pp. 6 and 23, Carl Zeiss Observatory, pp. 102 and 120). For the installation and manipulation of telescopes which have been supplied special instructions can be furnished on application.

Instruments of small size are delivered ready for use. The larger telescopes, which are necessarily forwarded in parts, may, if required, be erected by one of our fitters at the cost of the purchaser.

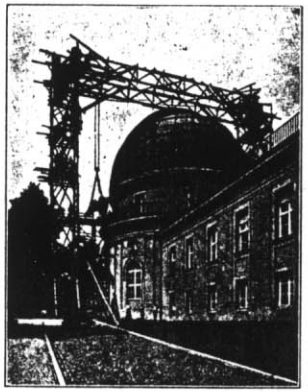

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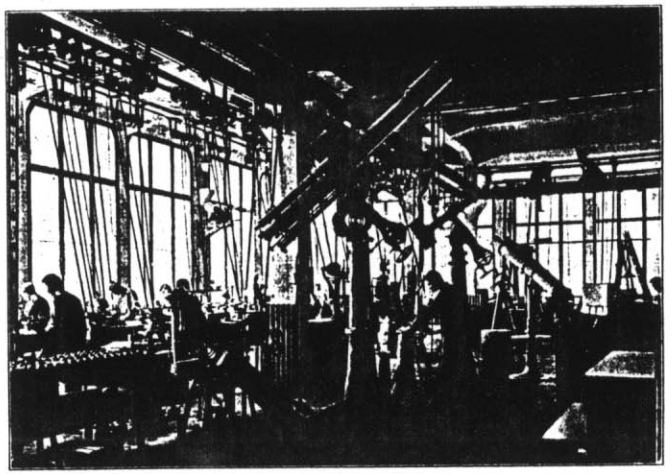
Fig. 2

Observatory at Berlin-Babelsberg

Scaffolding for housing the 650-mm. (25½-in.) Refractor (pp. 6 and 124)



A 91

Fig. 3

Astronomical Instrument Shop

Telescopes in Altazimuth Mounts

with Objectives of 60 to 130 mm. (2⅜ to 5⅛ in.) aperture.

These instruments are primarily equipped for astronomical observations. The position of their motion axes renders them readily adaptable for terrestrial use, in which case the astronomical eyepieces are employed in conjunction with erecting prisms (Nos. 113—116), or, if preferred, the terrestrial eyepieces (Nos. 315—318). The Look-out Telescopes on Stands (page 22) are primarily designed for terrestrial observations.

The telescopes are all mounted on trunnions in fork bearings and are well balanced for motion in altitude. Small disturbances of the balance due to a change in the eyepiece fittings may be overcome by slightly clamping the bearings in the fork. Greater disturbances of the balance are corrected by a displacement of the running weight.

Respecting the choice of a telescope to suit the nature of the astronomical object see page 118

60 and 80-mm. (2⅜ and 3⅛-inch) Altazimuth Telescopes on Table Stands. Figs. 4 and 5

The prices of Nos. 1 to 6 include:

No.	
	1 Telescope objective of 60 or 80 mm. (2⅜ or 3⅛ in.) aperture respectively
281	1 Kellner eyepiece, f=40 mm. (1⅝ in.)
253	1 Huygens eyepiece, f = 18 mm. (¾ in.)
265	1 Orthoscopic eyepiece, f = 9 mm. (⅜ in.)
126	1 Sun glass
95, 96	1 Tube mounting with 1 Eyepiece draw-tube
247	1 Eyepiece sliding sleeve
	1 Counterpoise 19, Fig. 4
	1 Objective sun shade
	1 Case for all telescope parts
84, 85	1 Table stand, disjointing

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	60-mm. (2⅜-in.) Telescope with erecting prisms No. 113		
1	with E-objective No. 217, focal length 85 cm. (33½ in.) Magnification astro. and terr: × 21, × 47, × 94 Field of view: 2° 1′ 1° 1′ 28′ Exit pupil: 3.0 1.3 0.6 mm.	*Asalveado*	51 10 21
2	with A-objective No. 227, focal length 105 cm. (41⅜ in.) Magnification astro. and terr: × 26, × 58, × 117 Field of view: 1° 40′ 51′ 22′ Exit pupil: 2.4 1.1 0.5 mm.	*Asalveamos*	51 10 22
3	with B-objective No. 233, focal length 85 cm. (33½ in.) Magnification astro. and terr: × 21, × 47, × 94 Field of view: 2° 1′ 1° 1′ 28′ Exit pupil: 3.0 1.3 0.6 mm.	*Asalvear*	51 10 23
	80-mm. (3⅛-in.) Telescope with erecting prisms No. 114		
4	with E-objective No. 218, focal length 120 cm. (47¼ in.) Magnification astro. and terr: × 30, × 67, × 134 Field of view: 1° 23′ 46′ 20′ Exit pupil: 2.7 1.2 0.6 mm.	*Asalvearia*	51 13 21
5	with A-objective No. 228, focal length 141 cm. (55½ in.) Magnification astro. and terr: × 35, × 78, × 157 Field of view: 1° 13′ 37′ 16′ Exit pupil: 2.4 1.1 0.5 mm.	*Asalvearon*	51 13 22
6	with B-objective No. 234, focal length 120 cm. (47¼ in.) Magnification astro. and terr: × 30, × 67, × 134 Field of view: 1° 23′ 46′ 20′ Exit pupil: 2.7 1.2 0.6 mm.	*Asalveles*	51 13 23

Additional Accessories recommended for Nos. 1—6:

No.	
252	Huygens eyepiece f = 25 mm. (1 in.)
266	Orthoscopic eyepiece f=7 mm. (⅜ in.)
110	Double revolver for Nos. 1—6 or
111	Triple revolver for Nos. 4—6
122	Eyepiece prism
124	Zenith prism
135	Revolving colour disc
141	Herschel sun prism, or
138	Colzi polarizing solar prism
152	Ring micrometer
166	Eyepiece spectroscope
144	Solar projection screen
117	×8 Finder
121	Finder, monocular field-glass type
62, 63	Changing device

For particulars of dimensions and weights see page 128 — **Price List at end of catalogue**

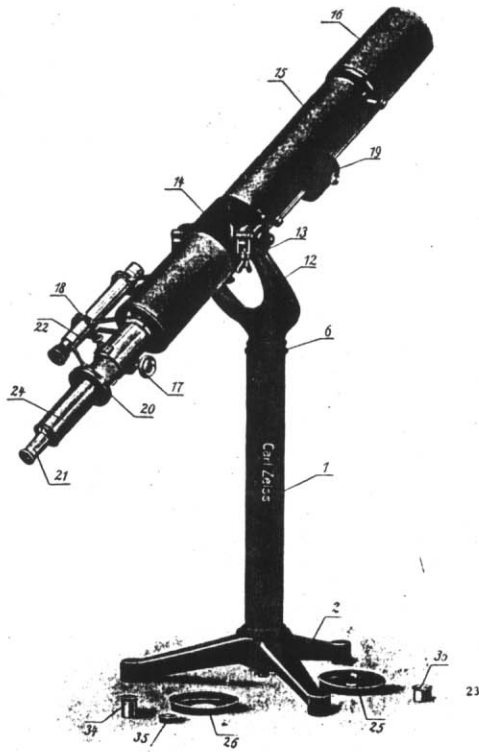


Fig. 4

Figs. 4 and 5

1 Pillar
2 Tripod, Claw
6 Azimuth motion
12 Telescope fork
13 Trunnion cap
14 Telescope trunnion sleeve
15 Telescope
16 Dew cap
17 Eyepiece draw-tube with rack and pinion
18 Clamp for eyepiece draw-tube
19 Counterpoise
20 Changing device
21 Eyepiece sliding sleeve
22 Finder with brackets
23 Triple revolver
24 Balancing and extension tube
25 Lens cap
26 Objective sun shade
27 Fitted case
34 Astro-eyepieces
35 Sun glasses
36 Lens cap for finder

Fig. 4
60 and 80-mm. (2⅜ and 3⅛-in.)
Altazimuth Telescopes
on table stands
Nos. 1—6

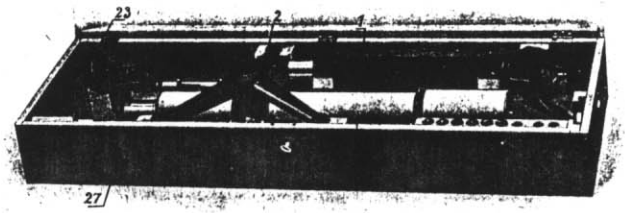


Fig. 5

60 and 80-mm. (2⅜ and 3⅛-inch) **Altazimuth Telescopes** on table claw stands
Nos. 1—6

All parts of the telescope and stand are accommodated in one case

60-mm. (2 3/8-inch) Travelling Telescopes

Figs. 6—8

In the prices of Nos. 7—12 are included:

No.	
	1 Telescope objective of 60 mm. (2 3/8 in.) aperture
281	1 Kellner eyepiece f = 40 mm. (1 7/8 in.)
253	1 Huygens eyepiece f = 18 mm. (1 1/8 in.)
265	1 Orthoscopic eyepiece f = 9 mm. (1/2 in.)
126	1 Sun glass
113	1 Set of erecting prisms

No.	
95, 96, 103, 104	1 Tube mounting with 1 Eyepiece draw-tube
247	1 Eyepiece sliding sleeve 1 Objective sun shade 1 Case accommodating all parts of telescope and tripod
86, 87,	1 Two-fold sliding wooden tripod 1 Extension rod for the tripod

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	60-mm. (2 3/8-in.) Travelling Telescope *with* slow motions in azimuth and altitude. Figs. 6 and 7		
7	with E-objective No. 217, focal length 85 cm. (33 1/2 in.) Magnification astro. and terr: × 21, × 47, × 94 Field of view: 2° 1′ 1° 1′ 28′ Exit pupil: 3.0 1.3 0.6 mm.	*Asedabais*	51 10 71
8	with A-objective No. 227, focal length 105 cm. (41 3/8 in.) Magnification astro. and terr: × 26, × 58, × 117 Field of view: 1° 40′ 51′ 22′ Exit pupil: 2.4 1.1 0.5 mm.	*Asalven*	51 10 72
9	with B-objective No. 233, focal length 85 cm. (33 1/2 in.) Magnification astro. and terr: × 21, × 47, × 94 Field of view: 2° 1′ 1° 1′ 28′ Exit pupil: 3.0 1.3 0.6 mm.	*Asalvenlo*	51 10 73
	60-mm. (2 3/8-in.) Travelling Telescope *without* slow motions in azimuth and altitude. Fig. 8		
10	with E-objective No. 217, focal length 85 cm. (33 1/2 in.) Magnification astro. and terr: × 21, × 47, × 94 Field of view: 2° 1′ 1° 1′ 28′ Exit pupil: 3.0 1.3 0.6 mm.	*Asedadme*	51 10 41
11	with A-objective No. 227, focal length 105 cm. (41 3/8 in.) Magnification astro. and terr: × 26, × 58, × 117 Field of view: 1° 40′ 51′ 22′ Exit pupil: 2.4 1.1 0.5 mm.	*Asalvenme*	51 10 42
12	with B-objective No. 233, focal length 85 cm. (33 1/2 in.) Magnification astro. and terr: × 21, × 47, × 94 Field of view: 2° 1′ 1° 1′ 28′ Exit pupil: 3.0 1.3 0.6 mm.	*Asalveo*	51 10 43

Additional Accessories recommended for Nos. 7—12:

No.	
252	Huygens eyepiece, f = 25 mm. (1 in.)
266	Orthoscopic eyepiece, f = 7 mm. (3/8 in.)
110	Double revolver
122	Eyepiece prism
124	Zenith prism
135	Revolving colour disc
141	Herschel sun prism, or
138	Colzi polarizing solar prism
152	Ring micrometer
166	Eyepiece spectroscope
144	Solar projection screen
125	Binocular eyepiece
121	Finder, monocular field-glass type
61, 63	Changing device

Catalogue of Travelling Telescopes, "Astro 28", on application

For particulars of dimensions and weights see page 128 — **Price List at end of catalogue**

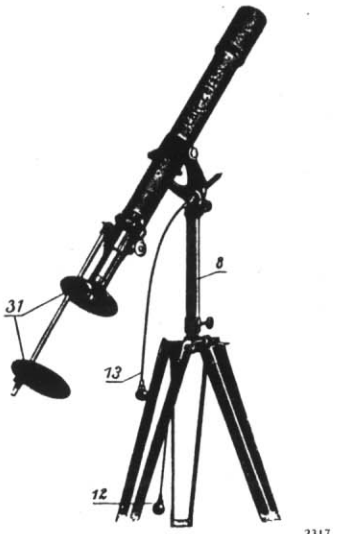


Fig. 6
60-mm. (2 3/8-in.) Travelling Telescope
Nos. 7—9



Fig. 8
60-mm. (2 3/8-in.) Travelling Telescope
Nos. 10—12

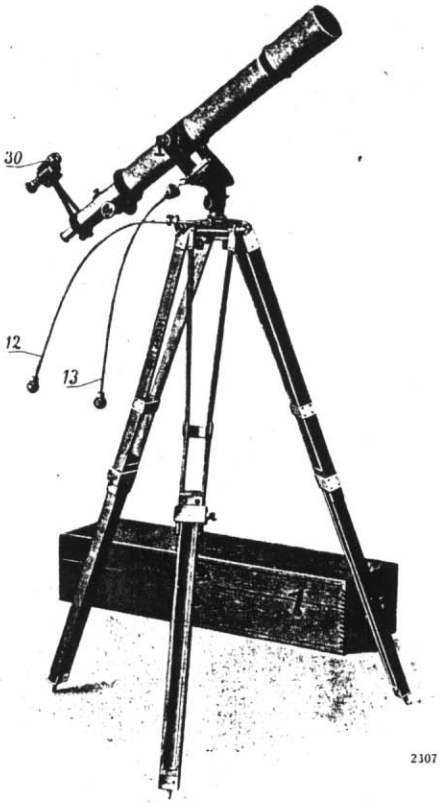


Fig. 7
60-mm. (2 3/8-in.) Travelling Telescope
Nos. 7—9

Figs. 6—8

8 Extension rod for the tripod
12 Slow motion in azimuth
13 Slow motion in altitude
30 Finder, monocular field-glass type, No. 121
31 Solar projection screen, No. 144

80-mm. (3⅛-inch) Altazimuth Telescopes on Floor Stands

Fig. 9

The prices of Nos. 13—18 include:

No.	
	1 Telescope objective of 80 mm. (3⅛ in.) aperture
281	1 Kellner eyepiece, f = 40 mm. (1 9/16 in.)
253, 254	2 Huygens eyepieces, f = 18, 12.5 mm. (¾, ½ in.)
266	1 Orthoscopic eyepiece, f = 7 mm. (9/32 in.)
126	1 Sun glass
127	1 Moon glass
-114	1 Set of erecting prisms
97, 98	1 Tube mounting with 1 Eyepiece draw-tube
247	1 Eyepiece sliding sleeve
	1 Sun shade
	1 Counterpoise
	1 Case for the telescope parts
88, 91	1 Elevating device for the tripod
	1 Protecting cover for tripod head

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	80-mm. (3⅛-in.) Altazimuth Telescope with *rigid* pyramid stand No. 88, Fig. 10, with foot screws and casters		
13	with E-objective No. 218, focal length 120 cm. (47¼ in.) Magnification astro. and terr: × 30, × 67, × 96, × 171 Field of view: 1° 23′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asalvera*	51 13 61
14	with A-objective No. 228, focal length 141 cm. (55⅝ in.) Magnification astro. and terr: × 35, × 78, × 113, × 201 Field of view: 1° 13′ 37′ 27′ 12′ Exit pupil: 2.4 1.1 0.7 0.4 mm.	*Asamara*	51 13 62
15	with B-objective No. 234, focal length 120 cm. (47¼ in.) Magnification astro. and terr: × 30, × 67, × 96, × 171 Field of view: 1° 23′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asamiento*	51 13 63
	80-mm. (3⅛-in.) Altazimuth Telescope with *folding* field tripod No. 91, Fig. 9, of steel tubes with fixing stays		
16	with E-objective No. 218, focal length 120 cm. (47¼ in.) Magnification astro. and terr: × 30, × 67, × 96, × 171 Field of view: 1° 23′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asana*	51 13 41
17	with A-objective No. 228, focal length 141 cm. (55⅝ in.) Magnification astro. and terr: × 35, × 78, × 113, × 201 Field of view: 1° 13′ 37′ 27′ 12′ Exit pupil: 2.4 1.1 0.7 0.4 mm.	*Asanara*	51 13 42
18	with B-objective No. 234, focal length 120 cm. (47¼ in.) Magnification astro. and terr: × 30, × 67, × 96, × 171 Field of view: 1° 23′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asanarse*	51 13 43

Additional Accessories recommended for Nos. 13—18:

No.	
252	Huygens eyepiece, f = 25 mm. (1 in.)
265	Orthoscopic eyepiece, f = 9 mm. (⅜ in.)
125	Binocular eyepiece
110	Double revolver, or
111	Triple revolver
122	Eyepiece prism
124	Zenith prism
130—133	Coloured glasses, or
135	Revolving colour disc
141	Herschel solar prism, or
138	Colzi polarizing solar prism
144	Solar projection screen
117	× 8 Finder, or
121	Finder, monocular field-glass type
62, 63	Changing device
166	Eyepiece spectroscope
152	Ring micrometer
68	Slow motions in azimuth and altitude
434	Observation ladder

For particulars of dimensions and weights see page 128 — **Price List at end of catalogue**

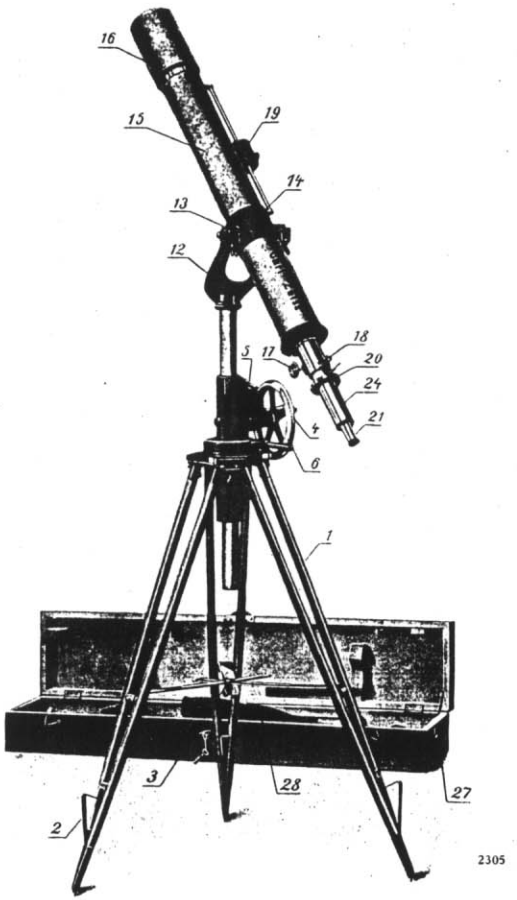


Fig. 9

80-mm. (3⅛-inch) Altazimuth Telescopes

Nos. 13—18

1 Field tripod
2 Tread
3 Stays with clamping screw
4 Elevating gear with rack and pinion
5 Clamp for elevating gear
6 Clamp for azimuth motion
12 Telescope fork
13 Trunnion cap
14 Trunnion sleeve
15 Telescope
16 Dew cap
17 Eyepiece draw-tube with rack and pinion
18 Clamp for eyepiece draw-tube
19 Counterpoise
20 Changing device
21 Eyepiece sliding sleeve
24 Balancing and extension tube
27 Case for all telescope parts
28 Cover for elevating gear and telescope fork

110-mm. (4¼-inch) Altazimuth Telescopes on Floor Stands

Figs. 9 and 10

The prices of Nos. 19—24 include:

No.	
	1 Telescope objective of 110 mm. (4¼ in.) aperture
280	1 Kellner eyepiece, f=50 mm. (2 in.)
252, 254	2 Huygens eyepieces, f=25, 12.5 mm. (1, ½ in.)
265, 267	2 Orthoscopic eyepieces, f=9.6 mm. (⅜ in.)
126	1 Sun glass
127	1 Moon glass
114	1 Set of erecting prisms
99, 100	1 Tube mounting with 1 Eyepiece draw-tube
62, 63	1 Changing device
247	1 Eyepiece sliding sleeve
111	1 Triple revolver
118	1 × 10 Finder
	1 Sun schade
	1 Counterpoise
	1 Fitted case for telescope
	1 Small polished wooden box for above eyepieces and accessories
89, 92	1 Elevating gear for stand
	1 Cover for stand head

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	110-mm. (4¼-inch **Altazimuth Telescope** with *rigid* pyramid stand No. 89, Fig. 10, with casters and levelling screws		
19	with E-objective No. 219, focal length 165 cm. (65 in.) Magnification astro. and terr: ×33, ×66, ×132, ×184, ×275 Field of view: 1° 20′ 45′ 23′ 14′ 10′ Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asand*	51 16 41
20	with A-objective No. 229, focal length 204 cm. (80½ in.) Magnification astro. and terr: ×41, ×82, ×164, ×226, ×340 Field of view: 1° 2′ 35′ 17′ 11′ 7′,9 Exit pupil: 2.8 1.4 0.6 0.5 0.4 mm.	*Asander*	51 16 42
21	with B-objective No. 235, focal length 165 cm. (65 in.) Magnification astro. and terr: ×33, ×66, ×132, ×184, ×275 Field of view: 1° 20′ 45′ 23′ 14′ 10′ Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asaneis*	51 16 43
	110-mm. (4¼-inch) **Altazimuth Telescope** with *folding* field tripod No. 92, Fig. 9, made of steel tubing with adjustable stays		
22	with E-objective No. 219, focal length 165 cm. (65 in.) Magnification astro. and terr: ×33, ×66, ×132, ×184, ×275 Field of view: 1° 20′ 45′ 23′ 14′ 10′ Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asanemos*	51 16 21
23	with A-objective No. 229, focal length 204 cm. (80½ in.) Magnification astro. and terr: ×41, ×82, ×164, ×226, ×340 Field of view: 1° 2′ 35′ 17′ 11′ 7′,9 Exit pupil: 2.8 1.4 0.6 0.5 0.4 mm.	*Asangue*	51 16 22
24	with B-objective No. 235, focal length 165 cm. (65 in.) Magnification astro. and terr: ×33, ×66, ×132, ×184, ×275 Field of view: 1° 20′ 45′ 23′ 14′ 10′ Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asantam*	51 16 23

Additional Accessories recommended for Nos. 19—24:

No.	
281	Kellner eyepiece, f=40 mm. (1 9/16 in.)
253	Huygens eyepiece, f=18 mm. (¾ in.)
266	Orthoscopic eyepiece, f=7 mm. (3/9 in.)
125	Binocular eyepiece
122	Eyepiece prism
124	Zenith prism
141	Herschel sun prism, or
138, 139	Colzi polarizing solar prism
130—133	Set of Coloured glasses
135	Revolving colour disc
145	Solar projection screen
166	Eyepiece spectroscope
152	Ring micrometer
69	Slow motions in azimuth and altitude
434	Observation ladder

For particulars of dimensions and weights see page 128 — **Price List at end of catalogue**

Fig. 10

1 Pyramid stand
2 Footscrew with lock nut
3 Caster
4 Elevating gear with rack and pinion motion
5 Clamp for elevating gear
7 Horizontal slow motion by wormwheel with disengaging worm for coarse motion in azimuth
8 Altitude slow motion by wormwheel with disengaging worm for coarse motion in altitude
9 Clamping screw for slow motion in altitude
10 Flexible shaft for actuating slow motion in azimuth
11 Flexible shaft for actuating slow motion in altitude
12 Telescope fork
13 Trunnion clip
14 Telescope sleeve
15 Telescope
16 Dew cap
17 Eyepiece draw-tube with rack and pinion motion
18 Clamp for eyepiece draw-tube
19 Counterpoise
20 Changing device
22 Finder
23 Triple revolver
25 Lens cap
26 Sun shade for objective
27 Fitted case for all telescope parts
28 Cover case for elevating gear and telescope fork
29 Directions for keeping telescope in good order
32 Zenith prism
33 Herschel sun prism
34 Astro-eyepieces
35 Sun and moon glasses
36 Lens cap for finder

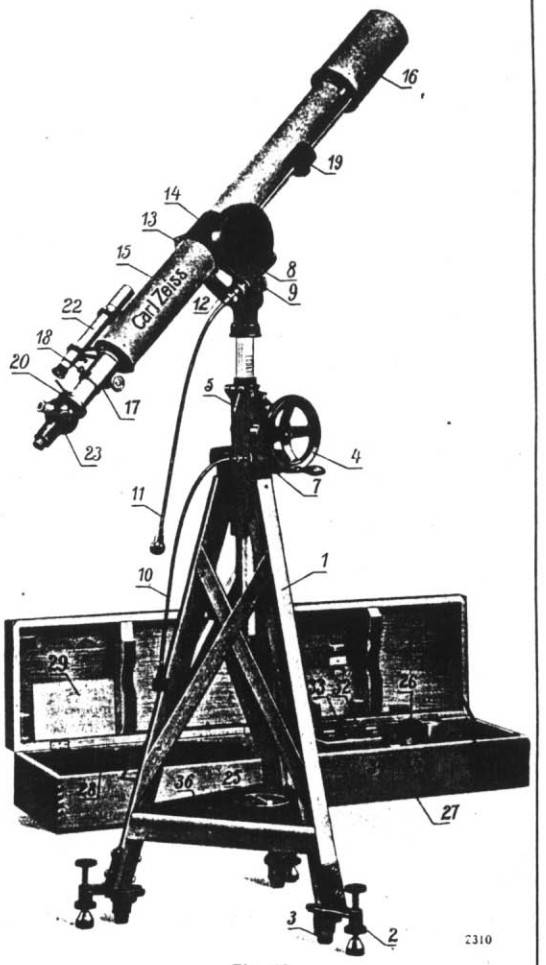


Fig. 10

110-mm. (4¼-inch) Altazimuth Telescope
Nos. 19—24

130-mm. (5⅛-inch) Altazimuth Telescopes on Tripod Stands

Figs. 10 and 11

The prices of Nos. 25—30 include:

No.	
	1 Telescope objective of 130 mm. (5⅛ in.) aperture
280	1 Kellner eyepiece, f = 50 mm. (2 in.)
252, 254	2 Huygens eyepiece, f = 25, 12.5 mm. (1, ½ in.)
265, 266, 268	3 Orthoscopic eyepiece, f = 9, 7, 5 mm. ($\frac{1}{3}\frac{1}{2}$, $\frac{9}{32}$, $\frac{5}{16}$ in.)
126	1 Sun glass
127	1 Moon glass
131	1 Yellow glass
115	1 Erecting prisms
101, 102	1 Tube mounting with
	1 Eyepiece draw tube
62, 63	1 Changing device
247	1 Eyepiece sliding sleeve
111	1 Triple revolver
118	1 ×10 Finder
	1 Sun shade
	1 Counterpoise
	1 Case for telescope
90, 93	1 Elevating gear for tripod
	1 Small polished box for above eyepieces and accessories
	1 Cover for tripod head

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	130-mm. (5⅛-in.) **Altazimuth Telescope** with rigid pyramid tripod No. 90, Fig. 10, with casters and levelling screws		
25	with E-objective No. 220, focal length 195 cm. (77 in.) Magnification astro. and terr: ×39, ×78, ×156, ×216, ×279, ×390 Field of view: 1°5′ 37′ 18′ 11′ 10′ 6′.5 Exit pupil: 3.3 1.7 0.8 0.6 0.5 0.3 mm.	*Asantes*	51 20 41
26	with A-objective No. 230, focal length 233 cm. (92 in.) Magnification astro. and terr: ×47, ×93, ×186, ×259, ×333, ×466 Field of view: 54′ 32′ 15′ 11′ 10′ 5′.6 Exit pupil: 2.8 1.4 0.7 0.5 0.4 0.3 mm.	*Asaph*	51 20 42
27	with B-objective No. 236, focal length 195 cm. (77 in.) Magnification astro. and terr: ×39, ×78, ×156, ×216, ×279, ×390 Field of view: 1°5′ 37′ 18′ 11′ 10′ 6′.5 Exit pupil: 3.3 1.7 0.8 0.6 0.5 0.3 mm.	*Asaphes*	51 20 43
	130-mm. (5⅛-in.) **Altazimuth Telescope** with folding field tripod No. 93, Fig. 11, made of steel tubing with adjustable stays		
28	with E-objective No. 220, focal length 195 cm. (77 in.) Magnification astro. and terr: ×39, ×78, ×156, ×216, ×279, ×390 Field of view: 1°5′ 37′ 18′ 11′ 10′ 6′.5 Exit pupil: 3.3 1.7 0.8 0.6 0.5 0.3 mm.	*Asaphia*	51 20 21
29	with A-objective No. 230, focal length 233 cm. (92 in.) Magnification astro. and terr: ×47, ×93, ×186, ×259, ×333, ×466 Field of view: 54′ 32′ 15′ 11′ 10′ 5′.6 Exit pupil: 2.8 1.4 0.7 0.5 0.4 0.3 mm.	*Asaphus*	51 20 22
30	with B-objective No. 236, focal length 195 cm. (77 in.) Magnification astro. and terr: ×30, ×78, ×156, ×216, ×279, ×390 Field of view: 1°5′ 37′ 18′ 11′ 10′ 6′.5 Exit pupil: 3.3 1.7 0.8 0.6 0.5 0.3 mm.	*Asarabacca*	51 20 23

Additional Accessories recommended for Nos. 25—30:

No.	
281	Kellner eyepiece, f = 40 mm. (1$\frac{9}{16}$ in.)
253	Huygens eyepiece, f = 18 mm. ($\frac{11}{16}$ in.)
125	Binocular eyepiece
122	Eyepiece prism
124	Zenith prism
141*	Herschel sun prism or
138, 139	Colzi polarizing solar prism
130—133	Set of coloured glasses
135	Revolving colour disc
145	Solar projection screen
166	Eyepiece spectroscope
152	Ring micrometer
70	Slow motion
434	Observatory ladder

For particulars of dimensions and weights see page 124 — **Price List at end of catalogue**

Fig. 11

1 Field tripod
2 Tread
3 Stays with clamping screw
4 Rack and tooth elevating gear
5 Clamp for elevating gear
6 Clamp for rotation in azimuth
12 Telescope fork
13 Trunnion clip
14 Telescope trunnion sleeve
15 Telescope
16 Dew cap
17 Eyepiece draw-tube with rack and pinion motion
18 Clamp for eyepiece draw-tube
19 Counterpoise
20 Changing device
22 Finder
23 Triple revolver
25 Lens cap
26 Objective sun shade
27 Fitted case for telescope
28 Cover for elevating gear and telescope fork
29 Directions for keeping telescope in good order
30 Small polished wood box for eyepieces and accessories
31 Small polished wood box for telescope objective
34 Astro-eyepieces
35 Dark glasses
37 Erecting prisms

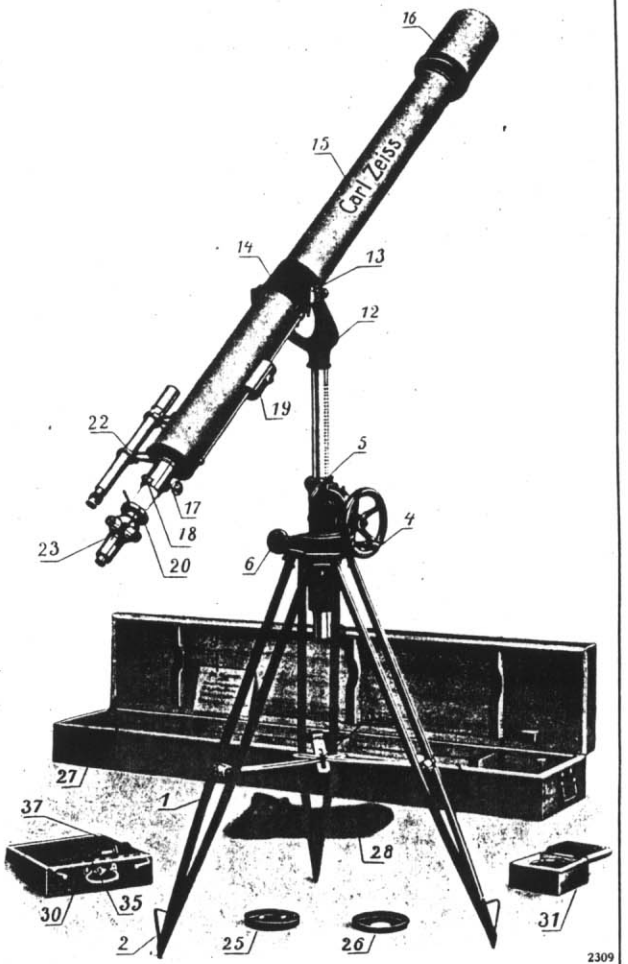
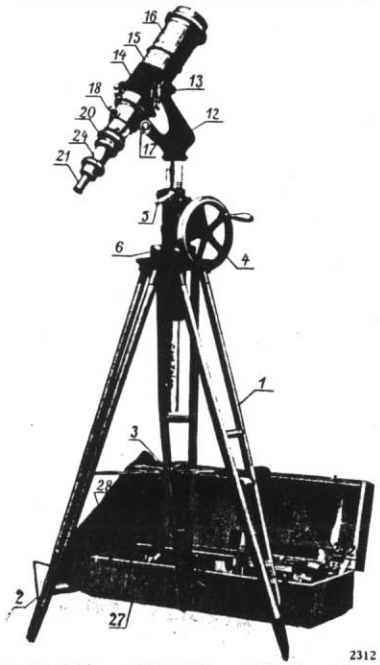


Fig. 11

130-mm. (52⅛-inch) Altazimuth Telescope

Nos. 25—30



2312

Fig. 12. 80-mm. (3⅛-in.) Comet Finder. No. 32

80-mm. (3⅛-inch) Comet Finder

An altazimuth telescope of great light gathering power and short focal length for astronomical and terrestrial use

Fig. 12

1 Field tripod
2 Tread
3 Stays with clamping screw
4 Rack and tooth elevating gear
5 Clamp for elevating gear
6 Clamp for horizontal rotation
12 Telescope fork
13 Trunnion clip
14 Telescope trunnion sleeve
15 Telescope
16 Dew cap, to unscrew
17 Eyepiece draw-tube with rack and pinion motion
18 Clamp for eyepiece draw-tube
20 Changing device
21 Eyepiece sliding sleeve
23 Triple revolver
24 Balancing and extension tube
25 Lens cap
26 Objective sun shade
27 Fitted case for all telescope parts
28 Cover for elevating gear and telescope fork
34 Astro-eyepiece
35 Sun glass
37 Erecting prisms

The prices for Nos. 31 and 32 include:

No.	
243	1 C-objective, 80 mm. (3⅛ in.) aperture, 49 cm. (19¼ in.) focal length
281	1 Kellner eyepiece, f = 40 mm. (1 9/16 in.)
252, 253, 254	3 Huygens eyepieces, f = 25, 18, 12.5 mm. (1, ¾, ½ in.)
126	1 Sun glass
114	1 Erecting prisms
111	1 Triple revolver
247	1 Eyepiece sliding sleeve
62, 63	1 Changing device
	1 Tube mounting with eyepiece draw-tube and sun shade
	1 Balancing and extension tube
	1 Fitted case for the telescope parts
	1 Cover for tripod head and telescope fork
90a, 94	1 Elevating gear for tripod

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
31	**80-mm. (3⅛-in.) Comet Finder,** Fig. 12, with pyramid tripod No. 90a, Fig. 10, with foot screws and casters Magnification, astro. and terr: ×12, ×20, ×27, ×39 Field of view: 3°45′ 2°23′ 1°49′ 1°13′ Exit pupil: 7.5 4.0 3.0 2.1 mm.	*Asaraban*	51 13 64
32	**80-mm. (3⅛-in.) Comet Finder,** Fig. 12, with field tripod No. 94, folding, made of steel tubing, with adjustable stays Magnification, astro. and terr: ×12, ×20, ×27, ×39 Field of view: 3°45′ 2°23′ 1°49′ 1°13′ Exit pupil: 7.5 4.0 3.0 2.1 mm.	*Asaraca*	51 13 44

For particulars of dimensions and weights see page 124 — **Price List at end of catalogue**

200-mm (8-inch) Comet Finder

An equatorial telescope of great light gathering power and short focal length for astronomical use

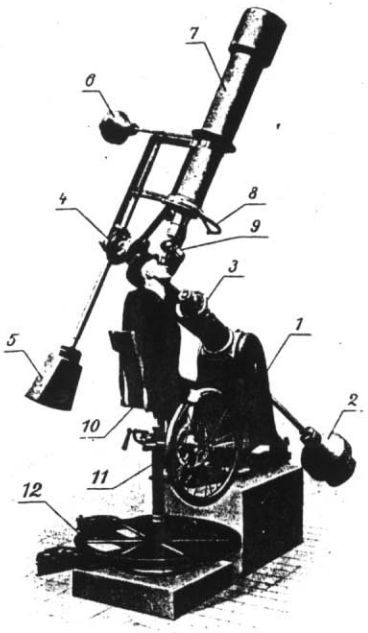
Fig. 14

1 Telescope base with azimuth and altitude correction
2 Counterpoise of telescope parts with respect to telescope base
3 Polar axis with divided circle
4 Declination axis with divided circle
5 Counterpoise of telescope with respect to declination axis
6 Counterpoise of telescope with respect to polar axis
7 Telescope
8 Handle for displacing telescope
9 Eyepiece draw-tube and triple revolver
10 Revolving seat, adjustable in height
11 Handwheel for rotating dome from seat
12 Transmission of rotatory motion from handwheel to dome ring by means of rollers and wire rope



2325

Fig. 13. 200 mm. (8-inch) Comet Finder in wooden dome
The wooden dome No. 35, shown without sheathing



2319

Fig. 14
200-mm. (8-inch) Comet Finder, Nos. 33 and 34

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
33	**200 mm. (8-inch) Comet Finder,** Fig. 14 The equatorial mounting being so arranged that the eyepiece is situated at the point of intersection of the polar and declination axes, the observer is enabled to always make his observations from a fixed position. The instrument is fitted with a D-Objective No. 246 of 200 mm. (8-in.) aperture and 133 cm. (52½ in.) focal length; a Kellner eyepiece, f = 30 mm. (1 3/16 in.), No. 282, three Huygens eyepieces, f = 50, 18, 12.5 mm. (2, ¾, 1 in.), Nos. 250a, 253, 254; two orthoscopic eyepieces, f = 7 and 5 mm. (9/32 and 3/16 in.), Nos. 266, 268; a triple revolver No. 111. Magnification, Astro: ×27, ×44, ×74, ×106, ×190, ×265 Field of view: 1°49′ 58′ 39′ 28′ 13′ 10′ Exit pupil: 7.7 4.6 2.7 1.9 1.1 0.8 mm.	*Asareel*	51 37 20
34	**Observation Chair,** Fig. 14, with revolving, adjustable seat and handwheel with running gear for dome	*Asarero*	51 98 51
35	**Wooden Dome of 3.3 m. (11 ft.) internal diameter** (page 116) with live ring, venetian shutter, and drive actuated from the observation chair.	*Asaret*	51 96 11

For particulars of dimensions and weights see page 126 — **Price List at end of catalogue**

Monocular and Binocular High-power Look-out Telescopes

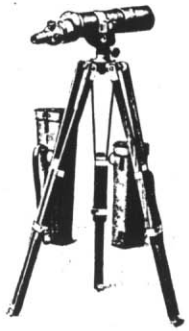


Fig. 15
80-mm. Monocular Look-out Telescopes
Magn.: ×12, ×20, ×40
Ident. Nos. 51 14 24 Codeword: *Asacanda*

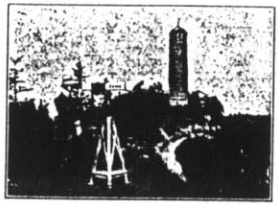


Fig. 16. Fox Tower near Jena
110-mm. Automatic Telescope
Magn.: ×33, ×52, ×72
Ident. Nos. 51 17 61 Codeword: *Asacar*



Fig. 17
80-mm. Binocular Look-out Telescope
Magn.: ×12, ×20, ×40
Ident. Nos. 51 14 79 Codeword: *Asaltanli*



Fig. 18 Inselsberg in Thuringia
130-mm. Automatic Telescope
Magn.: ×35, ×58, ×116
Ident. Nos. 51 21 51 Codeword: *Asalirco*



Fig. 19. Riffelalp above Zermatt
130-mm. Mon. Look-out Telescope
Magn.: ×35, ×58, ×116
Ident. Nos. 51 21 31 Codeword: *Asaliter*

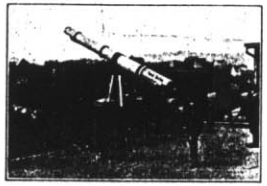


Fig. 20
240-mm. Look-out Telescope
Magn.: ×60, ×90, ×144
Ident. Nos. 51 23 61 Codeword: *Asalak*



Fig. 21
110-mm. Mon. Look-out Telescope
Magn.: ×33, ×52, ×72
Ident. Nos. 51 17 31 Codeword: *Asalumen*



Fig. 22
130-mm. Bin. Look-out Telescope
Magn.: ×35, ×58, ×116
Ident. Nos. 51 22 31 Codeword: *Asal*



Fig. 23
110-mm. Bin. Look-out Telescope
Magn.: ×33, ×52, ×72
Ident. Nos. 51 18 31 Codeword: *Asaltur*

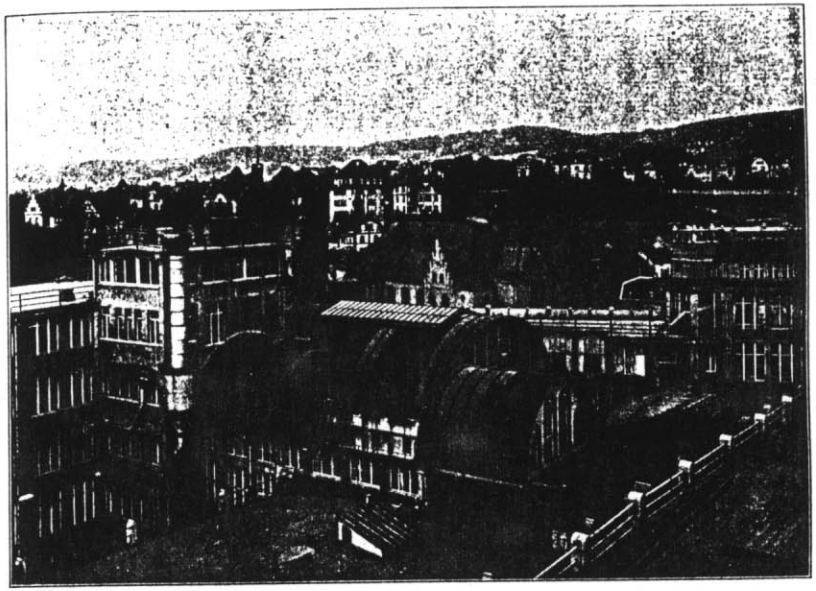


Fig. 24 2306

Erecting-Shop for Astronomical Instruments

The arched roof of the erecting shop is of the sliding type for testing instruments upon astronomical objects. At the rear of the erecting shop will be seen the arched roof of the dome erecting shop. (Page 115, Fig. 159)

Equatorially Mounted Telescopes

of 80—200 mm. (3¼—8 in.) aperture

Equatorial mountings, being intended exclusively for astronomical observations, vary very considerably in their elaboration and mechanical equipment according to the size of the objective and the scope of the investigations to which it lends itself. To meet these different requirements the instruments are variously equipped with the requisite auxiliary aids to observation, such as divided circles, slow motions and clock drive, or with such accessory apparatus as may be required for astrophysical (including astrophotographic) investigations, such as electric slow motion gears, seconds control for the driving clock.

The instruments are available for installation in latitudes ranging from $\varphi = 0°$ to $+ 70°$ (Polar adjustment). Where telescopes are intended for use in the southern hemisphere this should be expressly stated in the order in all cases when driving clocks and R. A. and declination circles are required or where it is proposed to add them subsequently. Also, when ordering, the latitude of the place of observation should be stated, so that the necessary adjustment for the required latitude may be carried out at the works.

Prices of equatorially mounted telescopes with objective apertures over 200 mm. (8 in.), as well as refractors of special mechanical construction and with special equipment for astro-photographic purposes will be quoted on demand.

Respecting the choice of telescopes to suit the nature of the proposed investigation see page 114

80-mm. (3⅛-inch) Equatorial Telescopes. Figs. 25 and 26.

Items included in the prices of Nos. 36—41:

The numbers in brackets refer to the items on the accompanying figures.

No.

1 Telescope objective of 80 mm. (3⅛ in.) aperture
251, 253, 254 3 Huygens eyepieces, f = 40, 18, 12.5 mm. (1 9/16, 11/16, ½ in.)
266 1 Orthoscopic eyepiece, f = 7 mm. (9/32 in.)
126 1 Sun glass
127 1 Moon glass
1 Tube mounting (31) with
1 Eyepiece draw-tube (36)
247 1 Eyepiece sliding sleeve
1 Objective sun shade (49), fig. 26
1 Counterpoise in declination (35)
1 Equatorial head without R. A. and declination circles
1 Slow motion in R. A. by flexible shaft (14)
1 Clamp in declination with key (15) actuated from the eye end
1 Polished wood box (50) for above eyepieces and accessory apparatus
1 Travelling case for the telescope (31) with cradle (29)

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	80-mm. (3⅛-in.) Equatorial Telescope with rigid pyramid tripod (2), Fig. 26, with foot screws and casters		
36	with E-objective No. 218, focal length 120 cm. (47¼ in.) Magnification Astro: × 30, × 67, × 96, × 171 Field of view: 1°35′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asargadas*	51 28 31
37	with A-objective No. 228, focal length 141 cm. (55⅝ in.) Magnification Astro: × 35, × 78, × 113, × 201 Field of view: 1°22′ 37′ 27′ 12′ Exit pupil: 2.4 1.1 0.7 0.4 mm.	*Asari*	51 28 32
38	with B-objective No. 234, focal length 120 cm. (47¼ in.) Magnification Astro: × 30, × 67, × 96, × 171 Field of view: 1°35′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asariamos*	51 28 33
	80 mm. (3⅛-in.) Equatorial Telescope with folding field tripod (3), Fig. 25, made of steel tubing with adjustable stays		
39	with E-objective No. 218, focal length 120 cm. (47¼ in.) Magnification Astro: × 30, × 67, × 96, × 171 Field of view: 1°35′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asarina*	51 28 35
40	with A-objective No. 228, focal length 141 cm. (55⅝ in.) Magnification Astro: × 35, × 78, × 113, × 201 Field of view: 1°22′ 37′ 27′ 12′ Exit pupil: 2.4 1.1 0.7 0.4 mm.	*Asarinos*	51 28 36
41	with B-objective No. 234, focal length 120 cm. (47¼ in.) Magnification Astro: × 30. × 67, × 96, × 171 Field of view: 1°35′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asarium*	51 28 37

Additional Accessories recommended for Nos. 36—41:

No.

252 Huygens eyepiece, f = 25 mm. (1 in.)
265 Orthoscopic eyepiece, f = 9 mm. (1 1/32 in.)
125 Binocular eyepiece
110 Double revolver or
111 Triple revolver
122 Eyepiece prism
124 Zenith prism
130, 133 Coloured glasses or
135 Revolving colour disc
141 Herschel sun prism or
138 Colzi polarizing solar prism
144 Solar projection screen
117 × 8 Finder
62, 63 Changing device
166 Eyepiece spectroscope
152 Ring micrometer
153 Eyepiece screw micrometer
167 Abbe Spectroscopic eyepiece
106 Abbe Dark ground illumination
71 Hour circle (12) with vernier, and declination circle (17) with vernier
76 Spring-driven clock (21)
434 Observation ladder

For particulars of dimensions and weights see page 126 — **Price List at end of catalogue**

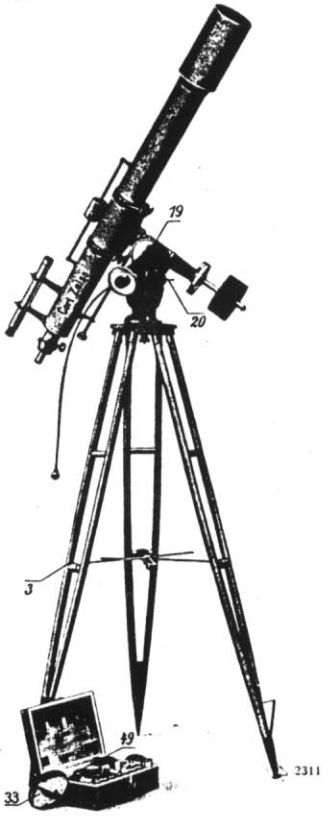


Fig. 25

80-mm. (3⅛-in.) Equatorial Telescope on field tripod stand Nos. 39—41

2 Pyramid tripod stand
3 Field tripod with adjustable stays
4 Foot screws with casters
5 Clamping screw for adjustment in azimuth
7 Tripod head with adjustment in latitude (1°—70°)
9 Polar axis
10 Declination axis
12 Hour circle divided in 10 min., reading to 1 min. by two verniers
13 Clamp in R. A.
14 Slow motion in R. A. by means of flexible shaft
15 Clamp in declination by means of key actuated from eye end
17 Declination circle divided in degrees and reading to 5 min. by two verniers
19 Clock circle
20 Helical drive to clock circle (19)
21 Spring-driven clock, No. 76, for motion in R. A.

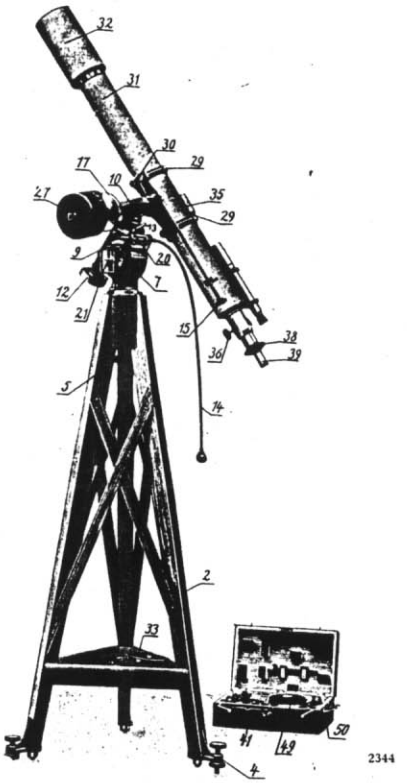


Fig. 26

80-mm. (3⅛-in.) Equatorial Telescope on pyramid tripod stand Nos. 36—38

27 Adjustable counterpoise of telescope with respect to polar axis
29 Telescope cradle with two clamping rings for fixing the telescope
30 Clamping screw of (29) for fixing the telescope to the declination axis
31 Telescope
32 Dew cap
33 Lens cap
35 Counterpoise with respect to declination axis
36 Eyepiece draw-tube with rack and pinion motion
38 Changing device
39 Eyepiece sliding sleeve
41 Eyepieces
49 Objective sun shade
50 Polished wood box for eyepieces and accessories

80 and 110-mm. ($3\frac{1}{8}$ and $4\frac{1}{4}$-inch) Equatorial Telescopes

Figs. 27 and 28

Items included in the prices of Nos. 42—47:

The numbers in brackets refer to the parts shown in the accompanying illustrations

No.	
	1 Telescope objective of 80 mm. or 110 mm. ($3\frac{1}{8}$ or $4\frac{1}{4}$ in.) aperture
126	1 Sun glass
127	1 Moon glass
	1 Tube mounting (31)
	1 Eyepiece draw-tube with rack and pinion motion
247	1 Eyepiece sliding sleeve
	1 Objective sun shade (49)
	1 Counterpoise with respect to declination (35)
117	1 Finder, ×8 (44)
	1 Equatorial head with hour circle (12) and declination circle (17)
	1 Clamp and slow motion in declination (15, 16) actuated from eye end by means of key
	1 Clamp and slow motion in R. A. (13, 14) actuated by means of draw-cords
	1 Polished wooden box (52), for above eyepieces and accessories
	1 Travelling case for telescope with cradle (29)
	1 Pyramid tripod stand (2), with foot screws and casters
	1 Fitted box for the 110-mm. objective

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	80-mm. ($3\frac{1}{8}$-in.) **Equatorial Telescope** with Nos. 251, 253, 254, 3 Huygens eyepieces, f = 40, 18, 12.5 mm. ($1\frac{9}{16}$, $\frac{11}{16}$, $\frac{1}{2}$ in.) and No. 266, orthoscopic eyepiece, f = 7 mm. ($\frac{9}{32}$ in.), No. 148, 1 cross-line diaphragm for eyepiece No. 266		
42	with E-objective No 228, focal length 120 cm. ($47\frac{1}{4}$ in.) Magnification Astro: ×30, ×67, ×96, ×171 Field of view: 1°35′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asarki*	51 28 81
43	with A-objective No. 228, focal length 141 cm. ($55\frac{3}{8}$ in.) Magnification Astro: ×35, ×78, ×113, ×201 Field of view: 1°22′ 37′ 27′ 12′ Exit pupil: 2.4 1.1 0.7 0.4 mm.	*Asaro*	51 28 82
44	with B-objective No. 234, focal length 120 cm. ($47\frac{1}{4}$ in.) Magnification Astro: ×30, ×67, ×96, ×171 Field of view: 1°35′ 46′ 31′ 15′ Exit pupil: 2.7 1.2 0.8 0.5 mm.	*Asaroide*	51 28 83
	110-mm. ($4\frac{1}{4}$-in.) **Equatorial Telescope** with Nos. 250a, 252, 254, 3 Huygens eyepieces, f = 50, 25, 12.5 mm. (2, 1, $\frac{1}{2}$ in.); Nos. 265, 267, 2 orthoscopic eyepieces, f = 9,6 mm. ($\frac{3}{8}$ in.), No. 148, 1 cross-line diaphragm for eyepiece No. 265		
45	with E-objective No. 219, focal length 165 cm. (65 in.) Magnification Astro: ×33, ×66, ×132, ×184, ×275 Field of view: 1°27′ 45′ 23′ 14′ 9′.9 Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asarona*	51 30 31
46	with A-objective No. 229, focal length 204 cm. ($80\frac{1}{2}$ in.) Magnification Astro: ×41, ×82, ×164, ×226, ×340 Field of view: 1°9′ 35′ 17′ 11′ 7′.9 Exit pupil: 2.8 1.4 0.6 0.5 0.4 mm.	*Asaroli*	51 30 32
47	with B-objective No 235, focal length 165 cm. (65 in.) Magnification Astro: ×33, ×66, ×132, ×184, ×275 Field of view: 1°27′ 45′ 23′ 14′ 9′.9 Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asarolica*	51 30 33

Additional Accessories recommended for Nos. 42—47:

No.	
125	Binocular eyepiece
250	Huygens eyepiece, f = 60 mm. ($2\frac{3}{8}$ in.)
111	Triple revolver
122	Eyepiece prism
124	Zenith prism
130—133	Set of coloured glasses or
135	Revolving colour disc
141	Herschel solar prism or
138, 139	Colzi polarizing prism
144, 145	Solar projection screen
62, 63	Changing device
76	Spring-driven clock or
77	Weight-driven clock
166	Eyepiece spectroscope
167	Abbe spectroscopic eyepiece
152	Ring micrometer
153	Eyepiece screw micrometer
154	Filar position micrometer
169	Prominiscence spectroscope
106	Abbe dark ground illumination
176—178	60-mm. ($2\frac{3}{4}$-in.) Astro camera
173	Sun and moon camera
434	Observation ladder
422, 423	Observatory dome

For particulars of dimensions and weights see page 126 — **Price List at end of catalogue**

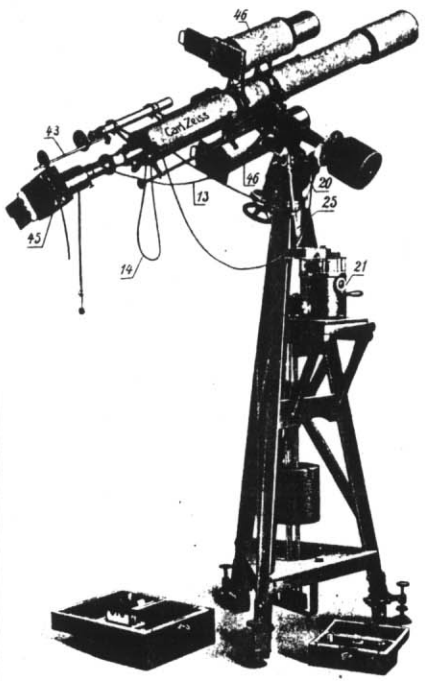


Fig. 27

80-mm. ($3\frac{1}{8}$-in.) **Equatorial Telescope**
Nos. 42—44 with two Astro cameras
Nos. 176 to 178 and a sun and moon camera No. 173

2 Pyramid tripod stand
4 Foot screws with foot plates and casters
5 Correction in azimuth
7 Tripod head with polar adjustments
9 Polar axis
10 Declination axis
11 Quick motion in R. A.
12 R. A. circle graduated in 10 minutes and reading to 1 minute by two verniers
13 Clamp in R. A. by means of draw cord
14 Slow motion in R. A. by means of draw cord and planet wheels
15 Clamp in declination by key actuated from eye end
16 Slow motion in declination by means of key actuated from eye end
17 Declination circle, graduated in degrees and reading to 5 minutes by two verniers
19 Clock circle
20 Helical drive for clock circle (19)
21 Clock No. 77 for motion in R. A.
22 Driving weight for clock (21)

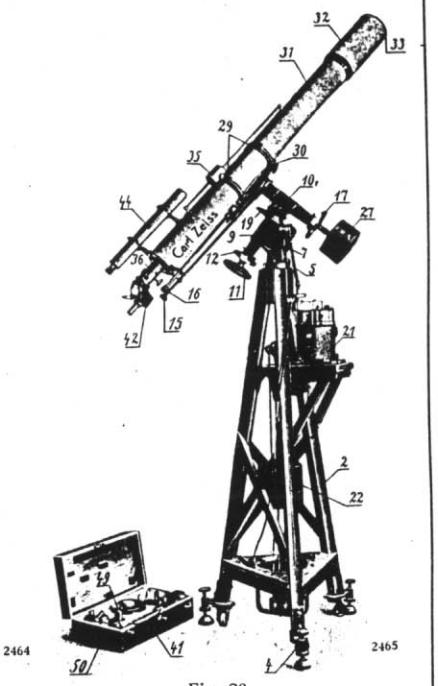


Fig. 28

110-mm. ($4\frac{1}{4}$-in.) **Equatorial Telescope**
Nos. 45—47 with polarizing solar prism No. 139

25 Transmission shaft from clock to (20)
27 Adjustable counterpoise of telescope with respect to the polar axis
29 Telescope cradle with clamping rings for fixing telescope
30 Clamping screws for fixing telescope with cradle to declination axis
31 Telescope
32 Dew cap
33 Lens cap
35 Counterpoise with respect to the declination axis
36 Eyepiece draw-tube with rack and pinion motion
41 Eyepieces
42 Colzi polarizing solar prism
43 Solar projection screen
44 Finder, ×8, No. 117
45 Sun and moon camera No. 173
46 60-mm. ($2\frac{3}{4}$-in.) Astro-camera Nos. 176—178
49 Objective sun shade
50 Box for accessories and eyepieces

110-mm and 130-mm. (4¼ and 5⅛-inch) Refractors

Figs. 29, 30, 33—35

Items included in the prices of Nos. 48—53:

The numbers in brackets refer to the parts shown in the accompanying illustrations

No.	
	1 Telescope objective of 110 mm. or 130 mm. (4⅛ or 5⅛ in.) aperture
126	1 Sun glass
127	1 Moon glass
130—133	1 Set of coloured glasses
	1 Tube mounting (31) with
	1 Objective sun shade
	1 Eyepiece draw-tube with rack and pinion motion
64	1 Changing device
65	4 Changing rings
247	1 Eyepiece sliding sleeve
111	1 Triple revolver
	1 Counterpoise in declination
118	1 Finder, ×10

No.	
124	1 Zenith Prism
141	1 Herschel sun prism
166	1 Eyepiece spectroscope
152	1 Ring micrometer
	1 Telescope standard with equatorial head
	1 Hour circle with vernier (12)
	1 Declination circle with vernier (17)
	1 Clamp and slow motion in R. A. (13, 14) by means of draw-cords and planet wheels
	1 Clamp and slow motion in declination (15, 16) by means of key actuated from eye end
	1 Polished wooden box for above eyepieces and accessories
	1 Fitted box for telescope objective

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	110-mm. (4⅜ inch) **Refractor** with No. 250a, 252, 253, 3 Huygens eyepieces, f = 50, 25, 12.5 mm. (2, 1, ½ in.); No. 265, 267, 2 orthoscopic eyepieces, f = 9.6 mm. (⅜ in.) No. 148, 1 cross-line diaphragm for eyepiece No. 265		
48	with E-objective No. 219, focal length 165 cm. (65 in.) Magnification Astro: ×33, ×66, ×132, ×184, ×275 Field of view: 1°27′ 44′ 23′ 14′ 9′.9 Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asaroticum*	51 30 61
49	with A-objective No. 229, focal length 204 cm. (80⅜ in.) Magnification Astro: ×41, ×82, ×164, ×226, ×340 Field of view: 1°9′ 35′ 17′ 11′ 7′.9 Exit pupil: 2.8 1.4 0.6 0.5 0.4 mm.	*Asarotorum*	51 30 62
50	with B-objective No. 235, focal length 165 cm. (65 in.) Magnification Astro: ×33, ×66, ×132, ×184, ×275 Field of view: 1°27′ 44′ 23′ 14′ 9′.9 Exit pupil: 3.4 1.7 0.9 0.6 0.4 mm.	*Asarotos*	51 30 63
	130-mm. (5⅛-in.) **Refractor** with No. 250a, 252, 254, 3 Huygens eyepieces, f = 50, 25, 12.5 mm. (2, 1, ½ in.); No. 265, 266, 268, 3 orthoscopic eyepieces, f = 9, 7, 5 mm. (⅓, 9/32, 3/16 in.); No. 148, 1 cross-line diaphragm for eyepiece No. 266		
51	with E-objective No. 220, focal length 195 cm. (77 in.) Magnification Astro: ×39, ×78, ×156, ×216, ×279, ×390 Field of view: 1°13′ 37′ 18′ 11′ 10′ 6′.5 Exit pupil: 3.3 1.7 0.8 0.6 0.5 0.3 mm.	*Asase*	51 31 31
52	with A-objective No. 230, focal length 233 cm. (92 in.) Magnification Astro: ×47, ×93, ×186, ×259, ×333, ×466 Field of view: 1°1′ 32′ 16′ 11′ 8′ 5′.6 Exit pupil: 2.8 1.4 0.7 0.5 0.4 0.3 mm.	*Asativas*	51 31 32
53	with B-objective No. 236, focal length 195 cm. (77 in.) Magnification Astro: ×39, ×78, ×150, ×216, ×279, ×390 Field of view: 1°13′ 37′ 18′ 11′ 10′ 6′.5 Exit pupil: 3.3 1.7 0.8 0.6 0.5 0.3 mm.	*Asayaba*	51 31 33

Additional Accessories recommended for Nos. 48—53:

No.	
125	Binocular eyepiece
250	Huygens eyepiece, f = 60 mm. (2⅜-in.)
135	Coloured glass revolver
138, 139	Colzi polarizing solar prism
145	Solar projection screen
77	Clock
80	Electric seconds control
79	Electric slow motion in R. A.
73	Hour circle for direct setting by stellar time
72	Hour angle circle
105	Illuminating device for declination circle
167	Abbe spectroscopic eyepiece

No.	
169, 170	Prominiscence spectroscope
153	Eyepiece screw micrometer
154	Filar position micrometer
106	Abbe dark ground illumination
176—178	60-mm. (2⅜-in.) Astro-camera
179—181	120 mm. (4¾-in.) Astro-camera
186a, 186b	Star guiding eyepiece head
173	Sun and moon camera
174	Sun camera
434, 435	Observation ladder
422, 423	Observatory dome

For particulars of dimensions and weights see page 126 — **Price List at end of catalogue**

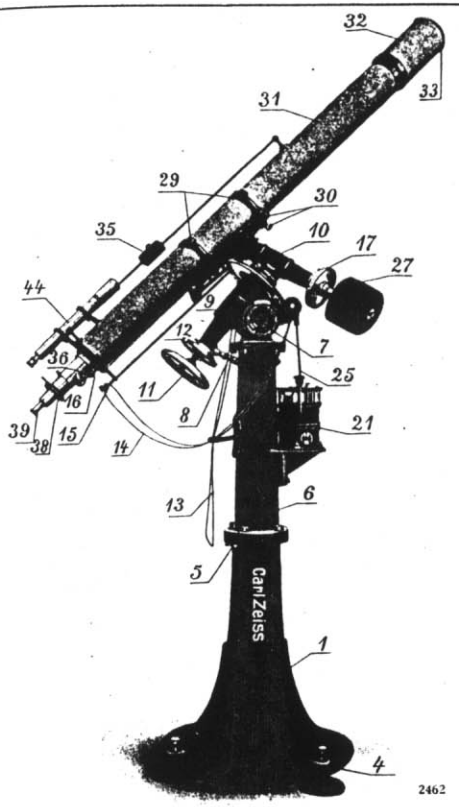


Fig. 29

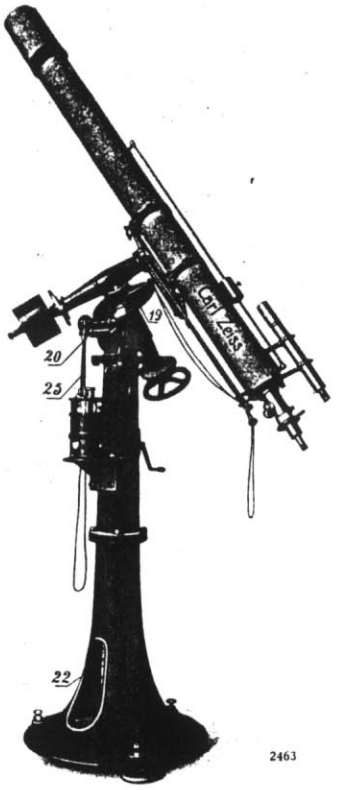


Fig. 30

110-mm. and 130-mm. (4¼ and 5⅛-in.) Refractors Nos. 48—53

1 Pedestal column
4 Foot screws with foot plates
5 Azimuth correction
6 Upper part of standard
7 Equatorial head with polar adjustments
8 Setting screw for polar adjustments
9 Hour axis
10 Declination axis
11 Quick motion in R. A.
12 Hour circle, graduated in 5 minutes and reading to 20 seconds by two verniers
13 Clamping device in R. A. actuated by cord
14 Slow motion in R. A. by means of draw-cord and planet wheels
15 Clamp in declination actuated by key from eye end
16 Slow motion in declination by means of key from eye end
17 Declination circle, graduated in degrees and reading to 5 minutes by two verniers
19 Clock circle
20 Helical drive for clock circle (19)
21 Clock for hour drive No. 77
22 Driving weight for clock (21)
25 Transmission shaft from clock to (20)
27 Adjustable counterpoise of telescopes with respect to hour axis
29 Telescope cradle with clamping rings for fixing telescope
30 Clamping screws for fixing telescope with cradle (29) to declination axis
31 Telescope
32 Dew cap
33 Lens cap
35 Counterpoise for declination axis
36 Eyepiece draw-tube with rack and pinion motion
38 Changing device No. 64
39 Eyepiece sliding sleeve
44 Finder × 10, No. 118

150-mm. and 200-mm. (6 and 8-inch) Refractors

Figs. 31, 32, 36, 37

Items included in the prices of Nos. 54—59:

The numbers in brackets refer to the parts shown in the accompanying illustrations

No.
- 1 Telescope objective of 150 mm. or 200 mm. (6 in. or 7¼ in.) aperture
- 250, 251—254 5 Huygens eyepieces, f = 60, 40, 25, 18, 12.5 mm. (2⅜, 1⅝, 1¼, ⅞ in.)
- 265, 266, 268 3 Orthoscopic eyepieces, f = 9, 7, 5 mm. (⅜, 2/9, 3/16 in.)
- 152 1 Ring micrometer
- 148 1 Cross line diaphragm fitted to eyepiece No. 266
- 126 1 Sun glass
- 127 1 Moon glass
- 130—133 1 Set of coloured glasses
- 124 1 Zenith prism
- 141 1 Herschel sun prism
- 166 1 Eyepiece spectroscope
- 1 Tube mounting (31) with

No.
- 1 Eyepiece draw-tube with rack and pinion motion
- 247 1 Ocular spring sleeve
- 1 Objective sun shade
- 1 Counterpoise in declination
- 112 1 Triple revolver
- 120 1 Finder, ×25
- 1 Standard with equatorial head
- 1 Hour circle with vernier (17)
- 1 Declination circle with vernier (17)
- 105 1 Illuminating device for declination circle
- 1 Clamp and slow motions in R. A. (13, 14) and in declination (15, 16) actuated from eye end by means of key
- 1 Polished wooden box for above eyepieces and accessories
- 1 Fitted box for telescope objective

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	150-mm. (6-in.) **Refractor,** Figs. 31, 32 and 105, with clock No. 77, changing device No. 64 and 4 changing rings No. 65		
54	with E-objective No. 221. focal length 225 cm. (88⅝ in.) Magnification Astro: ×38, ×56, ×90, ×125, ×180, ×250, ×321, ×450 Field of view: 1°20′ 53′ 33′ 24′ 16′ 11′ 7′.3 6′.0 Exit pupil: 4.0 2.8 1.6 1.3 0.8 0.6 0.5 0.4 mm.	*Asayabamos*	51 32 31
55	with A-objective No. 231, focal length 267 cm. (105⅛ in.) Magnification Astro: ×44, ×67, ×106, ×148, ×213, ×296, ×381, ×534 Field of view: 1°5′ 46′ 28′ 19′ 14′ 9′.3 6′.8 4′.9 Exit pupil: 3.5 2.3 0.5 1.0 0.7 0.6 0.4 0.3 mm.	*Asayado*	51 32 32
56	with B-objective 237, focal length 225 cm. (88⅝ in.) Magnification Astro: ×38, ×56, ×90, ×125, ×180, ×250, ×321, ×450 Field of view: 1°20′ 53′ 33′ 24′ 16′ 11′ 7′.3 6′.0 Exit pupil: 4.0 2.8 1.6 1.3 0.8 0.6 0.5 0.4 mm.	*Asayar*	51 32 33
	200-mm. (8-in.) **Refractor,** Figs. 36 and 37 with clock No. 78, changing device No. 66 and 4 changing rings No. 67		
57	with E-objective No. 222, focal length 300 cm. (118⅛ in.) Magnification Astro: ×50, ×75, ×120, ×167, ×240, ×334, ×429, ×600 Field of view: 57′ 38′ 25′ 18′ 12′ 8′ 5′.9 4′.2 Exit pupil: 4.0 2.7 1.7 1.2 0.9 0.7 0.5 0.3 mm.	*Asayaras*	51 33 31
58	with A-objective No. 232, focal length 360 cm. (142⅜ in.) Magnification Astro: ×60, ×90, ×144, ×200, ×288, ×400, ×514, ×720 Field of view: 50′ 33′ 20′ 14′ 11′ 6′.2 5′.0 3′.2 Exit pupil: 3.5 2.3 1.4 1.0 0.8 0.5 0.4 0.3 mm.	*Asayaron*	51 33 32
59	with B-objective No. 238, focal length 300 cm. (118⅛ in.) Magnification Astro: ×50, ×75, ×120, ×167, ×240, ×334, ×429, ×600 Field of view: 57′ 38′ 25′ 18′ 12′ 8′.1 5′.9 4′.2 Exit pupil: 4.0 2.7 1.7 1.2 0.9 0.7 0.5 0.3 mm.	*Asaz*	51 33 33

Additional Accessories recommended for Nos. 54—59 are:

No.
- 249 Huygens eyepiece, f = 80 mm. (3⅛ in.)
- 125 Binocular eyepiece
- 135 Coloured glass revolver
- 138, 139 Colzi polarizing solar prism
- 146 Solar projection screen
- 80, 81 Electric seconds control
- 79 Electric slow motion in R. A.
- 74, 75 Hour circle for direct setting by stellar time Eyepiece draw-tube with three-spindle action (9), Fig. 112, page 86

No.
- 72 Hour angle circle
- 167 Abbe spectroscopic eyepiece
- 169, 170 Prominiscence spectroscope
- 154 Filar position micrometer
- 106 Abbe dark ground illumination
- 179—184 120-mm. or 160-mm. (4¾ or 6¼-in.) Astro-camera
- 186a, 186b Star guiding eyepiece head
- 174, 175 Sun camera
- 434—439 Observation ladders
- 424—430 Observatory dome

For particulars of dimensions and weights see page 126 — **Price List at end of catalogue**

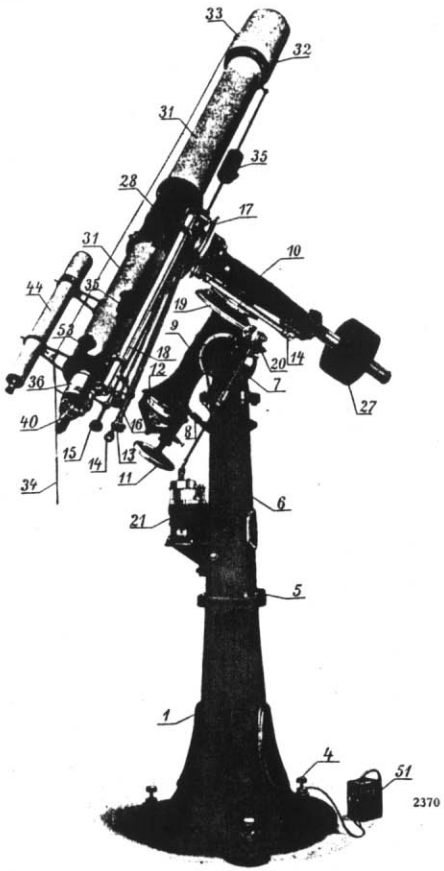


Fig. 31

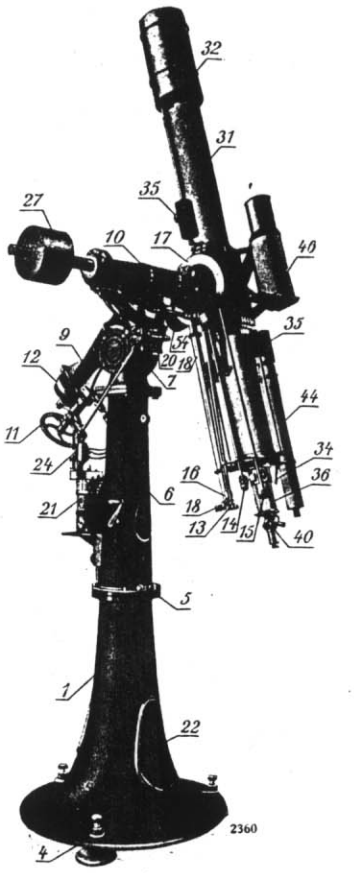


Fig. 32

150-mm. (6-inch) Refractor, Nos. 54—56

- 1 Standard
- 4 Foot screws with footplates
- 5 Azimuth correction
- 6 Upper part of standard
- 7 Standard head with polar adjustment
- 8 Adjustment screw for polar correction
- 9 Hour axis
- 10 Declination axis
- 11 Quick motion in R. A. by hand wheel with toothed gearing
- 12 Hour circle graduated in 2 minutes and reading to 5 seconds by two verniers
- 13, 14 Clamp and slow motion in R. A. actuated by a key from eye end
- 15, 16 Clamp and slow motion in declination actuated by a key from eye end
- 17 Declination circle graduated in 20′ and reading to 1′ by two verniers
- 18 Reading telescope for declination circle (17)
- 19 Clock circle
- 20 Helical drive for clock circle (19)
- 21 Clock No. 77, for hour motion
- 22 Driving weight for clockwork (21)
- 24 Electric slow motion in R. A.
- 27 Adjustable counterpoise of telescope to polar axis
- 28 Middle part of telescope body with flanges for screwing on astro-camera (46)
- 31 Telescope
- 32 Dew cap
- 33 Lens cap
- 34 Cord for opening lens cap (33)
- 35 Counterpoises to declination axis
- 36 Eyepiece draw-tube with rack and pinion motion
- 38 Changing device No. 64
- 40 Triple revolver No. 112
- 44 Finder, ×25, No. 120
- 46 60-mm. (2⅜-in.) Astro-camera Nos 176—178
- 51 4-volt accumulator for lighting declination circle and field of view
- 53 Plug contact for illumination of field of view
- 54 Counterpoise to Astro-camera (46)

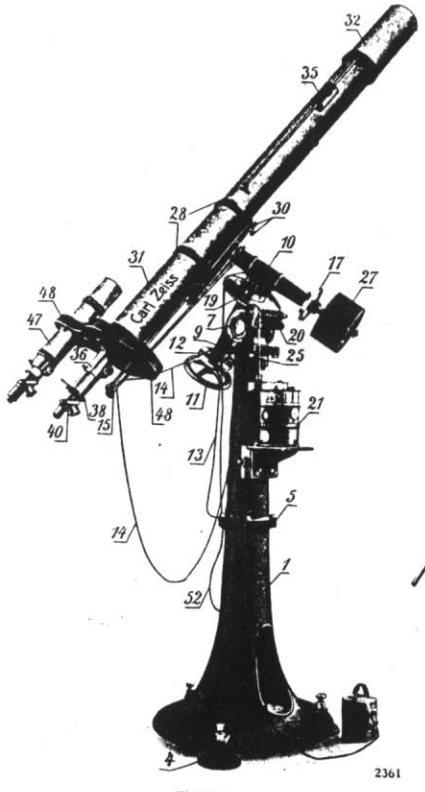


Fig. 33

130-mm. (5¼-in.) A-Refractor No. 52 with 80-mm. (3⅛-in.) Comet Finder No. 31

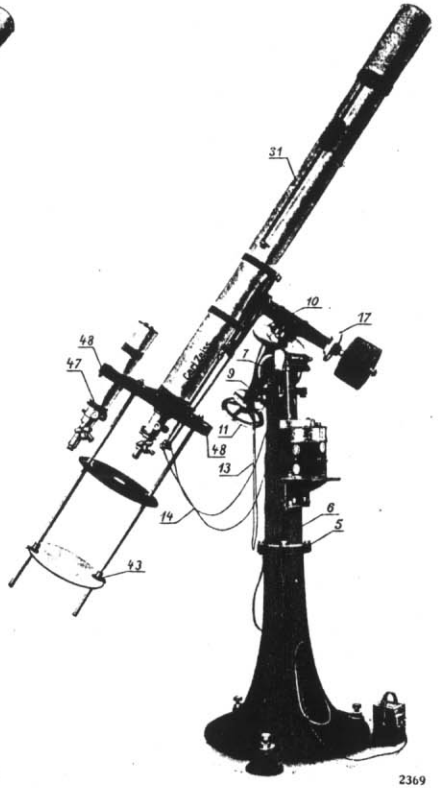


Fig. 34

130-mm. (5¼-in.) A-Refractor with 80-mm. (3⅛-in.) Comet Finder No. 31 and Solar Projection Screen No. 145

The comet finder is mounted on a braket piece capable of rotation about the telescope at such a distance from the telescope that observations can be made simultaneously with both telescopes by two persons

Key to Fig. 33, Fig. 34 and Fig. 35

1 Standard
4 Footscrews with footplates
5 Azimuth correction
6 Upper part of standard
7 Standard head with polar adjustment
9 Hour axis
10 Declination axis
11 Quick motion in R. A. by hand wheel
12 Hour circle graduated in 5 minutes and reading to 10 seconds by two verniers
13,14 Clamp and slow motion in R. A. by draw-cord
15,16 Clamp and slow motion in declination by a key actuated from eye end
17 Declination circle graduated in 1° and reading 5′ by two verniers
19 Clock circle
20 Helical drive for clock circle (19)
21 Clock No. 77 for R. A. drive
25 Transmission shaft from clock to (20)
27 Adjustable counterpoise of telescope for hour axis
28 Telescope cradle with clamping rings
30 Clamping srews for fixing (29) with telescope to declination axis
31 Telescope
32 Dew cap
35 Counterpoise to declination axis
36 Eyepiece draw-tube with rack and pinion motion
38 Changing device No. 64
40 Triple revolver
43 Solar projection screen No. 145
47 80-mm. (3⅛-in.) comet finder with triple revolver
48 Revolving holder with counterpoise for (47) with respect to telescope and for fixing solar projection screen (43)
51 4-volt accumulator for illuminating arrangement
52 Flexible conductor to illumination of the field of view

Key to Fig. 35

22 Driving weight for clock (21)
24 Electric slow motion in R. A. with contact key
33 Hinged lens cap in dew mount
34 Draw-cord for opening lens cap from eye end
44 Finder, ×15, No. 119
46 80-mm. (3⅛-in.) astrographic double camera 30×30 cm. (11¾×11¾ in.) with two 80-mm. (3⅛-in.) apochromatic Tessar lenses f = 840 mm. (329¾ in.) and with objective prism
50 Polished wooden box for eyepieces and accessories
52 Flexible conductors for illumination attachments to circles and field of view
53 Switch for illumination of circles
55 12×9-cm. (4¾×3½-in.) camera
56 Guiding eyepiece for (55)
57 Enlarging camera 12×9 cm. (4¾×3½ in.)

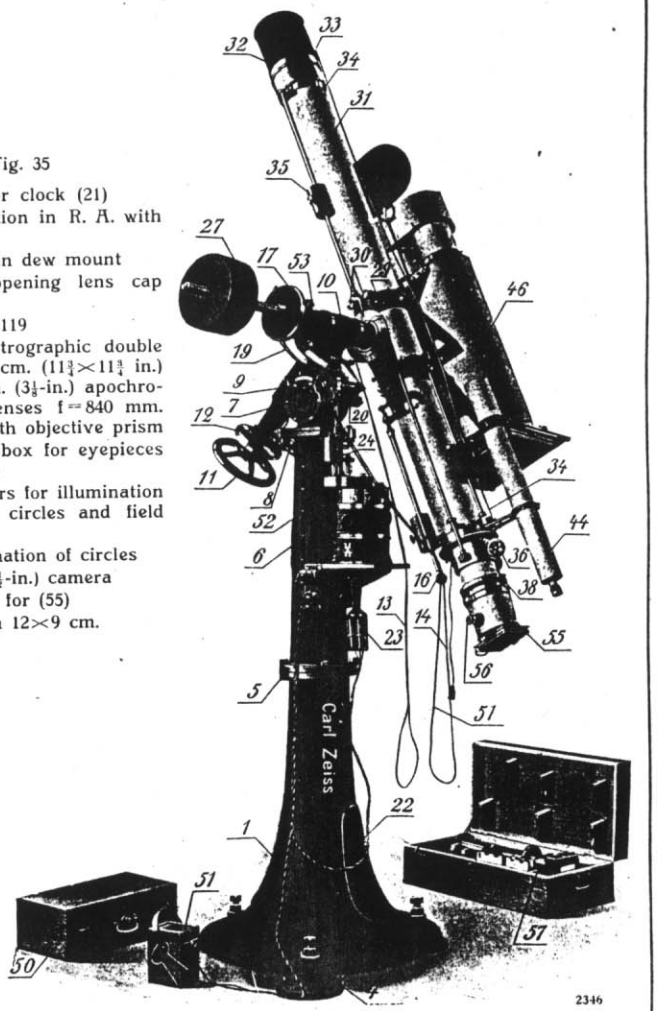


Fig. 35

130-mm. (5¼-inch) A-Refractor No. 52

with 80-mm. (3⅛-in.) astrographic double camera and 12×9-cm. (4¾×3½-in.) camera with guiding eyepiece on telescope draw-tube

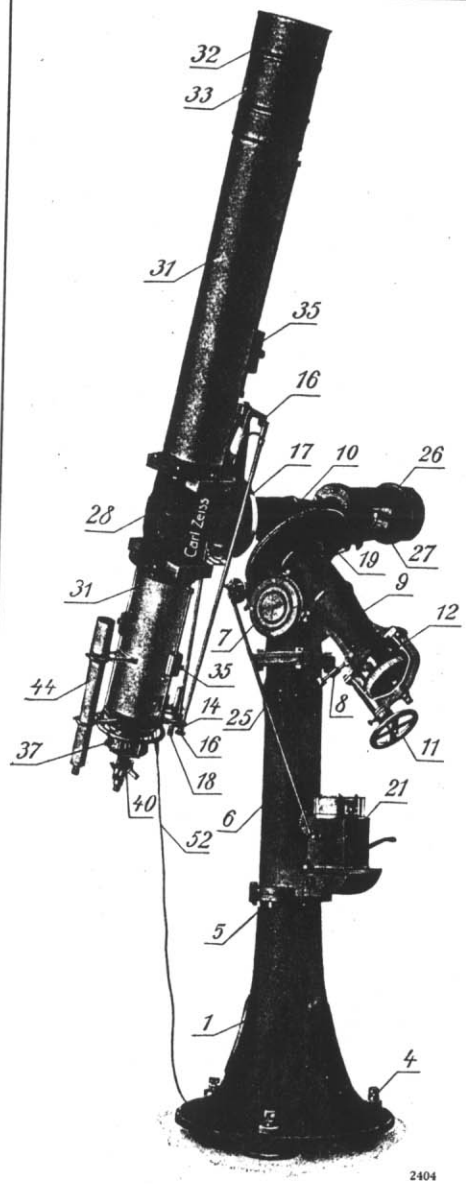


Fig. 36

Key to Fig. 36 and Fig. 37

1 Foot of standard

4 Foot screws with foot plates

5 Azimuth correction for setting hour axis in meridian

6 Upper part of standard

7 Equatorial head and polar adjustment with scale and index

8 Setting screw for polar adjustment

9 Hour axis

10 Declination axis

11 Quick motion in R. A. by handwheel with toothed gearing

12 Hour circle graduated in minutes of time and reading by two verniers to 2 seconds of time

13 Clamp in R. A. actuated by key from eye end

14 Slow motion in R. A. actuated by key from eye end

15 Clamp in declination actuated by key from eye end

16 Slow motion in declination actuated by key from eye end

17 Declination circle graduated in 15 minutes of arc and reading by two verniers to 30 seconds of arc

18 Reading telescope for declination circle

19 Clock circle for hour drive

20 Helical drive of clock circle (19)

21 Clock No. 78 for hour drive

22 Driving weight for clock (21)

Fig. 36

200-mm. (8-inch) Refractor Nos. 57—59

For particulars of dimensions and weights see page 126

Key to Figs. 36 and Fig. 37

25 Transmission shaft from clock to helical drive to clock circle (19)

26 Fixed counterpoise to telescope with respect to hour axis

28 Middle part of telescope body with seatings for attaching 120-mm or 160-mm ($4\frac{3}{4}$ or $6\frac{1}{4}$-in.) Astro-cameras Nos. 179—184

31 Front and back parts of telescope

32 Dew cap

33 Lens cap hinged inside dew cap mount

34 Draw-cord for opening lens cap (33)

35 Counterpoise to declination axis

37 Eyepiece draw-tube with three-spindle motion (Fig. 112, page 86)

38 Changing device No. 66

40 Triple revolver No. 112

44 Finder telescope No. 120

46 160-mm. ($6\frac{1}{4}$-in.) Astro-camera No. 181—184

54 Counterpoise for Astro-camera (46) with respect to declination axis

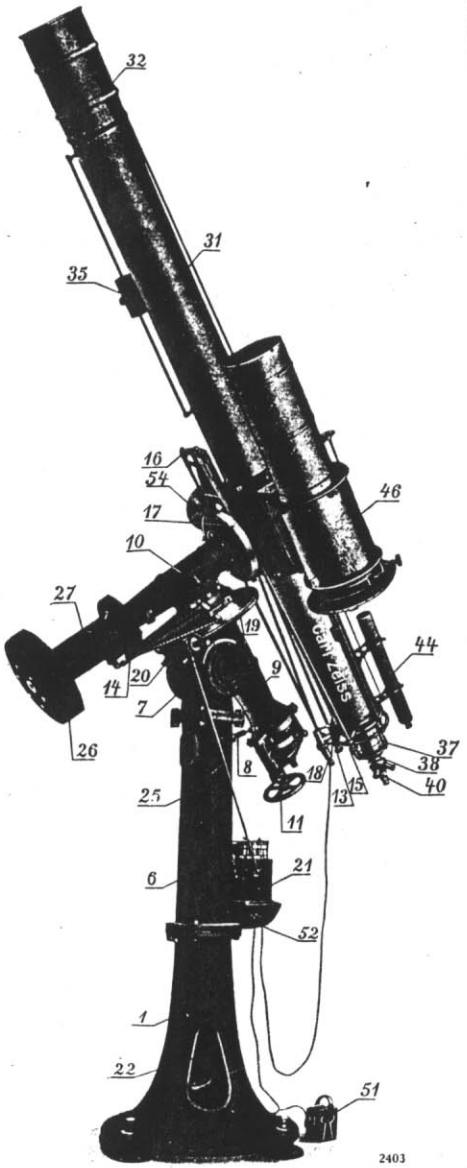
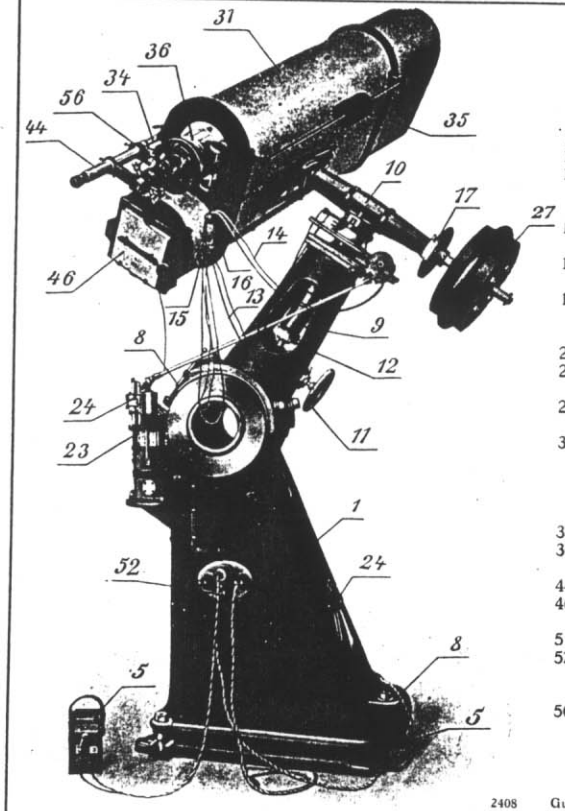


Fig. 37

200-mm. (8-inch) Refractor Nos. 57—59 with 160-mm. ($6\frac{1}{4}$-in.) Astro-camera No. 183

Fig. 37



1 Base
5 Azimuth correction
8 Setting screw for polar adjustment
9 Hour axis
10 Declination axis
11 Coarse setting in R. A.
12 Hour circle graduated in 5 minutes and reading by two verniers to 20 seconds
13, 14 Clamp and slow motion in R. A. actuated by draw-cord
15, 16 Clamp and slow motion in declination actuated by key
17 Declination circle graduated in degrees and reading by two verniers to 5 minutes
23 Electric seconds control
24 Electric slow motion in R. A. with key switch
27 Adjustable counterpoise to telescope with respect to hour axis
31 Telescope body common to guiding telescope of 110 mm. (4¼ in.) aperture and astro-camera of 160 mm. (6¼ in.) aperture
35 Counterpoise to declination axis
36 Eyepiece draw-tube with rack and pinion motion
44 ×10 Finder
46 Astro-camera for 16×16-cm. (6¼×6¼-in.) plates
51 4-volt accumulator
52 Electric conductors for slow motion in R. A., illumination and seconds control
56 Guiding eyepiece head No. 186b

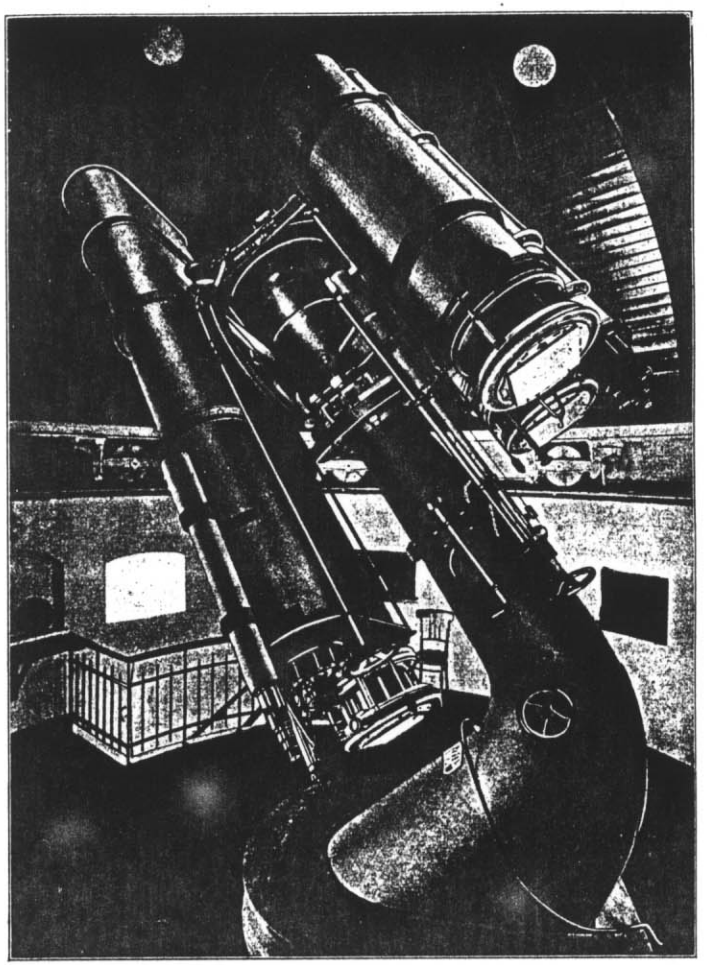
Fig. 38

160-mm. (6¼-in.) Astrograph

2408 Guiding telescope: 110-mm. (4¼ in.) aperture, 130 cm. (50⅛ in.) focal length. Astro-camera: 160-mm. (6¼-in.) Astro-Petzval 1:5, No. 323

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
60	**160-mm. (6¼-in.) Astrograph,** Fig. 38 1 C-Objective, 110-mm. (4¼ in.) aperture, 130 cm. (51⅛ in.) focal length, No. 241 1 Astro-Petzval, 160 mm. (6¼ in.) aperture, 80 cm. (31½ in.) focal length, No. 323 2 Huygens eyepieces, f = 60, 40 mm. (2⅜, 1⅝ in.) Nos. 250, 251 4 Orthoscopic eyepieces, f = 25, 12.5, 7.5 mm. (1, ½, ⅛ in.), Nos. 260, 264, 266, 268 1 Eyepiece prism No. 122 1 Changing device No. 64 4 Changing rings No. 65 1 ×10 Finder No. 118 1 Guiding eyepiece head No. 186b 1 Astro-camera with 3 metal slides 16×16 cm. (6¼×6¼ in.) 1 Clock No. 77 1 Electric seconds control No. 80 1 Electric slow motion in R. A. No. 79 1 Polished wooden box for the eyepieces and accessories included in the price of the instrument Equatorial head with slow motion and R. A. and declination circles Magnification Astro: ×22, ×33, ×52, ×104, ×186, ×260 Field of view: 2°13′ 1°28′ 48′ 24′ 13′ 10′ Exit pupil: 5.0 3.3 2.1 1.1 0.6 0.4 mm.	*Asbergo*	51 36 16

For particulars of dimensions and weights see page 126 — **Price List at end of catalogue**



2366

Fig. 39

340-mm. (13½-inch) Lippert Astrograph of the Hamburg Observatory

at Bergedorf. Constructed by Carl Zeiss, Jena, 1911

Left: Astrophotographic telescope with U. V. triplet of 340 mm. (13½ in.) aperture and 3.4 m. (11¼ ft.) focal length, guide telescope with E-objective of 230 mm. (9 in.) aperture and 3.4 m. (11¼ ft.) focal length.

Right: Two Astro-cameras with triplet and Astro-Petzval of 300 mm. (12 in.) aperture and 1.5 m. (5 ft.) focal length, and guide telescope with E-objective of 200 mm. (8 in.) aperture and 2.7 m. (9 ft.) focal length.

Size of plate for all cameras 30×30 cm. (11¾×11¾ in.)

Price: On application. Codeword: *Asbestas.* Ident. No.: 51 36 34

Equatorial Telescope Mountings

with stress relieving system to telescope and equatorial axes

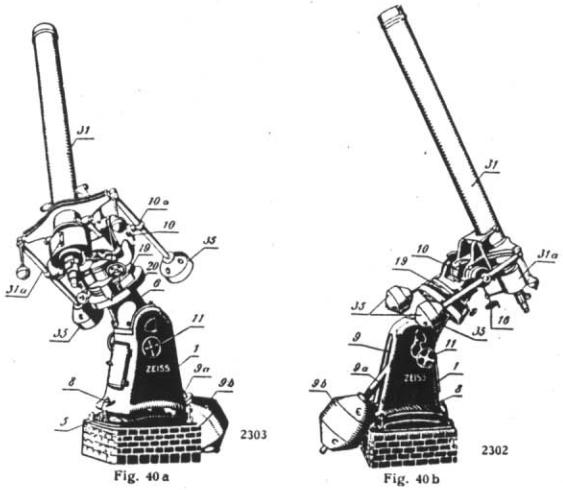


Fig. 40a Fig. 40b

300-mm. (12-inch) Refractor with stress relieving system to telescope and equatorial axes

1 Base
5 Azimuth correction
6 Upper part of body
8 Polar correction
9 Hollow hour axis for reception of
9a Hour relieving axis with
9b Counterpoise to movable parts with respect to centre of base (1)
10 Hollow declination axis for reception of
10a Declination relieving axis
11 Coarse adjustment in R. A.
16 Adjustment in declination
19 Clock circle
20 Drive by two diametrically engaging worm gears (19)
31 Telescope with outer tube and an inner relief tube for counteracting flexure
31a Counterpoise of telescope against flexure
35 2 Counterpoises of telescope for declination axis

The movable parts of the equatorial mounting are divided up into two distinct equatorial components, viz. —

1) an equatorial directing system comprising the optical parts and enabling the telescope to be directed upon astronomical objects in terms of the coordinates (hour angle and declination);
2) an equatorial system of carriers for taking up any stresses in the directing system.

The equatorial telescope mountings with stress relieving system fulfil the following requirements:

1) They obviate flexure in the telescope and in the polar and declination axes, and ensure easy movement of the axes by reason of all stresses being completely relieved in the carrying system.
2) Several telescopes may be assembled side by side on one mounting and any mutual tendency to deformation compensated by the stress relieving system.
3) The tubes are freely movable through all ranges of the hour and declination angles without encountering obstruction by any part of the mounting or stand.
4. The tubes are so mounted as to confine the movements of the eye end within a very small range, the eye being applied at a point near the intersection of the polar and declination axis.
5) The design affords easy access from the observer's position at the eye end to all attachments, such as astro-photographic cameras, Fig. 43.

Prices of refractors with objective apertures exceeding 200 mm. ($7\frac{7}{8}$ in.) will be furnished on application

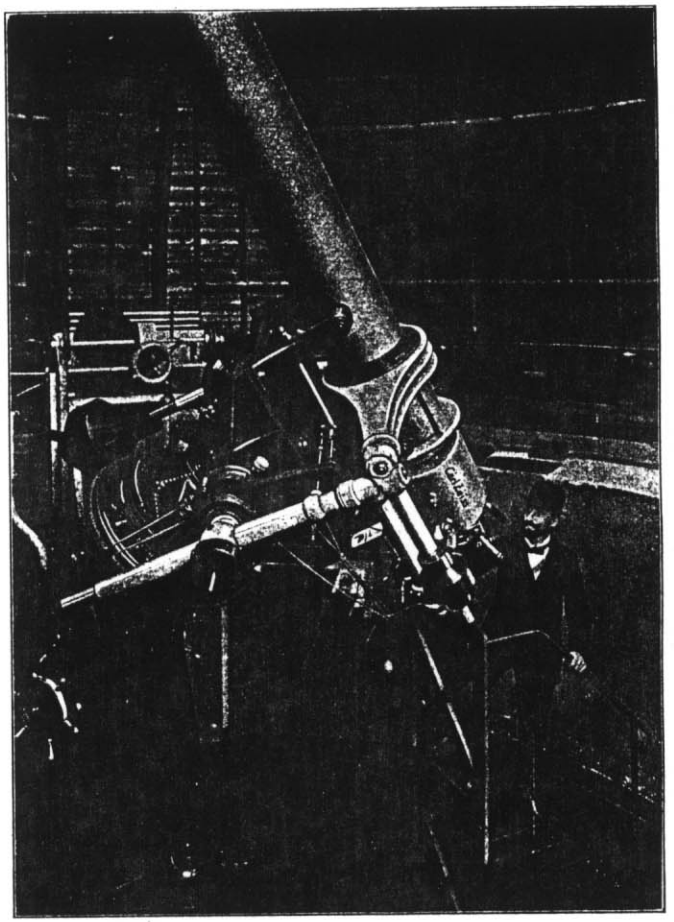


Fig. 41

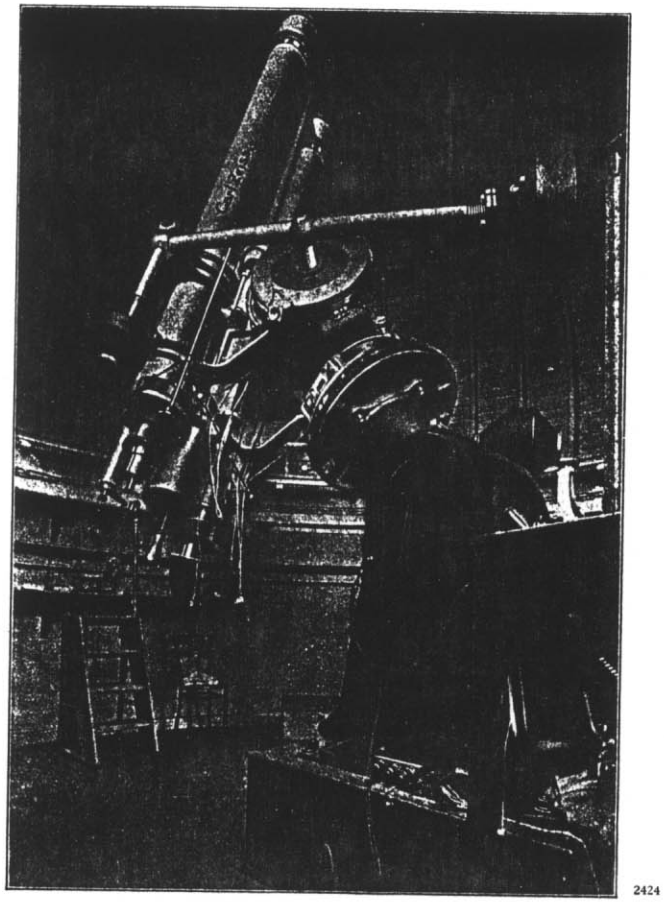
300-mm. (12-inch) Refractor of the "Urania", Zürich.

Constructed by Carl Zeiss, Jena, 1906

Optical parts: E - Objective of 300 mm. (12 in.) aperture and 5 m. ($16\frac{1}{2}$ ft.) focal length

Mechanical parts: Equatorial telescope mounting with stress relieving system to telescope and equatorial axes

Price: On application. Codeword: *Asbestine.* Ident. No.: 51 37 30



2424

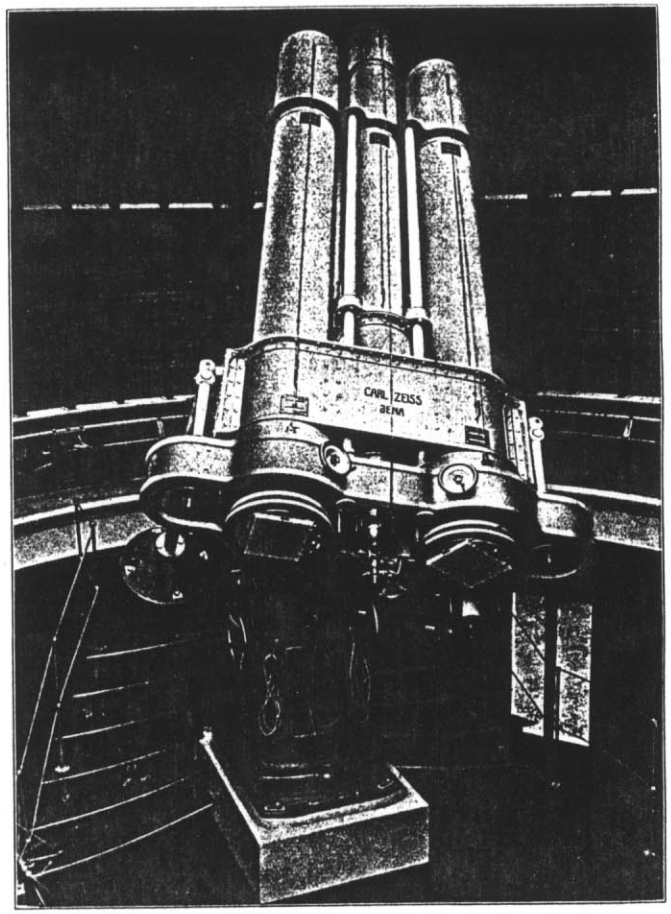
Fig. 42

Double Photographic Refractor of the Observatory of Dr. Rudolf König at Wien
Constructed by Carl Zeiss, Jena, 1908

Optical equipment: Guide telescope (left) with E-Objective of 180 mm. (7¼ in.) aperture and 3.4 m. (11 ft.) focal length. Photographic telescope (right) with two-lens U. V. objective of 210 mm. (8¼ in.) aperture and 3.4 m. (11 ft.) focal length.

Mechanical equipment: Equatorial telescope mounting with stress relieving system to telescopes and equatorial axes. Planet camera No. 187 on photographic telescope (right)

Price: On application. Codeword: *Asbestinum.* Ident. No.: 51 37 21



2245

Fig. 43

Triple Photographic Refractor

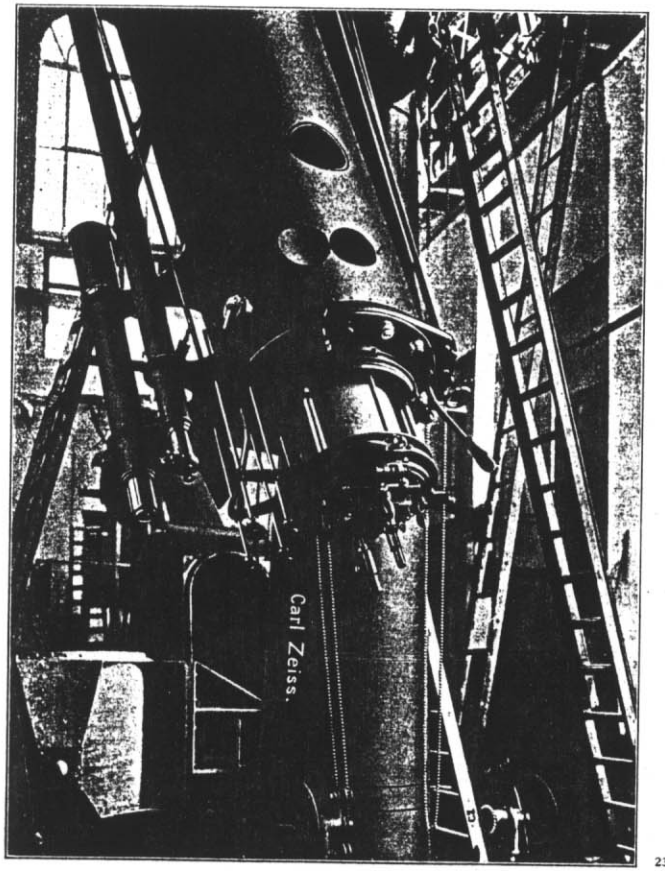
of the Observatory at Neuenburg (Switzerland)
Constructed by Carl Zeiss, Jena, 1910

Optical equipment: Guide telescope (central tube) with E-Objective of 300 mm. (12 in.) aperture and 5 m. (16½ ft.) focal length. Photographic telescopes (left and right) with U. V. triplets of 360 mm. (14¼ in.) aperture and 4.5 m. (14¾ ft.) focal length, Fig. 156, page 109.

Mechanical equipment: Equatorial telescope mounting with stress relieving system to telescopes and equatorial axes. Camera adjustment by three-spindle motion and metal dark-slides for 30×24-cm. (19¼×11¾-in.) plates.

Price: On application. Codeword: *Asbite.* Ident. No.: 51 37 36

Prices of refractors with objective apertures exceeding 200 mm. (7¼ in.) will be furnished on application



2350

Fig. 44

650-mm. (25½-inch) Refractor (Eye end)

of the Observatory at Babelsberg near Berlin.
Constructed by Carl Zeiss, Jena, 1914

The eyepiece draw-tube is fitted with three-spindle motion and has a range of 55 cm. (21⅝ in.) and a clear diameter of 33 cm. (13 in.). The eyepiece draw-tube has attached to it a double dark-slide with guiding and focussing microscope. Size of plate 12 × 9 cm. (4¾ × 3½ in.).

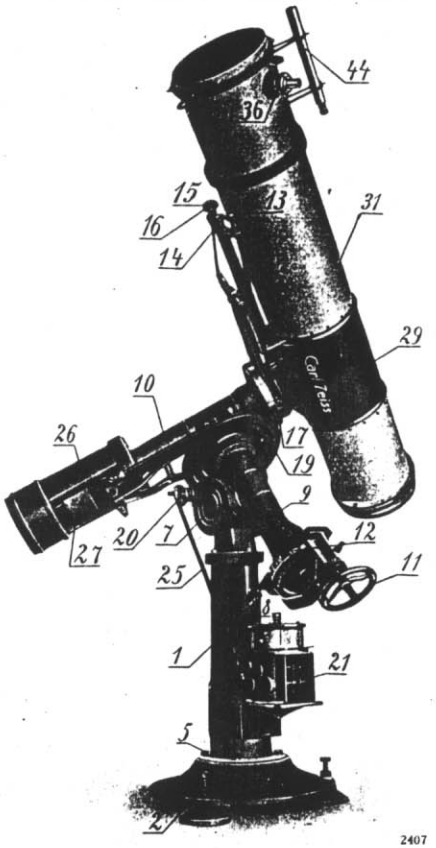
Prices of refractors with objective apertures exceeding 200 mm. (7⅞ in.) will be stated on application

Reflecting Telescopes

Fig. 45

1 Base
2 Foot screws and foot plates
5 Azimuth correction
7 Standard head with polar adjustment (0°—70°)
8 Setting screw for polar adjustment
9 Polar axis
10 Declination axis
11 Coarse adjustment in R. A. by toothed wheel gearing
12 Hour circle graduated in minutes and reading by two verniers to 2 seconds
13, 14 Clamp and slow motion in R. A. actuated by means of key from eye end
15, 16 Clamp and slow motion in declination actuated by means of key from eye end
17 Declination circle graduated in 15 minutes reading by two verniers to 30 seconds
19 Clock circle
20 Helical drive for (19)
21 Clock No. 78
25 Transmission shaft from clock (21) to (20)
26 Stationary counterpoise to telescope with respect to hour axis
27 Adjustable counterpoise to telescope with respect to hour axis
29 Tube clip with ball bearings for rotating the reflector tube about its axis with the aid of handles at upper end of tube
31 Newtonian reflector tube with silvered glass reflector of 300 mm. (12 in.) aperture and 2.4 m. (8 ft.) focal length
36 Eyepiece draw-tube with spiral groove
44 Finder × 10

Prices and particulars of reflecting telescopes of other dimensions will be furnished on application



2407

Fig. 45

300-mm. (12-in.) Newtonian Reflecting Telescope, No. 61

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
61	**300-mm. (12-in.) Newtonian Reflecting Telescope, Fig. 45** with: 1 Silvered parabolic glass reflector of 300 mm. (12 in.) aperture and 2.4 m. (8 ft.) focal length, No. 341 1 Elliptical reflector 4 Huygens eyepieces, f = 60, 40, 25, 12.5 mm. (2⅜, 1⅝, 1, ½ in.), Nos. 250, 251, 252, 254 2 Orthoscopic eyepieces, f = 7, 5 mm. (3/32, 3/16 in.), Nos. 266, 268 1 Cross line diaphragm No. 148 fitted to eyepiece No. 266 1 Finder telescope, × 10, No. 118 1 Polished wooden box for the eyepieces included in the price of the instrument 1 Clock No. 78 Telescope-mounting, R. A. and declination circles and slow motions as in Fig. 45 Magnification Astro: × 40, × 60, × 96, × 192, × 340, × 480 Field of view: 1°10′ 49′ 31′ 15′ 7′.9 5′.4 Exit pupil: 7.5 5.0 3.1 1.6 0.9 0.6 mm.	*Asbolane*	51 38 30

For particulars of dimensions and weights see page 126 — **Price List at end of catalogue**

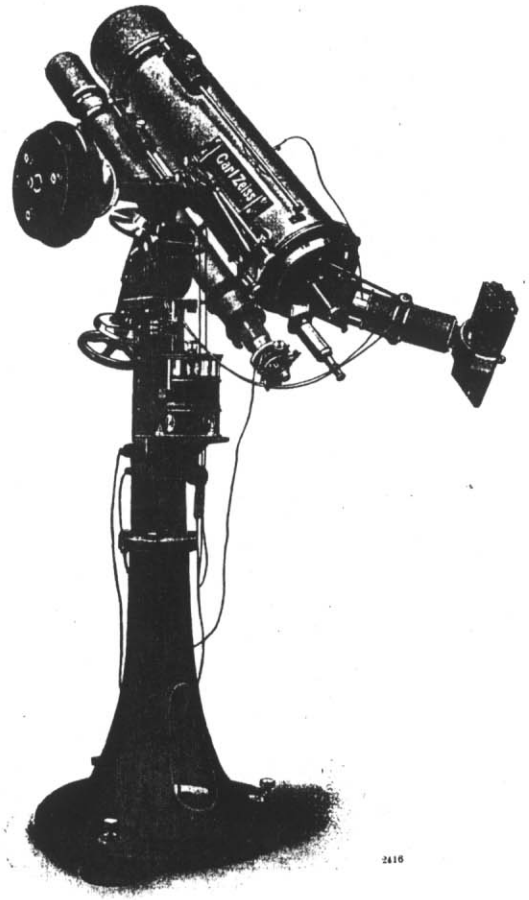


Fig. 46

Astrograph with Cassegrain Reflecting System

Optical equipment: Guide telescope with E-Objective of 100 mm. (4 in.) aperture and 1.5 m. (5 ft.) focal length, reflector tube with silvered Cassegrain glass reflector of 260 mm. (10¼ in.) aperture and 1.8 m. (6 ft.) focal length, spectrograph with 60° U. V. prism and three-lens U. V. Schwarzschild camera objective of 64 mm. (2½ in.) aperture and 300 mm. (12 in.) focal length No. 335.

Mechanical equipment: Equatorial mounting with clock, electric slow motion in R. A., guiding eyepiece head with compound slides No. 186a.

Price: On application. Codeword: *Asboli.* Ident. No.: 51 38 26

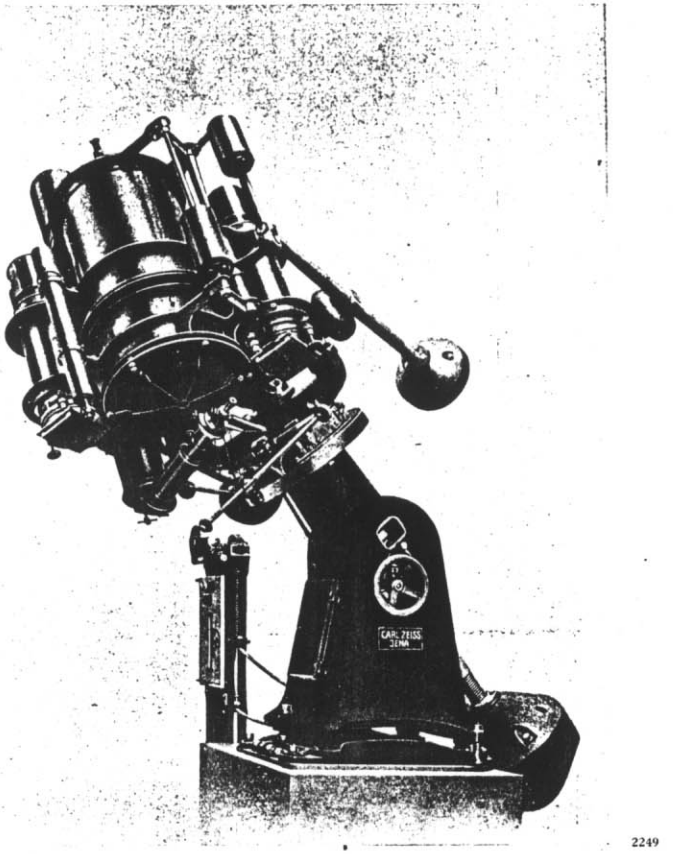


Fig. 47

400-mm. (15¾-inch) Reflecting Telescope of the Observatory at Innsbruck

Constructed by Carl Zeiss, Jena, 1905

Optical equipment: Parabolic silvered glass reflector of 100 mm. (4 in.) aperture and 1 m. (39¼ in.) focal length. Two 80-mm. (3⅛-in.) U.V. Astro-cameras, focal length 0.8 m. (31½ in.). Guide telescope with 180 mm. (7⅛ in.) aperture. Finder telescope with 75 mm. (3 in.) aperture.

Mechanical equipment: Equatorial telescope mounting with stress relieving system to telescopes and equatorial axes.

Price: On application. Codeword: *Asbolos.* Ident. Nr.: 51 39 40

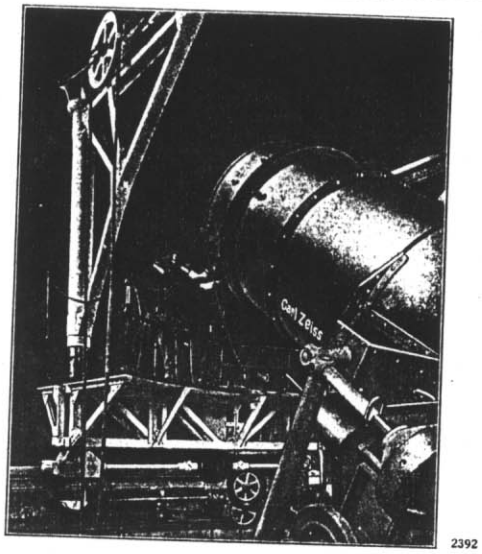


Fig. 48
Reflector of the Hamburg Observatory at Bergedorf
Eye end of the reflector tube with guiding attachment for photographic work. The rising observation platform is fixed to the dome, Fig. 172, page 119, and rotates horizontally with the latter.

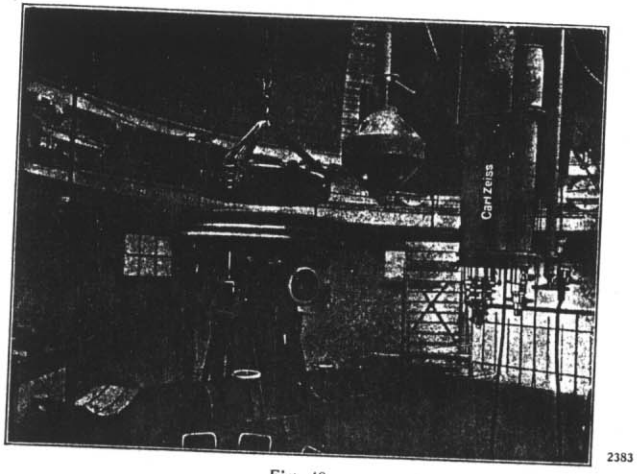


Fig. 49
Reflector of the Hamburg Observatory at Bergedorf
The truck (centre of illustration) serves for conveying the speculum to the silvering shop and also for its reception whilst being silvered.

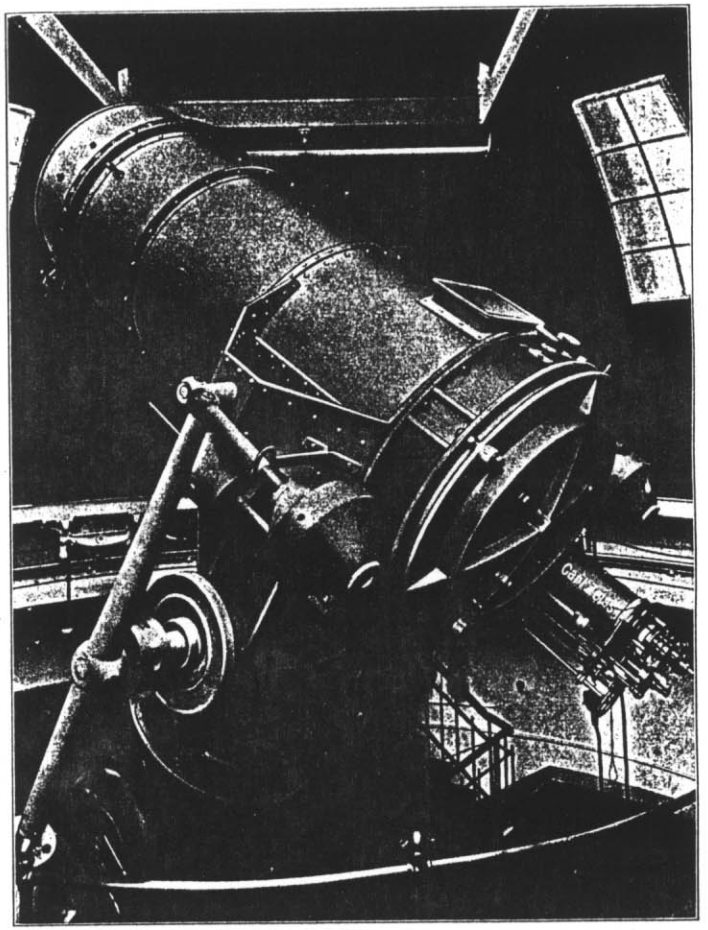


Fig. 50

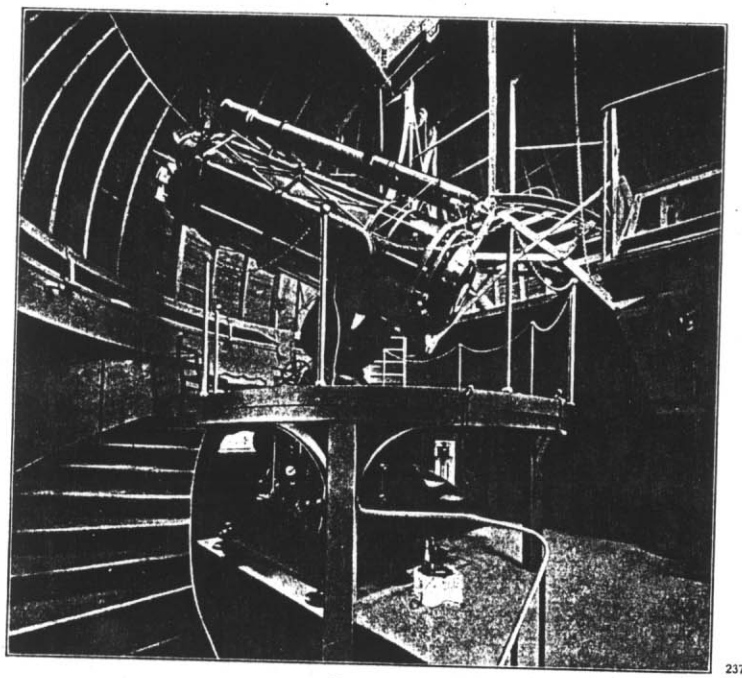
Reflector of the Hamburg Observatory at Bergedorf

Constructed by Carl Zeiss, Jena 1911

Optical equipment: Silvered parabolic glass reflector of 1000 mm. (39¼ in.) aperture and 3 m. (10 ft.) focal length. Guide telescope with E-Objective of 200 mm. (7⅞ in.) aperture and 3.5 m. (11½ ft.) focal length.

Mechanical equipment: Equatorial telescope mounting with relieving system to telescopes and equatorial axes.

Price: On application. Codeword: *Ascalabos.* Ident. No.: 51 39 10



2377

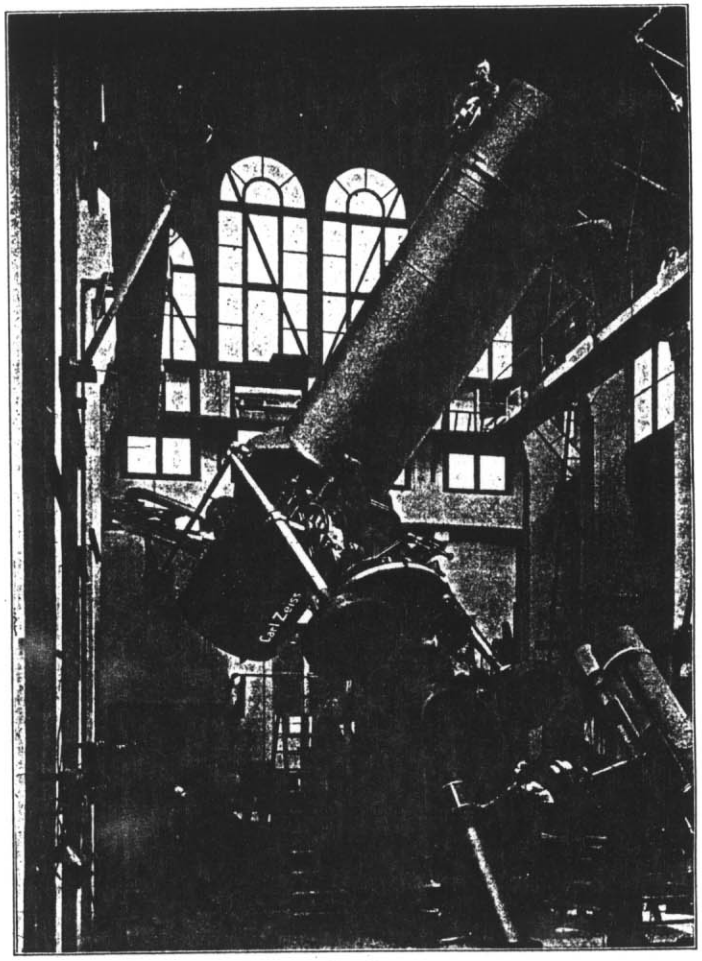
Fig. 51

Reflector of the Observatory at Heidelberg (Königstuhl)

Constructed by Carl Zeiss, Jena 1904

Silvered parabolic glass reflector of 720 mm. (28¼ in.) aperture and 2.8 m. (11¾ ft.) focal length; guide telescope with E-Objective of 610 mm. (24 in.) aperture and 2.4 m. (8 ft.) focal length; finder of 60 mm. (2⅜ in.) aperture, magnification 25×; double dark-slide for 12×9-cm. (4¾×3½-in.) plates, Fig. 114, page 88; two-prism U. V. spectrograph, Fig. 118, page 90.

Price: On application. Codeword: *Ascalabota.* Ident. No.: 51 39 72



2384

Fig. 52

Reflector of the Observatory at Berlin-Babelsberg

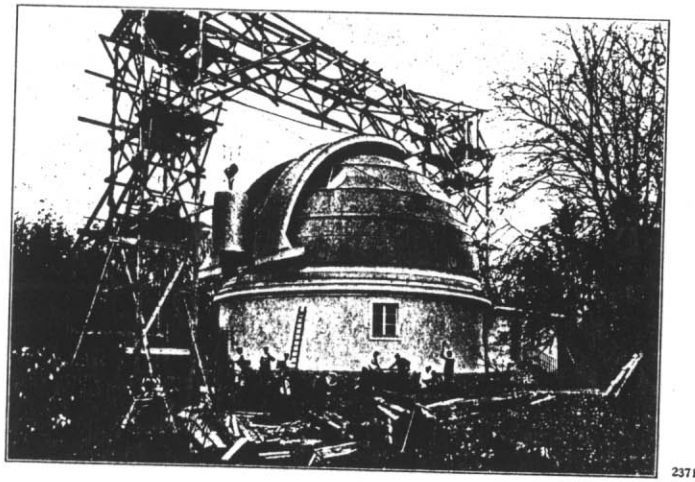
Constructed by Carl Zeiss, Jena, 1915

Showing the reflector under construction in the erecting shop.

Optical equipment: Silvered parabolic glass reflector of 1220 mm. (48½ in.) aperture with auxiliary Newtonian mirror, focal length 8.4 m. (27½ ft.); with auxiliary Cassegrain mirror, focal length 24 m. (78¾ ft.).

Mechanical equipment: Equatorial telescope mounting with stress relieving system to reflector tube and equatorial axes.

Price: On application. Codeword: *Ascalia.* Ident. No.: 51 39 12



2371

Fig. 53

Observatory at Berlin-Babelsberg

Scaffolding for housing the great reflector
Fig. 52, page 49



A 131

Fig. 54
Machine shop in the works of Carl Zeiss, Jena

Accessories

The interposition between the eyepiece and the eyepiece draw-tube necessitates a certain reduction in the length of the draw-tube extension corresponding to the lengthening of the optical path occasioned by the added aparatus. This difference in the focal adjustment will be referred to in the succeeding pages as the "tube shortening" and will in every case be stated in millimetres. The owner of a telescope will thus be enabled to decide whether, without any alteration, his instrument will accommodate the accessory in question. Where this is not the case, the focal length of the objective should either be appropriately increased by the interposition of a concave lens, or the tube mount should be suitably reduced in length. Either change will be made to order at a cost depending upon the circumstances. In the case of the accessories supplied with, or recommended for use with, Telescopes Nos. 1—61 no alteration is necessary as the eyepiece draw-tube of these telescopes has the requisite length for their addition.

When ordering any accessory it is sufficient to state the factory number of the instrument, which is inscribed on the eyepiece draw-tube below the firm's name. In the event of the telescope not being of our make it will be necessary to send a fitting bearing the screw thread of the eyepiece draw-tube. When it is intended to use an apparatus with one of the changing devices Nos. 62—67 the exact outer diameter of the existing fitting should be stated to enable us to provide a suitable changing collar, the latter being subject to a separate charge.

The smaller accessories are supplied in plain boxes, the larger ones in polished wooden cases, except where they are either permanently fitted to the telescope or intended to be kept in the telescope case. The prices of these cases or boxes are included in those stated in the succeeding pages.

Mechancial Accessories and Separate Parts of Telescopès

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Changing Device, Fig. 55 This device, which is designed after the manner of a bayonet catch, admits of the attachment of any accessory to the eyepiece draw-tube without the use of screw threads. Each accessory has a changing ring (2) attached to it. The three lugs on this ring are introduced into the three recesses of (1), the ring is then turned until it comes to a stop, and is then clamped by means of the lever (3)		
62	**Model II,** diameter of field of view 40 mm. ($1\frac{5}{16}$ in.), tube shortening 16 mm. ($\frac{5}{8}$ in.), without changing rings	*Ascaliarum*	51 42 11
63	**1 Changing Ring** for No. 62	*Ascalon*	51 42 12
64	**Model III,** diameter of field of view 55 mm. ($2\frac{1}{8}$ in.), tube shortening 20 mm. ($\frac{3}{4}$ in.), with clamping lever, without changing rings.	*Ascalonem*	51 42 21
65	**1 Changing Ring** for No. 64	*Ascalonius*	51 42 22
66	**Model VI,** diameter of field of view 100 mm. (4 in.), tube shortening 50 mm. (2 in.), with clamping lever, without changing rings.	*Ascalopam*	51 42 31
67	**1 Changing Ring** for No. 66	*Ascalpatur*	51 42 32
	Slow Motions in azimuth and altitude by means of helical gear and flexible shaft Fig. 10, page 17, including fitting to telescope and alterations to tripod and box		
68	for 80-mm. (3 -in.) altazimuth telescopes, Nos. 13—18 . .	*Ascalpemus*	51 43 11
69	for 110-mm. ($4\frac{1}{4}$-in.) altazimuth telescopes, Nos. 19—24 . .	*Ascalpens*	51 43 16
70	for 130-mm. ($5\frac{1}{8}$-in.) altazimuth telescopes, Nos. 25—30 . .	*Asecholas*	51 43 21
	R. A. and Declination Circles with verniers R. A. circle graduated in 10 min., reading to 1 min., Declination circle graduated in 1°, reading to 5'.		
71	for 80-mm. ($3\frac{1}{8}$-in.) equatorial telescopes, Nos. 36—41. . .	*Ascalpere*	51 43 31
72	**Hour Angle Disc, Fig. 56,** for direct reading of hour angle corresponding to any right ascension after setting to stellar time	*Ascalpis*	51 43 41
	Hour circle for direct setting by stellar time and R. A., Fig. 57 Circle (2) having been rotated with the aid of the milled head (4) and set by the vernier (1) to read stellar time at the instant of observation, the instrument may be set to any R. A. by rotating the telescope and with the aid of vernier (3). The graduation and the degree of accuracy with which readings can be taken are of the same order as with the single circles. The prices of Nos. 73—75 are additional to the equipment of the refractors Nos. 48—59 with simple hour circles.		
73	for 110—130-mm. ($4\frac{1}{4}$—$5\frac{1}{8}$-in.) refractors, Nos. 48—53 . . .	*Ascalpo*	51 43 51
74	for 150-mm. (6-in.) refractors, Nos. 54—56	*Ascalpunt*	51 43 55
75	for 200-mm. ($7\frac{7}{8}$-in.) refractors, Nos. 57—59	*Ascania*	51 43 61

For particulars of dimensions and weights see page 132 — **Price List at end of catalogue**

1 Clamping ring
2 Changing collar
3 Clamping lever
4 Rack and pinion focussing attachment on eyepiece draw-tube
5 Clamp for focussing attachment
6 Two small round-headed screws for taking up wear in (4)
7 Extension piece for eyepiece draw-tube
8 Eyepiece sliding sleeve No. 247 for astro-eyepieces
9 Unscrewing eye-cap for astro-eyepieces

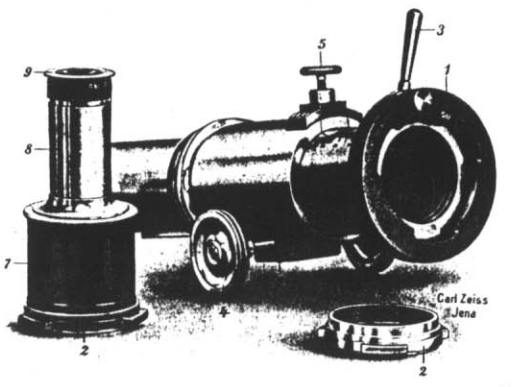


Fig. 55

Changing Attachment

No. 62—67

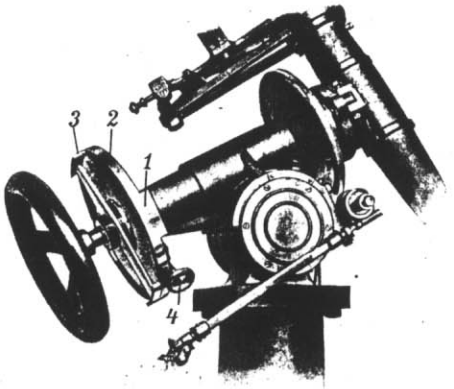


Fig. 57

Hour circle for direct setting by stellar time and R. A.

No. 73—75

1 Vernier for stellar time
2 Hour circle
3 Vernier for R. A.
4 Milled head for rotating circle (4)



Fig. 56

Hour Angle Disc

No. 72

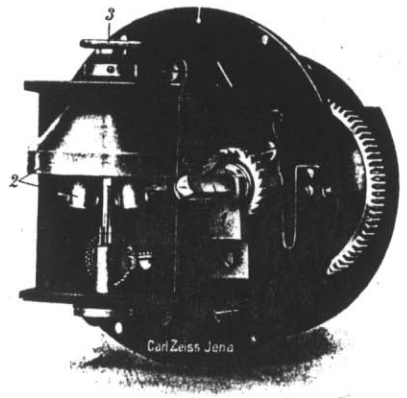


Fig. 58

Spring-driven Clock No. 76

1, Winding gear of clock, 2, Friction Governor, 3, Speed regulator

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Clocks, Figs. 58—60, for equatorial telescope mountings including adaptation, winding gear, and driving weights		
76	Clock, *spring-driven,* for 80 to 110-mm. ($3\frac{1}{4}$—$4\frac{1}{4}$-in.) equatorial telescopes Nos. 36—47	*Ascaniora*	51 43 71
77	Clock, *weight-driven,* for 80 to 150-mm. ($3\frac{1}{8}$—6-in.) equatorial telescopes Nos. 42—56	*Ascanius*	51 43 76
78	Clock, *weight-driven,* for 200-mm. ($7\frac{7}{8}$-in.) refractors Nos. 57—59	*Ascarat*	51 43 81
79	**Electric Slow Motion in R. A., Figs. 59, 62,** for Nos. 77 and 78, 4 volts, 4 amps. including adaptation, switch, and wires	*Ascarento*	54 43 91
80	**Electric Seconds Control, Figs. 59 and 60,** for automatically regulating clock in conjunction with seconds pendulum clock. Prices include adaptation to clock and electric conductors on telescope for Clock No. 77	*Ascaride*	51 44 11
81	for Clock No. 78 } 4 volts, 2 amps.	*Ascaridum*	51 44 16
82	**Electric Accumulator** 4 volts, in wooden box, for Nos. 79—81, with connecting plug, without flexible wire	*Ascarina*	51 44 19

For particulars of dimensions and weights see page 132 — **Price List at end of catalogue**

Weight-Driven Clocks

with seconds control and electric slow motion in R. A.

Nos. 77 — 81

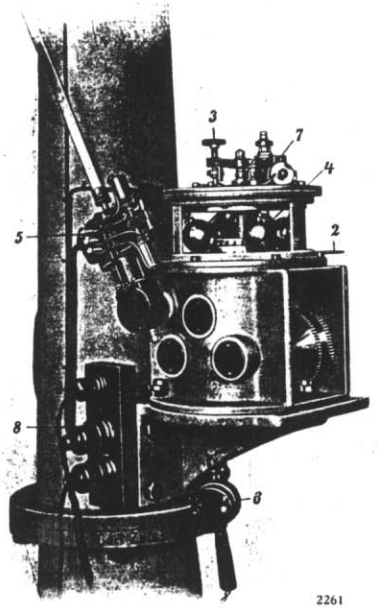


Fig. 59

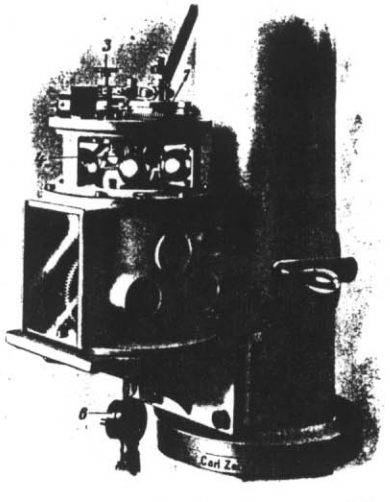
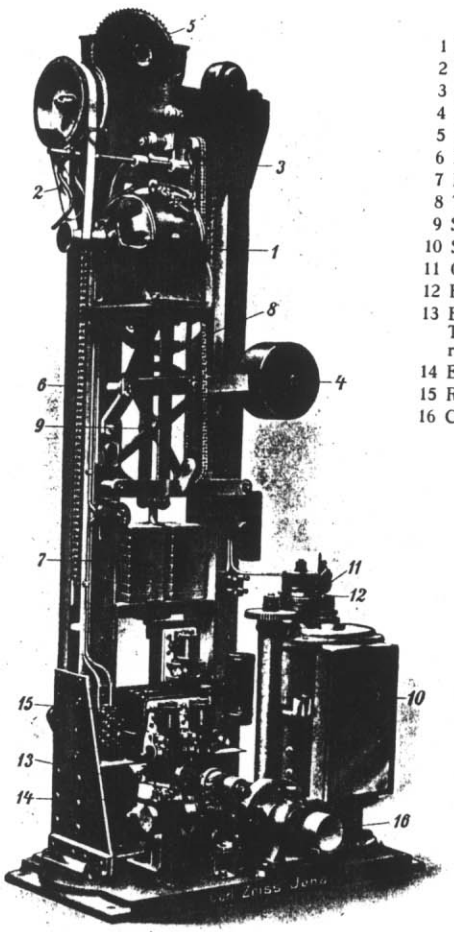


Fig. 60

1 Winding gear
2 Starting lever
3 Speed Change
4 Friction governor
5 Electric slow motion in R. A. No. 79
6 Switch for electric slow motion
7 Electric seconds control No. 80, 81
8 Connecting wires for electric slow motion (5), electric seconds control (7), and illuminating arrangements on telescope



2257

1 Electric motor (about $\frac{1}{8}$ H. P.)
2 Belt drive with two conical pulleys
3 Automatic belt shifting device
4 Weight for tightening belt
5 Worm drive
6 Endless chain
7 Driving weight
8 Tappet for (3)
9 Suspension for (7)
10 Spring friction governor
11 Governor speed change
12 Electric seconds control
13 Electro-magnetic slow motions in R. A. Two speeds each for acceleration and retardation
14 Electric motors for slow motions (13)
15 Reversing relays for electric motor
16 Coupling to refractor

Weight (7) is continuously wound by the electric motor (1). The tappet (8) and belt shifting device (3) vary the speed ratio at (2) so as to correct the speed changes arising from variations in the current supplied to the electric motor. Weight (7) remains approximately at the same height during the running of the mechanism and drives both the governor and the refractor

Fig. 61
Driving Clock for the motion in R. A. of large refractors and reflectors, No. 83

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
83	**Driving Clock for the motion in R. A.** of large refractors and reflectors, Fig. 61, with switch for the two slow motions (two speeds) forward and backward, *not* including electric conductors	*Ascarius*	51 44 31

For particulars of dimensions and weights see page 132 — **Price List at end of catalogue**

Tripod Stands and Tube Mountings
for altazimuth telescopes

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Table Tripod Stands, Fig. 4,		
84	for 60-mm. ($2\frac{3}{8}$-in.) telescopes Nos. 1—3 without telescope fork	*Ascaro*	51 40 01
85	for 80-mm. ($3\frac{1}{2}$-in.) telescopes Nos. 4—6 with telescope fork	*Ascaule*	51 40 03
	Tripod stands with standard socket pin for 60-mm. ($2\frac{3}{8}$-in.) Travelling Telescopes		
86	with altazimuth slow motion, Fig. 7, for 60-mm. ($2\frac{3}{8}$-in.) telescopes, Nos. 7—9	*Ascaulibus*	51 40 11
87	without altazimuth slow motion, Fig. 6, for 60-mm. ($2\frac{3}{8}$-in.) telescopes, Nos. 10—12	*Ascaulium*	51 40 16
87a	Extension rod for tripods of telescopes Nos. 7—12, Figs. 6 and 8, part 8, one end fitted with the standard pin, the other with socket and clamp	*Asegundais*	51 40 19
	Pyramid Tripod Stands, Fig. 10, made of wood with casters, foot screws, elevating gear and telescope fork		
88	for 80-mm. ($3\frac{1}{8}$-in.) telescopes Nos. 13—15	*Ascaunt*	51 40 43
89	for 110-mm. ($4\frac{1}{4}$-in.) telescopes Nos. 19—21	*Ascella*	51 40 45
90	for 130-mm. ($5\frac{1}{8}$-in.) telescopes Nos. 25—27	*Ascellarum*	51 40 63
90a	for 80-mm. ($3\frac{1}{8}$-in.) comet finder No. 31.	*Ascelletta*	51 40 44
	Field Tripods, Figs. 9 and 11, made of steel tubes, with elevating gear and telescope fork		
91	for 80-mm. ($3\frac{1}{8}$-in.) telescopes Nos. 16—18	*Ascenar*	51 41 03
92	for 110-mm. ($4\frac{1}{4}$-in.) telescopes Nos. 22—24	*Ascendaba*	51 41 05
93	for 130-mm. ($5\frac{1}{8}$-in.) telescopes Nos. 28—30	*Ascendado*	51 41 14
94	for 80-mm. ($3\frac{1}{8}$-in.) comet finder No. 32.	*Ascendam*	51 41 04
	Telescopes, Figs. 4—11, **Tube Mountings** without optical equipment, with tubular clip, eyepiece draw-tube, eyepiece sliding sleeve, movable counterpoise, sun shade and fitted case		
95	for 60-mm. ($2\frac{3}{8}$-in.) E- and B-Objectives	*Ascendanse*	51 10 01
96	for 60-mm. ($2\frac{3}{8}$-in.) A-Objectives	*Ascendar*	51 10 02
97	for 80-mm. ($3\frac{1}{8}$-in.) E- and B-Objectives	*Ascendaron*	51 13 01
98	for 80-mm. ($3\frac{1}{8}$-in.) A-Objectives	*Ascende*	51 13 02
99	for 110-mm. ($4\frac{1}{4}$-in.) E- and B-Objectives	*Ascendemos*	51 16 01
100	for 110-mm. ($4\frac{1}{4}$-in.) A-Objectives	*Ascendenlo*	51 16 02
101	for 130-mm. ($5\frac{1}{8}$-in.) E- and B-Objectives	*Ascendera*	51 20 01
102	for 130-mm. ($5\frac{1}{8}$-in.) A-Objectives	*Ascendia*	51 20 02
	Telescopes, Figs. 6—7, **Tube Mountings** without optical equipment, with tubular clip, eyepiece draw-tube, eyepiece sliding sleeve, fork with slow motion in altitude, and fitted case for "Travelling Models" with slow motions		
103	for 60-mm. ($2\frac{3}{8}$-in.) E- and B-Objectives	*Ascendiamo*	51 10 61
104	for 60-mm. ($2\frac{3}{8}$-in.) A-Objectives	*Ascendido*	51 10 62

Illuminating Devices

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
105	**Illuminating device,** Fig. 62, for declination circles of refractors Nos. 42—53	*Ascendimus*	51 47 11
106	**Abbe Dark Ground Illumination Attachment,** Fig. 64, for the illumination of fiducial lines (bright lines on a dark ground) in field of view of eyepieces. The eyepiece cap (4), which has to be specially supplied for each eyepiece, allows only such rays to reach the eye from the graticule illuminated by (5) as have been deflected by diffraction. The price includes two eyepiece caps but no eyepieces. The latter, which should be of the orthoscopic type, f=25 to 5 mm. (1 to $\frac{3}{16}$ in.), and cross-line diaphragms, as may be required, should be ordered separately. Tube shortening: 60 mm. ($2\frac{3}{8}$ in.)	*Ascending*	51 47 15
107	**Cross Line Illumination Attachment,** Fig. 63 (bright-lines on a dark ground) for finder telescopes with cross-lines on glass plate	*Ascendisse*	51 47 21
108	**Osram Lamps** 4 volts, 0,4 amps. . . . . each	*Ascendol*	51 44 18
109	**Accumulator,** Figs. 33—35, pages 32, 33 4 volts, 16 ampère-hours (when discharging at 2 amps.) with switch, in wooden box	*Ascendome*	51 44 19

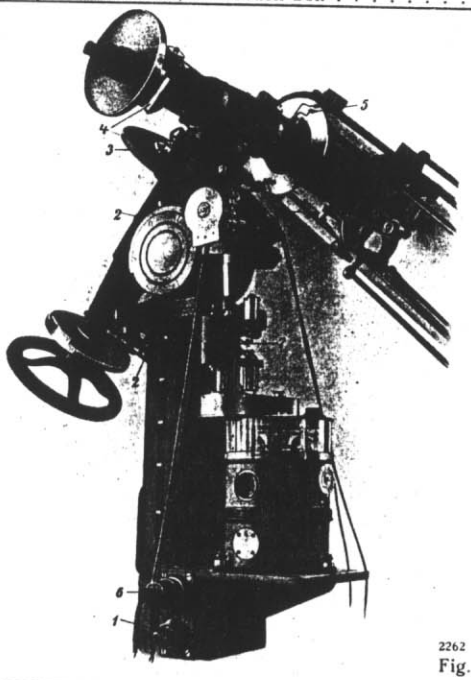


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Fig. 62

Illuminating Attachment for the declination circle and electric connections to the telescope No.105

1 Plug for electric connections from accumulator (4 volts) to illuminating attachments
2 Electric connections and conductors on telescope
3 Sliding contact on hour circle
4 Illumination attachment to the declination circle (Osram lamp in casing with opal-glass front)
5 Sliding contact for the supply of current to telescope for the illumination of the field and cross-lines
6 Plug switch for current from accumulator (4 volts) to the
7 Electric slow motion in R. A.

1 Electric conductor
2 Plug connector
3 Switch
4 Resistance for varying the brightness of the cross-lines
5 Osram lamp (4-volt) in sliding socket
6 Finder, monocular field glass type

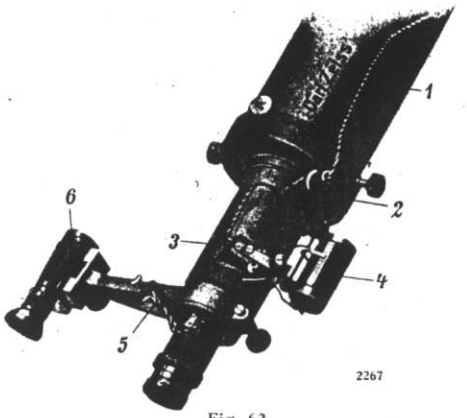

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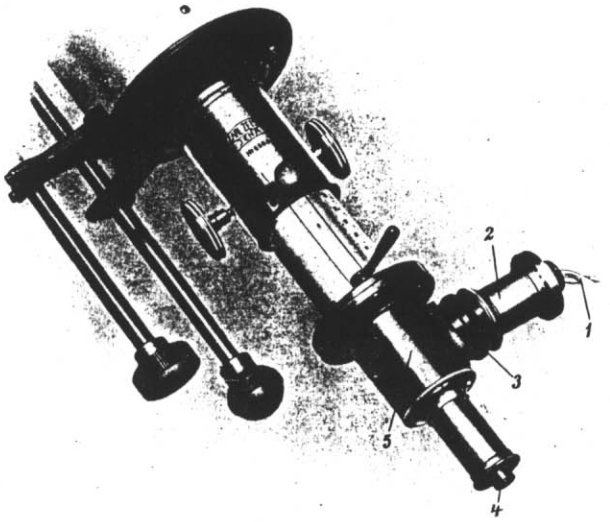
Fig. 63
Cross-line Illuminating Attachment for Finders (Bright-lines on a dark ground)
No. 107



1 Electric conductors
2 Plug connector
3 Iris diaphragm for varying brightness of cross-lines
4 Eyepiece cap with small diaphragm in exit pupil
5 Casing with white illumination ring

2258

Fig. 64
Abbe Dark Ground Illuminating Attachment for the illumination of fiducial lines in the field of view of the eyepiece, showing bright lines on a dark ground, No. 106

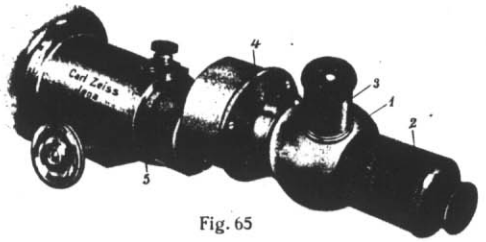


Fig. 65

Double Revolver No. 110

with erecting prisms No. 113

2268

1 Double revolver
2 Kellner eyepiece, f = 40 mm. ($1\frac{9}{16}$ in.) made to unscrew for use without revolver
3 Sliding sleeve for eyepieces, f = 25 to 5 mm. (1 to $\frac{3}{16}$ in.)
4 Erecting prisms
5 Eyepiece draw-tube

For astronomical observations the revolver (1) screws directly into the eyepiece draw-tube (5) without the erecting prisms

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
110	**Double Revolver,** Fig. 65, with sliding sleeve for eyepieces of 25—5 mm. ($1-\frac{3}{16}$ in.) focus, screw socket for eyepieces up to f = 40 mm. ($1\frac{9}{16}$ in.). Tube shortening 60 mm. ($2\frac{3}{8}$ in.). In case, without eyepieces	*Ascendunt*	51 47 22
111	**Triple Revolver** (small model), Fig. 66, with 2 sliding sleeves for eyepieces of 25—5 mm. ($1-\frac{3}{16}$ in.) focus, screw socket for eyepieces up to f = 50 mm. (2 in.). Tube shortening 60 mm. ($2\frac{3}{8}$ in.). In case, without eyepieces	*Ascensae*	51 47 23
112	**Triple Revolver** (large model), Fig. 36, page 34, with sliding sleeve and 2 screw sockets for eyepieces up to f = 60 mm. ($2\frac{3}{8}$ in.). Tube shortening 95 mm. ($3\frac{3}{4}$ in.). In case, without eyepieces	*Ascensi*	51 47 33

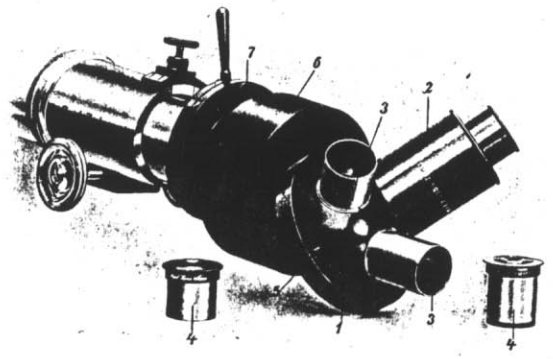


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Fig. 66

Triple Revolver No. 111

with erecting prisms No. 114

1 Triple revolver No. 111
2 Kellner eyepiece, f = 40 mm. ($1\frac{9}{16}$ in.), made to unscrew, for direct use without revolver
3 Sliding sleeve for
4 Eyepieces, f=25 to 5 mm. ($1-\frac{3}{16}$ in.)
5 Index to rotation of revolver
6 Erecting prisms
7 Changing attachment No. 62

For astronomical observations the revolver (1) should be unscrewed from the erecting prisms (6), and together with the changing ring used directly on the eyepiece draw-tube

Accessory Apparatus for Terrestrial Observations

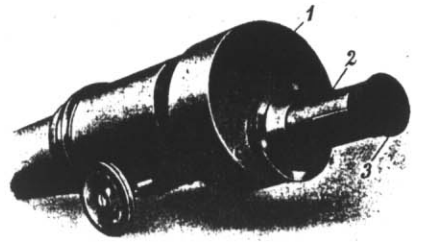

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Fig. 67
Erecting Prisms No. 113—116

1 Casing with erecting prisms
2 Eyepiece sliding sleeve ,
3 Eyepieces, f = 25—5 mm. ($1-\frac{3}{16}$ in.). Eyepieces, f = 60—30 mm. ($2\frac{3}{8}-1\frac{3}{16}$ in.) screwing to the casing (1) in the place of the sliding sleeve (2)

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Erecting Prisms, Figs. 67 and 68, in conjunction with Astro-eyepieces, for erecting the image in terrestrial observations, with sliding sleeve for eyepieces of 25—5 mm. ($1-\frac{3}{16}$ in.) focus. In case.		
113	for Astro-eyepieces of 40—5 mm. ($1\frac{9}{16}-\frac{3}{16}$ in.) focus. Tube shortening 90 mm. ($3\frac{9}{16}$ in.)	*Ascensibus*	51 47 41
114	for Astro-eyepieces of 40—5 mm. ($1\frac{9}{16}-\frac{3}{16}$ in.) focus. Tube shortening 100 mm. (4 in.)	*Ascensione*	51 47 43
115	for Astro-eyepieces of 50—5 mm. ($2-\frac{3}{16}$ in.) focus. Tube shortening 120 mm. ($4\frac{3}{4}$ in.)	*Ascensiora*	51 47 45
116	for Astro-eyepieces of 60—5 mm. ($2\frac{3}{8}-\frac{3}{16}$ in.) focus. Tube shortening 150 mm. (6 in.)	*Ascensius*	51 47 47

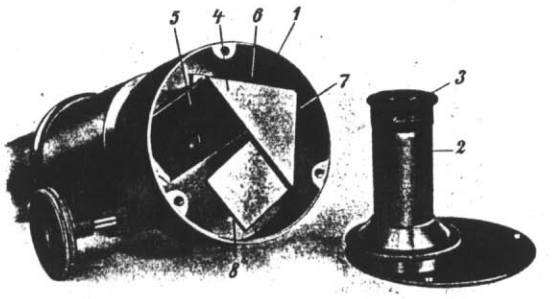

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Fig. 68
Erecting Prisms with prism casing shown open
Nos. 113—116

1 Prism casing
2 Eyepiece sliding sleeve
3 Astro-eyepiece, f = 25—5 mm. ($1-\frac{3}{16}$ in.)
4 Erecting Prisms with four reflecting surfaces (5—8), at which the rays are totally reflected

Finders and Zenith Prisms

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Finder, Fig. 10, 11, 31, with 1 two-lens objective, 1 Kellner eyepiece with crossed lines on glass plate, focussing b rotation of eye-cap, within multiple helix 2 brackets with adjusting screws for mounting and ranging the finders on the telescope An order for a finder to an existing telescope should be accompanied by a sketch giving length and diameter of the telescope tube for suitably dimensioning the brackets		
	Aperture of objective mm / Focal length of objective mm / Focal length of eyepiece mm / Magnification / Field of View / Exit pupil mm		
117	25 (1 in.) / 200 (7⅞ in.) / 25 (1 in.) / ×8 / 5°13′ / 3.1	*Ascensoir*	51 47 61
118	30 (1 1/16 in.) / 300 (11¾ in.) / 30 (1 3/16 in.) / ×10 / 4°10′ / 3.0	*Ascensorem*	51 47 63
119	45 (1¾ in.) / 360 (14 in.) / 25 (1 in.) / ×15 / 2°47′ / 3.0	*Ascensum*	51 47 65
120	60 (2⅜ in.) / 750 (30 in.) / 30 (1 3/16 in.) / ×25 / 1°40′ / 2.4	*Ascensuri*	51 47 67
121	**Monocular Field-glass** arranged as a Finder, Fig. 71. Free aperture 24 mm. (1⅛ in.) magnification ×6, field of view 6°48′, exit pupil 4 mm. . . . . The field glass is readily detachable and may be used independently. In case	*Ascentaar*	51 47 71
122	**Eyepiece Prism**, Figs. 69 and 70, consisting of a right angled prism in revolving mount for setting to any position angle, screwing on to eyepieces f = 40—5 mm. (1 1/16—3/16 in.) in place of eye-cap. . . . . This prism admits of the head being held in the normal position when observing stars near the zenith (a useful adjunct to the guide telescope in prolonged photographic exposures). In case	*Ascertain*	51 48 11
124	**Zenith Prism**, Fig. 72, consisting of a right angled prism for deflecting the rays through 90° and suitable for observations in the neighbourhood of the zenith. The mount can be rotated and clamped in position angles. Eyepiece sliding sleeve No. 247. Eyepieces of 50—5 mm. (2—3/16 in.) focus are *not* included in the price. Tube shortening 60 mm. (2⅜ in.). In case	*Ascesso*	51 48 25

For particulars of dimensions and weights see page 132 — Price List at end of calalogue



2331

Fig. 69

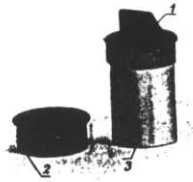

Fig. 70

1 The prism revolves about the axis of the eyepiece and screws to it in the place of the
2 Eye cap
3 Eyepiece

2356

Eyepiece Prism No. 122

1 Monocular field-glass, ×6, with cross-lines
2 Ranging adjustment for the field-glass with respect to the telescope
3 Clamp for fixing field-glass to the
4 Bracket, which is capable of rotation about the telescope axis
5 Clamp for fixing the bracket in position

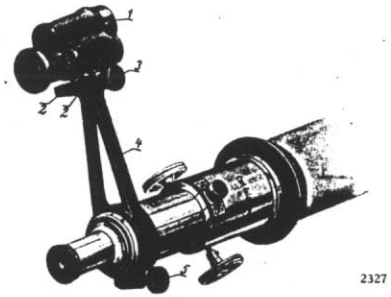

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Fig. 71

Monocular Field-glass arranged as a Finder No. 121

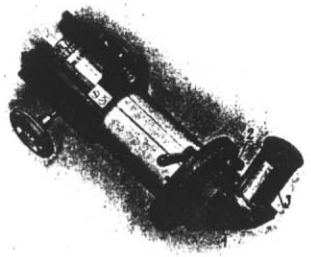

Fig. 72

Zenith Prism Nos. 123, 124

1 Zenith prism — a right angled reflecting prism in mount
2 Clamp for securing the prism against rotation about axis of telescope
3 Sliding sleeve for eyepieces of 25 to 5 mm. (1 to 3/16 in.) focus

The zenith prism facilitates the observation of objects at a great altitude

2345

Zeiss Field Glasses

Fig. 73—79

The subjoined list comprises those models of the Zeiss Field Glasses which are suitable for astronomical observation on account of their great light gathering power (exit pupil) and their extensive field of view, especially for the observation of variable stars and the like. Particulars of all models of Zeiss Field Glasses will be found in Catalogue „T 215"

Magnification	Weight of field-glasses oz.	in black stiff leather case with shoulder strap: Codeword (to be quoted on order)	in black stiff leather case with shoulder strap: Weight of case oz.	in brown stiff leather case with shoulder strap: Codeword (to be quoted on order)	in brown stiff leather case with shoulder strap: Weight of case oz.	in pocket case of soft calf with velvet finish: Codeword (to be quoted on order)	in pocket case of soft calf with velvet finish: Weight of case oz.
Field Glasses with Separately Focussing Eyepieces Figs. 73, 75, 78, 79							
4	9½	*Turol*	7½	*Turolba*	7½	*Turolwe*	3⅜
6	22	*Silvamar*	16	*Silvamarba*	16	*Silvamarwe*	4
7	40¾	*Binoctar*	22	*Binoctarba*	22	—	—
8	25½	*Deltrentis*	16	*Deltrentisba*	16	*Deltrentiswe*	4
Field Glasses with Twin Focussing Eyepieces Figs. 74, 76, 79a							
4	10⅜	*Turolem*	7½	*Turolemba*	7½	*Turolemwe*	3⅜
6	25½	*Silvarem*	15¾	*Silvaremba*	15¾	*Silvaremwe*	4
8	26½	*Deltrintem*	16	*Deltrintemba*	16	*Deltrintemwe*	4
Monocular Field Glasses Fig. 77							
6	10¾	*Simpsilv*	8	—	—	*Simpsilvpo*	2⅝
8	10	*Deltrintmo*	8½	*Deltrintmoba*	8½	*Deltrintwe*	2⅝

Optical Features of Field Glasses

Magnification	Exit pupil in	Effective diameter of objective in	Field of view: in angular measure degrees	Field of view: Diameter subtended at 1000 yds in yds	Faintest still visible stars, in magnitudes (see also page 114)
4	$\frac{3}{16}$	$\frac{3}{4}$	10°.3	182	7.4
6	$\frac{3}{16}$	$1\frac{3}{16}$	8°.4	150	8.2
8	$\frac{3}{16}$	$1\frac{9}{16}$	6°.3	110	8.7



Fig. 73. *Turol*, magnifying 4×
Diameter of 0.9. 20 mm. (¾ in.)
⅓ natural size



Fig. 74. *Turolem*, magnifying 4×
Diameter of 0.9. 20 mm. (¾ in.)
⅓ natural size

Price List at end of catalogue



Fig. 75. *Silvamar*, magnifying ×6
Diameter of o. g. 30 mm. (1$\frac{3}{16}$ in.)
⅓ nat. size



Fig. 76. *Silvarem*, magnifying ×6
Diameter of o. g. 30 mm. (1$\frac{3}{16}$ in.)
⅓ nat. size



Fig. 77. *Monocular Field Glass*
Magnifying ×6
Diameter of o. g. 30 mm. (1$\frac{3}{16}$ in.)



Fig. 78. *Binoctar*, magnifying ×7
Diameter of o. g. 50 mm. (2 in.)
⅓ nat. size



Fig. 79. *Deltrentis*, magnifying ×8
Diameter of o. g. 30 mm. (1$\frac{3}{16}$ in.)
⅓ nat. size



Fig. 79a. *Deltrintem*, magnifying ×8
Diameter of o. g. 30 mm. (1$\frac{3}{16}$ in.)
⅓ nat. size

Binocular Eyepieces, Dark Glasses, Revolving Colour Discs, Absorbing Wedges

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Binocular Eyepiece, Fig. 82 This enables the observer to use both eyes on a single-tube astronomical telescope. The eyepiece is fitted with erecting prisms, so as to furnish erect images. It is accordingly available for terrestrial, as well as astronomical observations. Eyepieces f = 25 to 5 mm. (1 — $\frac{3}{16}$ in.), as may be desired. The eyepieces are not included in		
125	the price . . . . . In case	*Asceteria*	51 48 41
	Dark Glasses, Fig. 80 These consist of a small plate of neutral tint or coloured glass in mount with screw for attachment to the eyepieces in the place of the eye cap. The glass plates are held in position by means of a screw ring and are readily inserted and removed.		
	Neutral Dark Glasses, Fig. 80 These are used in the observation of bright objects, the sun, moon, planets and the like.		
126	Sun glass, absorbing power 13 magnitudes	*Asceterium*	51 48 61
127	Moon glass, dark „ „ 3,3 „	*Ascetery*	51 48 62
128	moon glass, light „ „ 1,6 „	*Ascetical*	51 48 63
129	Neutral glass, „ according to requirement	*Ascetismo*	
129a	Sun glass No. 126 *without* mount	*Asegunden*	51 48 65
	Coloured Dark Glasses, Fig. 80 These serve for obtaining sharper image by removing the disturbing effects of chromatic aberrations; also for viewing extended objects, such as the sun, moon or planets, details being rendered more distinct by the accentuation of contrasts.		
130	Red glass	*Ascetrias*	51 48 71
131	Yellow glass	*Ascham*	51 48 72
132	Green glass	*Aschbelt*	51 48 73
133	Blue glass	*Aschbus*	51 48 74
134	Coloured glass, thickness and kind as may be required .	*Aschemmer*	
	Revolving Colour Glass Discs, Fig. 83 with five different Colour Glasses, Nos. 127, 130—133,		
135	neutral, red, yellow, green, blue . . . . . In case	*Aschera*	51 48 81
	Absorbing Wedges, consisting of two cemented glass wedges, one being made of ordinary white optical glass, the other of dense neutral tint glass.		
	Absorbing Wedges, Fig. 81 for viewing bright objects, the sun etc., in mount with slide for displacing and screw for attachment to eyepieces in the place of the eye cap. Range of absorbing power 2.5 to 15.5 magnitudes. Travel		
136	of wedges 36 mm.	*Aschetos*	51 48 91
	Absorbing Wedges for photometric purposes. Wedge constant and dimensions		
137	of wedge according to requirement . . . . . In case	*Aschgat*	

For particulars of dimensions and weights see page 132 — **Price List at end of catalogue**

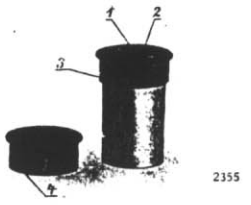

Fig. 80

Dark Glass No. 126—134

1 Dark glass
2 Retaining ring
3 Mount of moderating glass
4 Eyepiece cap



Fig. 81

Absorbing Wedge No. 136

1 Absorbing wedge
2 Mount with slide fitting and attachment screw
3 Eyepiece, f = 25 to 5 mm. (1 to $\frac{3}{16}$ in.)
4 Eyepiece cap

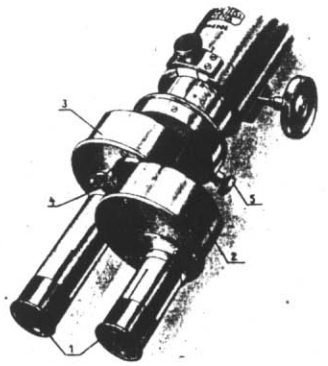

Fig. 82

Binocular Eyepiece No. 125

1 Eyepieces, f = 25 to 5 mm. (1 to $\frac{3}{16}$ in.) in sliding sleeve
2, 3 Erecting prisms
4 Scale showing distance between the eyes
5 Clamp for rotation about position axis

1 Five dark-glasses of different colours
2 Retaining rings
3 Notched revolving disc
4 Spring catch
5 Screw threads for attachment to eyepiece

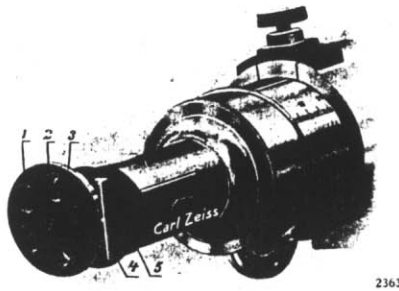

Fig. 83

Revolving Colour Disc No. 135

Solar Prisms, Helioscopes and Projection Screens

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Colzi Polarizing Solar Prism, Fig. 84, being a combination of a Herschel glass mirror (1) and a Pickering double prism (2) with a deflecting mirror (5) and a sliding sleeve (4) for eyepieces of 25 to 5 mm. (1 to $\frac{3}{16}$ in.) focus. Without eyepieces. By a suitable choice of liquid in (2) the sun's rays may be reduced to a convenient intensity for viewing the sun's image and the intensity varied within wide limits by rotating the prism body (2) with respect to the glass mirror (1). A full description will be found in our leaflet entitled "Colzi Polarizing Solar Prism".		
138	**Small Prism** for images of the sun up to 20 mm. ($\frac{3}{4}$ in.) diameter (as furnished by objectives of about 2 m. = $6\frac{1}{2}$ ft. focus); suitable for eyepieces of 25 to 5 mm. (1 to $\frac{3}{16}$ in.) focus. Tube shortening 70 mm. ($2\frac{3}{4}$ in.) . . . . . In case	*Aschhok*	51 49 11
139	**Large Prism** for images of the sun up to 35 mm. ($1\frac{3}{8}$ in.) diameter (as furnished by objectives of about 4 m. = 13 ft. focus); suitable for eyepieces of 40 to 5 mm. ($1\frac{9}{16}$ to $\frac{3}{16}$ in.) focus. Tube shortening 100 mm. (4 in.) . . . . . In case	*Aschiai*	51 49 21
139a	**Concave Lens** in mount for extending the focal length of the object glass.	*Aschiandor*	51 42 01
139b	**Fluid** in 50-grm. bottle for replenishing the chamber	*Asegundad*	51 49 25
141	**Herschel Solar Prism,** with absorbing wedge, Fig. 85, consisting of a glass wedge (1), having its front face inclined at an angle of 45° to the axis of the telescope and diverting about 95% of the incident light and heat; together with a sliding sleeve No. 247 and an absorbing wedge (3) for varying the intensity of the sun's image within a range of 16 magnitudes. The glass wedge (1) and the absorbing wedge (3) provide a means of reducing the intensity within magnitudes 4 to 20. Being fitted with a collar for rotation about the position axis, the solar prism may be used with comfort for observation with the sun at any distance from the zenith, much in the same way as the zenith prism. Eyepieces f=50 to 5 mm. (2 to $\frac{3}{16}$ in.), with which the prism can be used, are not included in the price. Tube shortening 73 mm. ($2\frac{7}{8}$ in.) . . . . . In case	*Aschiare*	51 49 41
	Polarizing Helioscope, Fig. 86, consisting of four plane mirrors mounted within the drums (1) and (2) and placed parallel in pairs, together with a sliding sleeve for eyepieces of 25 to 5 mm. (1 to $\frac{3}{16}$ in.) focus. The light of the sun is partially polarised by the pair (1) of mirrors. The rotation of the mirrors (2) about the position axis provides a means of varying within wide limits the intensity of the sun's image.		
142	**Small Helioscope** for eyepieces of 25 to 5 mm. (1 to $\frac{3}{16}$ in.) focus. Tube shortening 120 mm. ($4\frac{3}{4}$ in.). . . . . In case	*Aschiassi*	51 49 61
143	**Large Helioscope** for eyepieces of 40 to 5 mm. ($1\frac{9}{16}$ to $\frac{3}{16}$ in.) focus. Tube shortening 160 mm. ($6\frac{1}{4}$ in.). . . . . In case	*Aschiava*	51 49 71
	Solar Projection Screen, being a white screen with carrying rods and tube clip for attachment to the telescope, as well as a black protecting screen.		
143a	for finder telescopes, Fig. 107, page 82, part 4	*Asegundese*	51 49 90
144	for telescopes of 60–80 mm. ($2\frac{3}{8}$–$3\frac{1}{8}$ in.) aperture, Fig. 6, page 13	*Aschiera*	51 49 91
145	for telescopes of 110–130 mm. ($4\frac{1}{4}$–$5\frac{1}{8}$ in.) aperture, Fig. 34, part 32	*Aschierana*	51 49 93
146	for telescopes of 150–200 mm. (6–8 in.) aperture, Fig. 34, part 32	*Aschieremo*	51 49 95

For particulars of dimensions and weights see pages 132 and 133 — Price List at end of catalogue

1 Glass mirror
2 Glass prism
3 Liquid prism
4 Sliding sleeve for eyepieces, f = 25 to 5 mm. (1 to $\frac{3}{16}$ in.)
5 Safety mirror
6 Transparent membrane
7 Screw plug
8 Clamp to rotation about position axis
9 Clamp to prism rotation for varying the intensity

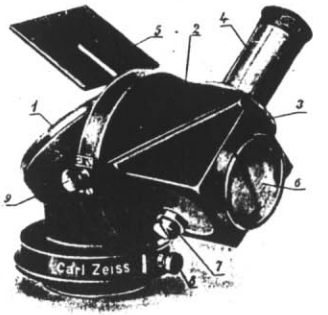

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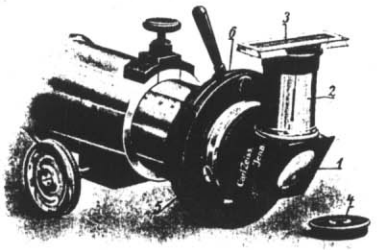
Fig. 84
Colzi Polarising Solar Prism Nos. 138, 139



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1 Reflecting prism
2 Sliding sleeve for eyepieces, f = 25 to 5 mm. (1 to $\frac{3}{16}$ in.)
3 Absorbing wedge No. 136
4 Eyepiece cap
5 Clamp to rotation about axis of telescope
6 Changing device No. 62

Fig. 85
Herschel Solar Prism with Absorbing Wedge Nos. 140, 141

1 Polariser
2 Analyser capable of rotation about the position axis
3 Divided circle with index to (2)
4 Sliding sleeve for eyepieces, f = 25 to 5 mm. (1 to $\frac{3}{16}$ in.)
5 Changing device

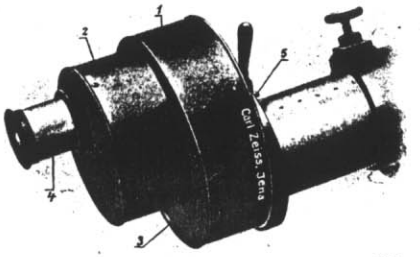

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Fig. 86
Polarising Helioscope Nos. 142, 143

Micrometers

The eyepiece micrometers Nos. 147 to 152 are mounted in a special screw fitting, by means of which they can be adjusted to a sharp focus within the eyepiece. When ordering any of the micrometers Nos. 147 to 152 for use with existing eyepieces, these should be sent for adaptation.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No
147	**Cross Webs,** being spider's webs stretched over a plate, fitted to eyepiece	*Aschiel*	51 50 10
148	**Cross Lines,** etched on glass and fitted into eyepiece. Thickness of lines according to specification or to suit stated purpose	*Aschino*	51 50 15
149	**Eyepiece Micrometer,** being a ruled glass plate, upon which 5 mm. are divided into tenths of a millimetre. The price includes the mount and adaptation to the eyepiece	*Aschiosa*	51 50 20
150	**Eyepiece Cross Line Micrometer,** being a small glass plate with ruled reticule of 5 mm. square divided into squares of 0.5 mm. side. The mount and adaptation to the eyepiece are included in the price. . .	*Aschiza*	51 50 25
151	**Circular Micrometer,** being a small glass plate having three concentric circles ruled upon it. The diameters of these circles according to requirements and to correspond with the field of view of the eyepiece employed. The mount and adaptation to the eyepiece are included in the price	*Aschkar*	51 50 30
152	**Ring Micrometer,** consisting of a steel ring cemented to a glass plate. The inner and outer diameters of the ring (according to requirement) are made to correspond to the eyepiece employed. The mount and adaptation to the eyepiece are included in the price	*Aschkarman*	51 50 35
152a	**Cross Bar Micrometer,** Figs. 86a and 86c, consisting of two steel bars at right angles to each other within the field stop and so arranged that they may be rotated about the position axis and clamped at position angles of 0°, 45° and 135°. Orthoscopic eyepieces of 25 to 5 mm. (1 to $\frac{3}{16}$ in.) focus, which should be used, are not included in the price of the micrometer . . . . In case	*Aseguraba*	51 50 36
152b	**Position Circle,** Figs. 86a to c and 87, divided into degrees, fitted with index for reading fractional degrees, with clamp and collar for rotation about the position axis. Screw with inside thread to fit Nos. 106, 152a and 247 . . . . . In case	*Asegurado*	51 50 38
153	**Eyepiece Screw Micrometer,** Fig. 87, consisting of a micrometer screw with movable filar plate (cross lines and double lines); rotation counter within the field of view; stationary filar plate; (orthoscopic) eyepiece in special mount for the accomodation of the micrometer; focal length 12.5, 10, 9 or 7 mm. ($\frac{1}{2}$, $\frac{13}{32}$, $\frac{11}{32}$ or $\frac{9}{32}$ in.), according to requirement. The micrometer slides into an eyepiece sleeve and has a clamping collar for rotation in terms of position angles. Tube shortening: 30 mm. ($1\frac{3}{16}$ in.). In case	*Aschkolk*	51 50 41

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

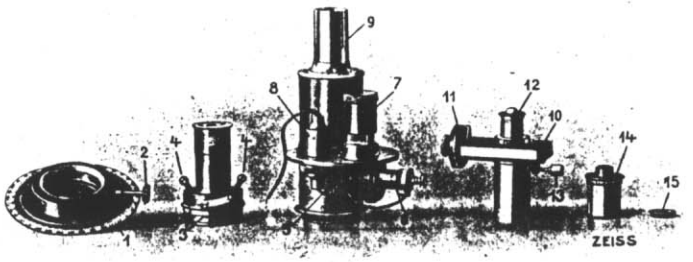

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Fig. 86a

Key to Figs. 86a—c and 87

1 Position circle No. 152b
2 Clamp to rotation about position axis
3 Cross-bar micrometer No. 152a
4 Revolving collar with spring catch for rotation into position angles
5 Abbe dark-ground illuminating attachment No. 106
6 Electric lamp with conducting wires
7 Regulating resistance drum
8 Plug connector
9 Eyepiece sliding sleeve No. 247
10 Eyepiece screw micrometer No. 153
11 Graduated drum (100 divisions) with index; screw pitch 0.5 mm.
12 Micrometer eyepiece with dark-ground stop
13 Clamp for the eyepiece screw micrometer
14 Sliding eyepiece with dark-ground stop in cap
15 Ordinary eyepiece cap

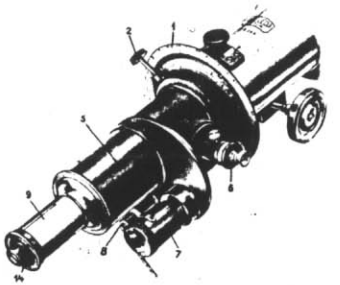

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Fig. 86b

Position Circle No. 152b
with dark-ground illuminating attachment No. 106 and eyepiece with micrometer No. 148—152

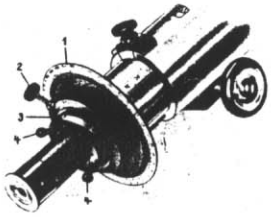

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Fig. 86c

Position Circle No. 152b
with cross-bar micrometer No. 152a

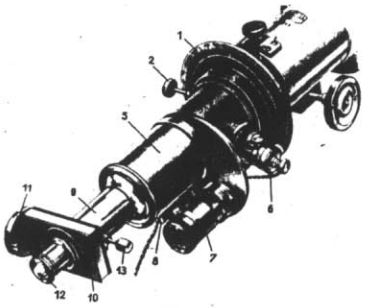

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Fig. 87

Position Circle No. 152b
with dark-ground illuminating attachment No. 106 and eyepiece screw micrometer No. 153

Micrometer

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
154	**Position Filar Micrometer,** Model I, Figs. 88, 89, consisting of a position circle with two verniers reading to $\frac{1}{10}^0$; clamp and slow motion in position angles; two (orthoscopic) eyepieces in special mounts, for the accommodation of micrometers, of 12.5 and 7 mm. ($\frac{1}{2}$ and $\frac{3}{8}$ in.) focus. Field and filar illumination by electric incandescent lamps. The micrometer mount has a screw for attachment to the eyepiece draw-tube. Tube shortening: 60 mm. ($2\frac{3}{4}$ in.). In case	*Aschkuil*	51 50 51
155	**Position Filar Micrometer,** Model II, Figs. 91, 92, consisting of a micrometer casing with drum reading recorder, position circle graduated into 10-min. divisions, microscopes reading to 1 min., continuous slow motion, 5 orthoscopic micrometer eyepieces adjustable in terms of diopters, f = 25, 12.5, 9, 7 and 5 mm. (1, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ in.), and microscope for controlling the measuring screw. Tube shortening: 120 mm. ($4\frac{3}{4}$ in.) In wooden case	*Aschling*	51 50 61

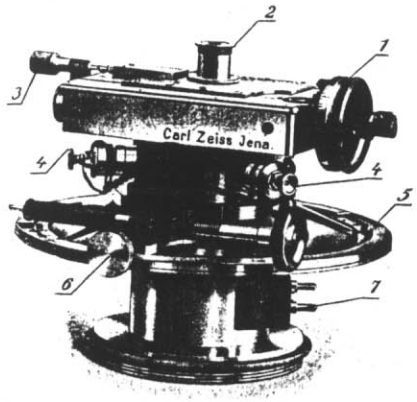
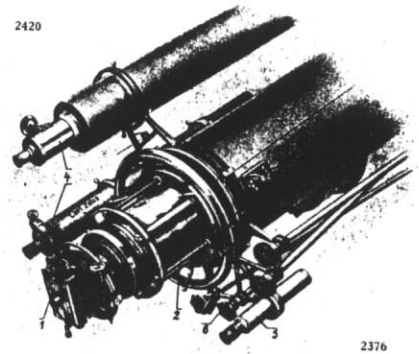


Fig. 88
Position Filar Micrometer
Model I, No. 154

Key to Fig. 88

1 Graduated drum (100 divs.) with index and revolution counter. Pitch of measuring screw 0.5 mm.
2 Micrometer eyepiece
3 Screw head for displacement of eyepiece along scale
4 Electric filar and field illuminating attachment (4-volt Osram lamps)
5 Position circle divided in degrees and reading by two verniers to $\frac{1}{10}$ degrees
6 Clamp and slow motion through position angles
7 Plug connectors



Key to Fig. 89

1 Position filar micrometer
2 Eyepiece draw-tube with three-spindle mechanism
3 Electric switch
4 Finder telescopes
5 Telescopic reader for declination circle
6 Keys for clamping and slow motions in R. A. and declination

Fig. 89
Position Filar Micrometer Model I, No. 154
attached to the 200-mm. (8-in.) Refractor No. 57—59

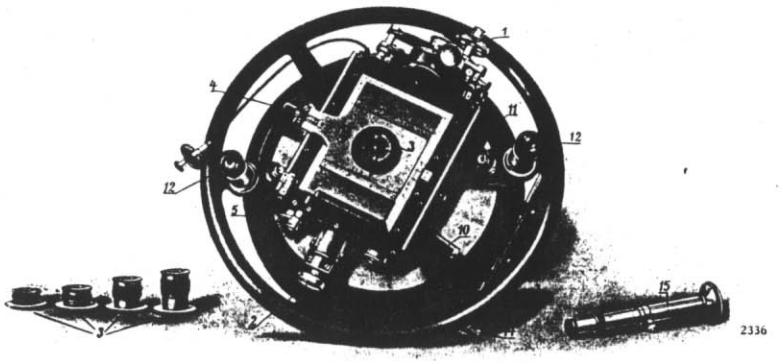


Fig. 91
Position Filar Micrometer, Model II.
No. 155

1 Micrometer drum with type-inking recording attachment. Pitch of measuring screw 0.4 mm
2 Screw for bodily displacement of the micrometer casing
3 Micrometer eyepieces with focussing collar graduated in diopters
4, 5 Screw heads for displacing eyepiece
6 Electric filar and field illuminating attachment (4-volt Osram lamps)
7 Adjustment to filar illumination
8 Adjustment to field illumination
9 Changing ring
10 Changing device
11 Position circle, divided into 10 minutes of arc
12 Reading microscopes, reading to 1 minute of arc, with electric illuminator
13 Clamp in position angles
14 Slow motion through position angles
15 Microscope for controlling the measuring screw

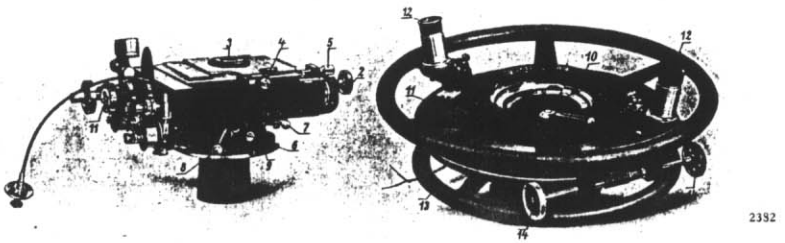


Fig. 92
Position Filar Micrometer, Model II.
No. 155

The micrometer casing together with the lighting attachment is fitted with a changing device and is readily removable, so that the position circle can be freely used in combination with other accessories.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
156	**Wellmann Double Image Micrometer,** Fig. 90, for measuring small distances, double stars, and the like, without measuring screw and solely by angular measurements with the aid of double-refracting prisms (see „Beobachtungsergebnisse der Kgl. Sternwarte Berlin", No. 6); with two orthoscopic eyepieces f = 25 and 12 mm. (1 and ½ in.) and two double refracting prisms. Tube shortening 95 mm. (3¾ in.) . . . . . In wooden case	*Aschman*	51 50 71

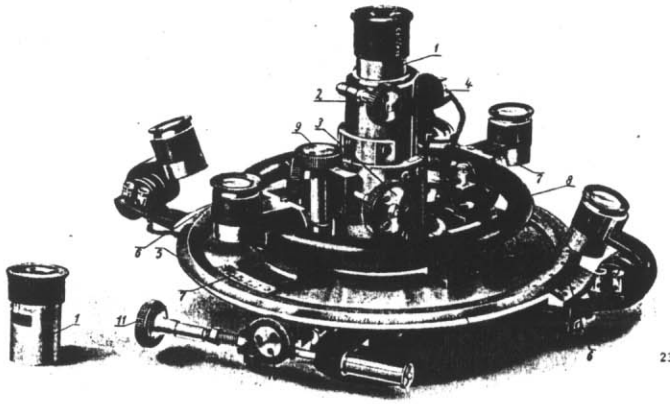


Fig. 90

Wellmann Double Image Micrometer, No. 156

1 Eyepiece with double refracting prism screwed on
2 Eyepiece clamp
3 Pinion head for focussing eyepiece upon cross lines
4 Filar illuminating attachment
5 Position circle with inner and outer graduations in half degrees
6 Verniers (reading to 1 min.) with magnifying readers for measuring position angles
7 Verniers (reading to 1 min.) with magnifying readers for measuring angular distances
8 Hand wheel for rotating eyepiece with verniers (7) when measuring distances
9 Clamp for vernier arms (7)
10 Clamp for position circle
11 Slow motion for rotation through position angles

Key to Figs. 93 and 95

1 Ring for attachment to telescope
2 Plug connectors for electric lighting (4-volt lamp)
3 Clamp for position circle
4 Helical slow motion in position angle
5 Encased position circle graduated into 10 minutes of arc, reading by two microscopes with verniers to one minute of arc
6 Microscopic readers for the position circle
7 Illuminating attachment for the position circle
8 Change-over switch to lamp for position circle
9 Sliding contacts for establishing electric connection to micrometer casing
10 Changing device for fixing the micrometer casing
11 Locating stops and screws for fixing the micrometer casing in position
12 Locating marks for correctly applying the micrometer casing
16 Change-over switch for red and white filar illumination
17 Box slide for the micrometer casing
18 Handles to (17)
20 Micrometer casing
21 Screw head for displacing the micrometer casing
23 Milled head to micrometer displacement. Pitch of micrometer screw ½-mm. Limit of filar motion 45 mm. (1¾ in.). Limit of distance measurement 70 mm. (2¾ in.)
24 Reading drum with revolution counter for the micrometer motion
25 Drum illuminating attachment
26 Magnifying reader, 6×
27 Milled head for displacing the stationary filar plate relatively to the movable plate
28 Push-in limit stop to (27)
38 Switch for (25)
40, 41 Milled heads for displacing the eyepiece
42 Orthoscopic eyepiece with focussing collar graduated in terms of diopters
45 Scale to (40)
46 Scale to (21)

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

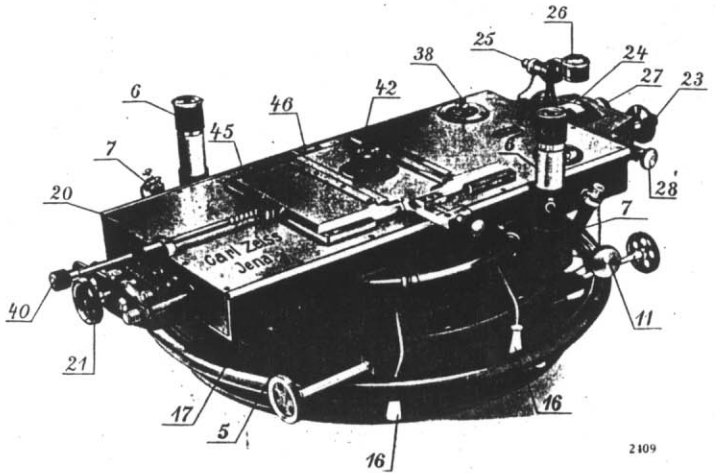


Fig. 93

Position Filar Micrometer, Model III, No. 157

Price: On application. Codeword: *Aschoura.* Ident. No.: 51 50 81

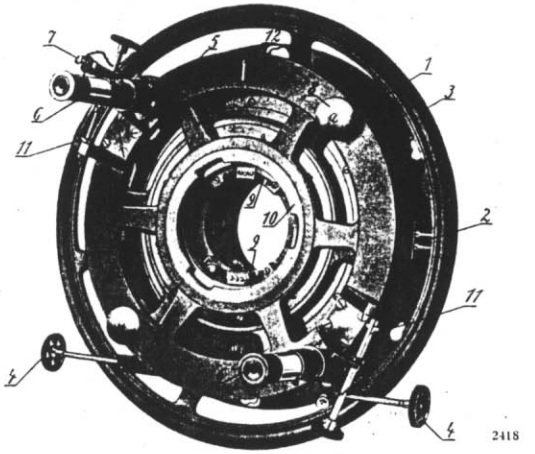


Fig. 95

Position Filar Micrometer, Model III, No. 157

Position circle with changing device, available for use with other accessories after the detachment of the micrometer casing.

Surveying Instruments

Descriptive pamphlets on application



6089

Fig. 96

Models Nos. I, II, and III have biaxial telescopes with reversible spirit levels. The bubble is seen without parallax through prisms from the eye and objective ends. The telescope has an internal focussing lens.

Fig. 96

Levels Nos. II and III

Nos. 159—161

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Levels, Figs. 96, 98, with accessories, stand, and case		
158	No. I, Diam. of objective: 27 mm. ($1\frac{1}{16}$ in.), magn. 20 ×	*Geodesmus*	
159	No. II, „ „ „ 35 mm. ($1\frac{3}{8}$ in.), „ 28 ×	*Geodesy*	
160	No. III, „ „ „ 45 mm. ($1\frac{3}{4}$ in.), „ 36 ×	*Geodetical*	
161	No. III, „ „ „ with parallel plate micrometer 45 mm. ($1\frac{3}{4}$ in.), „ 36 ×	*Geodie*	
162	No. IV, „ „ „ without circular bubble 27 mm. ($1\frac{1}{16}$ in.) „ 20 ×	*Geodized*	
163	No. IV, „ „ „ with circular bubble 27 mm. ($1\frac{1}{16}$ in.) „ 20 ×	*Geodore*	
	High Precision Levelling Staves with Invar Tape, see special leaflet		
	Repeating Theodolite No. II, Fig. 97 The circles read to $\frac{1}{10}$ ths of a double minute by scale telescopes. The diameter of the objective is 35 mm. ($1\frac{3}{8}$ in.) and the telescope magnifies 30 ×. Complete with all accessories, case, and stand		
164	**Repeating Theodolite No. II**, without altitude circle.	*Geodromica*	
165	„ „ **No. II**, with altitude circle	*Geodynamik*	

Dimensions and Weights

Astro 30 No.	Instrument	Dimensions: Instrument Width	Instrument Height	Case Length	Case Width	Case Height	Weights: Instr.	Case	Stand
		in.	in.	in.	in.	in.	lbs.	lbs.	lbs.
158	Level No. I	$7\frac{7}{16}$	$7\frac{1}{2}$	$9\frac{1}{16}$	$6\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{4}$	$8\frac{3}{4}$
159	Level No. II	$11\frac{3}{16}$	$7\frac{1}{2}$	$12\frac{1}{4}$	$8\frac{1}{2}$	$4\frac{1}{2}$	$7\frac{3}{4}$	6	10
160	Level No. III	$10\frac{1}{4}$	$7\frac{1}{2}$	$15\frac{3}{4}$	$8\frac{5}{16}$	$4\frac{3}{4}$	$9\frac{1}{2}$	$6\frac{3}{4}$	10
161	Level No. III with parall. plate micrometer	$15\frac{3}{4}$	$7\frac{1}{2}$	$15\frac{3}{4}$	$8\frac{5}{16}$	$4\frac{3}{4}$	$10\frac{1}{4}$	$6\frac{3}{4}$	10
162	Level No. IV	$7\frac{7}{16}$	$4\frac{3}{4}$	$8\frac{5}{16}$	6	$4\frac{1}{2}$	$3\frac{1}{4}$	$2\frac{1}{4}$	$8\frac{3}{4}$
164	Rep. Theod. No. II without altit. circle	$9\frac{1}{16}$	$10\frac{5}{16}$	$7\frac{7}{16}$	$7\frac{7}{16}$	$12\frac{1}{4}$	$11\frac{1}{2}$	11	$10\frac{1}{2}$
165	Rep. Theod. No. II with altit. circle	$9\frac{1}{16}$	$12\frac{1}{4}$	$7\frac{7}{16}$	$7\frac{7}{16}$	$12\frac{1}{4}$	$14\frac{1}{4}$	11	$10\frac{1}{2}$

For particulars of dimensions and weights see also page 133 — **Price List at end of catalogue**

Repeating Theodolite with completely covered circles, reading by scale microscopes, with transit telescope having an internal focussing lens, pin and socket arrangement on tripod, simple repeating axis without adjustment, centreing adjustment independent of levelling devices. The graduation is in sexagesimal and centesimal units.

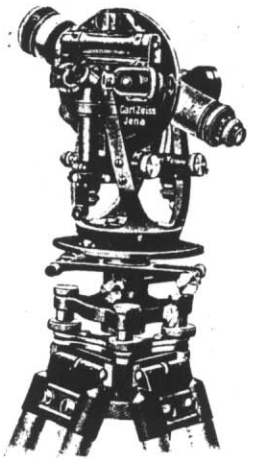


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Fig. 97

Repeating Theodolite No. II

Nos. 164, 165

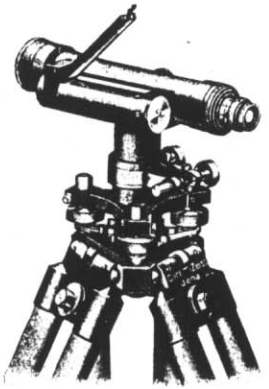

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Fig. 98

Level No. IV

Nos. 162, 163

Small Level with new type of telescope (with Wild's internal focussing lens). The instrument is of an extraordinarily rigid design and can therefore be employed on heavy work without fear of damage. It mounts in an exceedingly simple manner on the tripod, which is likewise very firm, and it packs away in its case without the least possible trouble. The bubble casing and telescope are in one piece. The bubble is set by means of the tribrach screws. The instrument is suitable for all practical purposes, whilst its sturdy design renders it particularly well adapted for building operations. The telescope magnifies 20 times and gives a very sharp image. The centimetre divisions on the staves can be read at a distance of 250 yards. The telescope is provided with a subtense attachment. Distances can be calculated from the formula

$$D = 0.10\ m + 100\ l$$

Astro Spectroscopes

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No
166	**Eyepiece Spectroscope, Figs. 99, 100,** consisting of a direct-vision prism and two cylinder lenses of different powers mounted for attachment to prism casing. The spectroscope has a screw for attachment to eyepiece in the place of the eyepiece cap . . . . . In case	*Asciabam*	51 52 11
167	**Abbe Spectroscopic Eyepiece, Fig. 101,** consisting of an Amici direct-vision set of prisms, a comparison wave-length scale, and a comparison spectrum, a Huygens eyepiece of 40 mm. ($1\frac{9}{16}$ in.) focus, slit, and Geissler tube. Tube shortening: 20 mm. ($\frac{4}{5}$ in.) . . . . . In case	*Asciabant*	51 52 21
168	**Astro Spectroscope, Fig. 102** consisting of a set of simple prisms of heavy flint glass, slit mechanism, collimator, observation telescope, and adapter. Details of construction to suit individual requirements.	*Asciabatis*	—



Eyepiece Spectroscope
No. 166

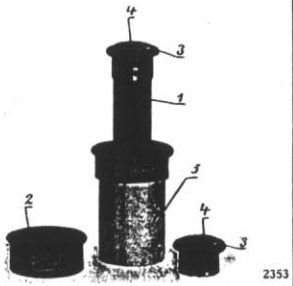


Fig. 99

1 Spectroscope tube with triple Amici prism and attachment screw
2 Eyepiece cap
3 Cylinder lens in mount

Fig. 100

4 Screw-in retaining ring for interchanging cylinder lenses
5 Eyepiece, f = 25 to 5 mm. (1 to $\frac{3}{16}$ in.)
6 Eyepiece sliding sleeve



Fig. 101

1 Tubular mount with Amici triple prism
2 Wave-length scale
3 Illuminating mirror for (2)
4 Prism displacement
5 Hinge for swinging out the prism attachment
6 Huygens eyepiece, f = 40 mm. ($1\frac{9}{14}$ in.)
7 Screw for adjusting the length of the slit
8 Screw for adjusting the width of the slit
9 Holder for the Geissler tube
10 Clamp for the rotation about the position axis

Fig. 101
Abbe Spectroscopic Eyepiece No. 167

Fig. 102

1 Prism casing
2 Collimator with focussing mechanism
3 Slit mechanism
4 Revolving collar and clamp for rotation about the position axis
5 Telescope
6 Telescope displacing gear
7 Counterpoise

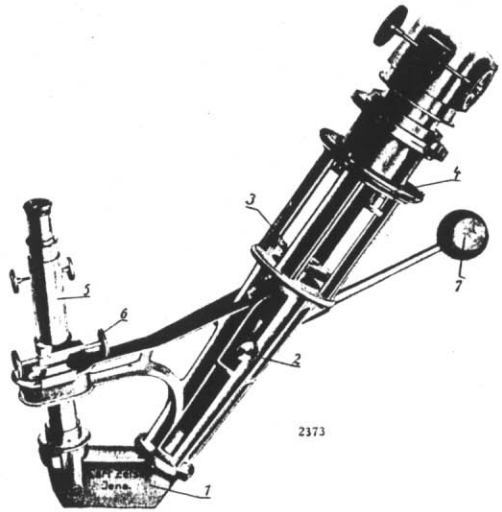


Fig. 102
Astro Spectroscope No. 168

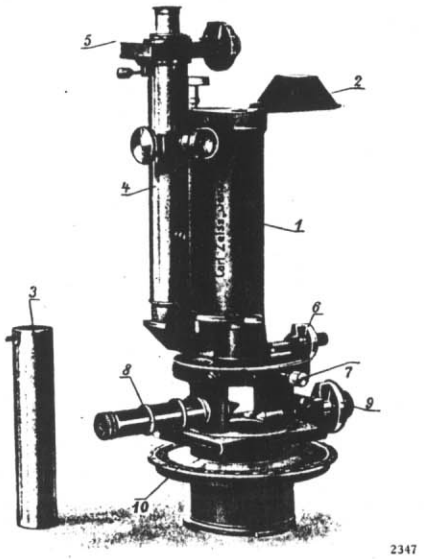


Fig. 103

Prominence Spectroscope
No. 170

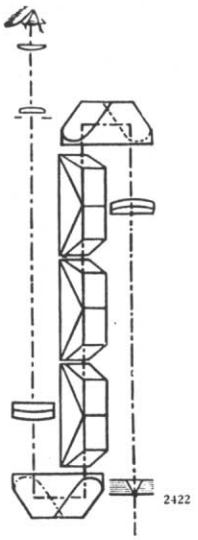


Fig. 104

Path of rays in Prominence Spectroscope
Nos. 169—170

Key to Fig. 103

1 Casing for direct-vision prism and collimator
2 Reflecting prism in swing-out mount for the interchange of (3)
3 Direct-vision prism
4 Telescope
5 Eyepiece screw micrometer No. 153
6 Screw for adjusting the width of the slit
7 Clamp to rotation of spectroscope for placing the slit parallel and at right angles to the sun's edge
8 Telescope for viewing the slit
9 Screw for adjusting the slit to the sun's edge
10 Position circle with graduation and index

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
169	**Prominence Spectroscope** of the type shown in Fig. 105, **Model A,** consisting of triple Amici prism (dispersion C–F = 15°), two right-angled reversing prisms shortening the instrument to one third the optical length (slit eyepiece), slit mechanism with divided drum for measuring the width of the slit, eccentric micrometer displacement of the spectroscope with respect to the telescope axis, position circle with clamp. The instrument has a screw for its attachment to the eyepiece draw-tube. Tube shortening: 40 mm [$1\frac{5}{8}$ in.] . . . . . In case	*Asciabere*	51 52 31

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

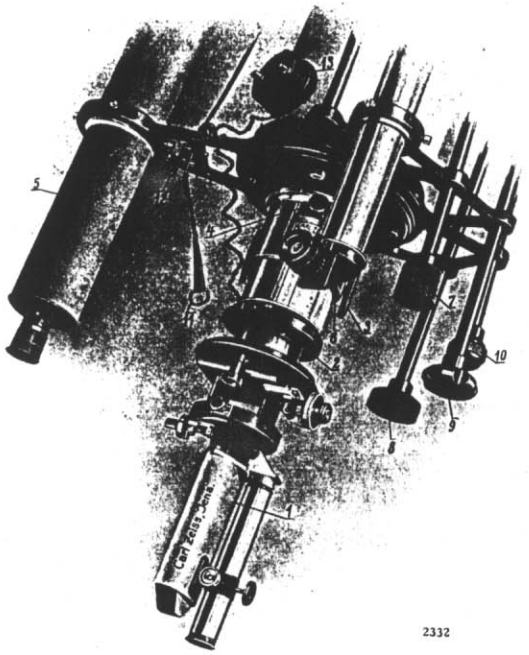


Fig. 105

Prominence Spectroscope No. 169
attached to 150-mm. (6-in.) Refractor Nos 54—56.

1 Prominence spectroscope
2 Changing device
3 Eyepiece draw-tube with rack and pinon movement
4 Clamp for eyepiece draw-tube
5 Finder telescope
6 Telescopic reader for the declination circle
7 Clamp to declination circle
8 Slow motion in declination
9 Clamp in R.A.
10 Slow motion in R.A
11 Draw-cord for opening the lens cap
12 Clamp to draw-cord (11)
13 Plug switch for electric illumination

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
170	**Prominence Spectroscope,** Model B, Figs. 104—105, similar to No. 169, fitted, in addition, with a triple Amici prism (Dispersion C-F = 5°) for stellar observations (the two sets of prisms being interchangeable). Eyepiece screw micrometer No. 153. Telescope for viewing the slit. Tube shortening: 40 mm. ($1\frac{9}{16}$ in.). . . . . In case	*Asciabimur*	51 52 41

Price List at end of catalogue

Accessories for Astro Photography

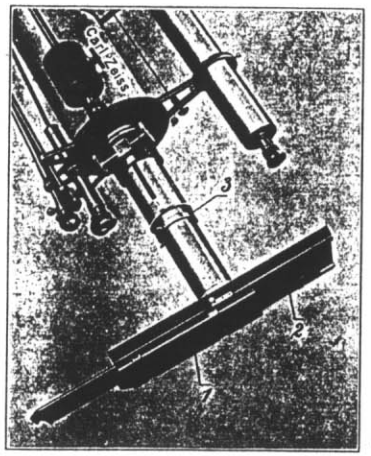


Fig. 106

Moon Camera No. 171
attached to 150-mm. (6-in.) Refractor No. 54

1 12×9-cm. (4¾×3¼-in.) double dark-slide
2 Ground glass focussing screen
3 Instantaneous iris-shutter

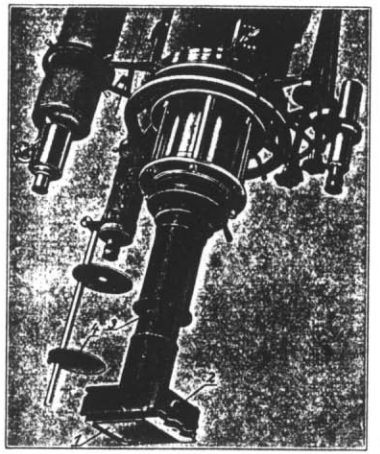


Fig. 107

Sun and Moon Camera No. 173
attached to 200-mm. (8-in.) Refractor No. 57

1 12×9-cm. (4¾×3¼-in.) double dark slide
2 Roller blind shutter
3 Revolving collar and clamp for rotation about the position axis
4 Solar projection screen attached to the finder telescope for controlling the position of the photographic image during exposure

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Moon Camera, Fig. 106, with screw for attachment to eyepiece draw-tube, fitted with magnifying combination, ground glass focussing screen, instantaneous iris-shutter. With box for storing		
171	**Moon Camera, Small Pattern,** for images of the moon up to 60 mm. (2⅜ in.) in diameter, equipped as above and supplied with a double dark-slide for four 12×9-cm. (4¾×3¼-in.) plates	*Asciabis*	51 53 11
172	**Moon Camera, Large Pattern,** for images of the moon up to 12 cm. (4¾ in.) in diameter, equipped as above, fitted with two double dark-slides, each available for two 18×13-cm. (7½×5-in.) plates, and a sector diaphragm for focussing	*Asciabor*	51 53 21
173	**Sun and Moon Camera,** Figs. 107 and 27, with screw for attachment to eyepiece draw-tube, consisting of magnifying combination, focal plane shutter, two double dark-slides available each for two 12×9-cm. (4¾×3¼-in.) plates, ground glass focussing screen and yellow screen. In box for storing	*Asciale*	51 53 31

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

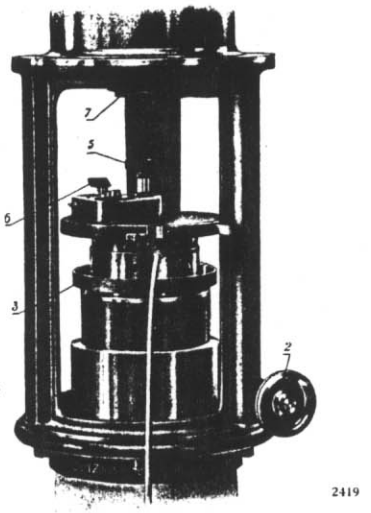


Fig. 108

Sector Instantaneous Shutter for Solar Cameras Nos. 174, 175

1 Double dark-slide
2 Pinion head for focussing the sun's image
3 Milled collar for focussing the cross lines
4 Release to instantaneous shutter
5 Milled head for setting the width of the sectors
6 Key for setting the shutter speed
7 Revolving colour disc
8 Collar and clamp for rotation about the position axis

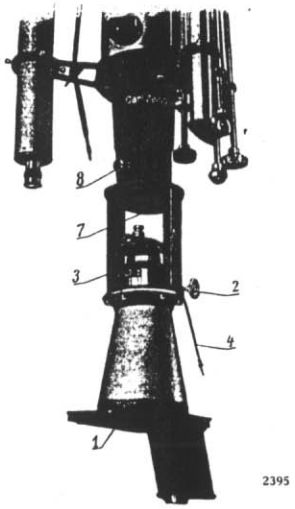


Fig. 109

Solar Cameras Nos. 174, 175
attached to a 150-mm. (6-in.) Refractor

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Solar Camera, Figs. 108, 109, consisting of magnifying combination, instantaneous shutter with variable sector opening and mechanical release, focussing devices, revolving colour disc, ground glass focussing screen, collar and clamp for rotation about position axis. The camera attaches to the telescope in the place of the eyepiece draw-tube. With box for storing		
174	**Solar Camera, Small Pattern,** for solar images up to 90 mm. (3½ in.) in diameter, equipped as above and supplied with three double dark-slides for 18×13-cm. (7½×5-in.) plates.	*Asciamini*	51 53 51
175	**Solar Camera, Large Pattern,** for solar images up to 150 mm. (6 in.) in diameter, equipped as above and provided with three double dark-slides for 24×18-cm. (9½×7-in.) plates	*Asciamus*	51 53 61

Price List at end of catalogue

Astro Camera

for photographing stars, nebulae, comets, etc., Figs. 110, 111,
for attachment to equatorial telescope mountings Figs. 32, 37 and 47.

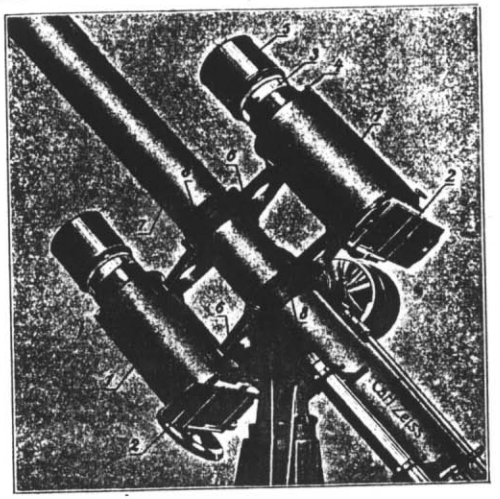
When ordering astro cameras for use with existing telescopes the following particulars should be supplied for determining the dimensions of the requisite clip attachments, viz. — The outer tube diameter, the dimensions of the middle body of the telescope and of the tubular clip, the distance of the middle body from the object glass, the inside diameter of the observatory dome and the middle of the observing slit.

Prices of astro cameras for objectives and dark-slides of dimensions other than here stated will be quoted on application.

The symbol "U. V." refers to the enhanced permeability to ultraviolet rays of the U. V. Glasses produced at the Jena Glass Works of Messrs. Schott & Co.

Astro 30 No.	Description	Aperture	Focal Length	To be quoted when ordering: Codeword	Identification No.
	60-mm. (2⅜-in.) Astro Camera, Fig. 110, with helical focussing mount, three metal dark-slides for 12×9-cm. (4¾×3½-in.) plates, ground glass focussing screen, and astro-photographic objective, exclusive of clips for attachment to telescope				
176	with Astro Petzval Lens No. 321 . . .	60 mm. (2⅜ in.)	27 cm. (10⅝ in.)	*Ascian*	51 54 21
177	with Astro Tessar Lens No. 324 . . .	60 mm. (2⅜ in.)	30 cm. (12 in.)	*Ascianda*	51 54 22
178	with Special Astro U. V. Lens No. 327	60 mm. (2⅜ in.)	40 cm. (15¾ in.)	*Asciandior*	51 54 23
	120-mm. (4¾-in.) Astro Camera, Fig. 111, with three-spindle focussing motion at dark-slide end, three metal dark-slides for 18×13-cm. (7½×5-in.) plates, ground glass focussing screen, and astro-photographic lens, exclusive of clips for attachment to telescope				
179	with Astro Petzval Lens No. 322 . . .	120 mm. (4¾ in.)	60 cm. (23⅝ in.)	*Asciandum*	51 54 41
180	with Astro Tessar Lens No. 325 . . .	120 mm. (4¾ in.)	60 cm. (23⅝ in.)	*Asciantes*	51 54 42
181	wit Special Astro U. V. Lens No. 328	120 mm. (4¾ in.)	100 cm. (39⅜ in.)	*Asciare*	51 54 43
	160-mm. (6⅓-in.) Astro Camera, Fig. 37, (page 35) with three-spindle focussing motion at dark-slide end, three metal dark-slides for 18×13-cm. (7½×5-in.) plates, ground glass focussing screen, and astro-photographic lens, exclusive of clips for attachment to telescope				
182	with Astro Petzval Lens No. 323 . . .	160 mm. (6⅓ in.)	80 cm. (31½ in.)	*Asciaremus*	51 54 61
183	with Astro Tessar Lens No. 326 . . .	160 mm. (6⅓ in.)	80 cm. (31½ in.)	*Asciarent*	51 54 62
184	with Special Astro U. V. Lens No. 329	160 mm. (6⅓ in.)	150 cm. (59 in.)	*Asciaretis*	51 54 63
185	The dimensions of clips for the attachment of the astro camera are governed by the dimensions of the existing telescope. Prices subject to quotation in each case . . .			*Asciarono*	
185a	**12×9-cm. (4¾×3¼-in.) Camera Attachment** for the eye end of 130 to 200-mm. (5¼ to 8-in.) refractors. Page 33, Fig. 35, Parts 55, 56 for astro-photography with the telescope object-glasses; with guide eye-piece (orthoscopic eyepiece f = 12.5 mm. = ½ in.), with cross-lines and electric dark-ground illumination with regulating resistance, collar and clamp for rotation about the position axis, two metal dark-slides for 12×9-cm. (4¾×3¼-in.) plates. In case. The cost of an eyepiece draw-tube with enlarged aperture, which is required for the unimpeded use of the camera is subject to an additional charge.			*Asemblaras*	51 54 11

For particulars of dimensions and weights see page 133 — Price List at end of catalogue



1 60-mm. (2⅜-in.) Astro Cameras
2 Metal dark-slides for one 12×9-cm. (4¾×3¼-in.) plate
3 Helical focussing collar
4 Clamp to focussing collar
5 Dew cap
6 Attachment clips
7 Telescope
8 Telescope clips

Fig. 110
Two 60-mm. (2⅜-in.) Astro-Cameras Nos. 176—178 attached to an 80-mm. (3⅛-in.) Telescope Nos. 42—44.

1 120-mm. (4¾-in.) Astro Camera
2 Metal dark-slides for one 18×13-cm. (7½×5-in.) plate
3 Three-spindle focussing motion
4 Dew cap
5 Draw-cord for opening lens cap
6 Attachment clips
7 Telescope
8 Middle body of telescope to which clips are to attached

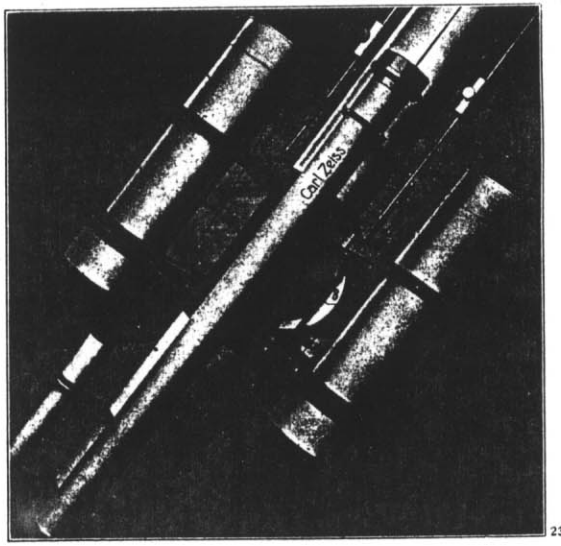
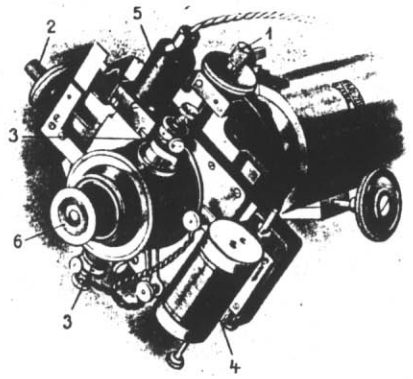


Fig. 111
Two 120-mm. (4¾-in.) Astro-Cameras Nos. 179—181 attached to 150-mm. (6-in.) Refractor Nos. 54—56.



1, 2 Micrometer double slide motion. Limit of motion 20 mm., reading by scale and index
3, 3 Electric lamp in mount, for filar illumination (bright lines on a dark ground)
4 Regulating resistance for varying the intensity of the illumination
5 Plug switch
6 Orthoscopic micrometer eyepiece

Fig. 111a

Guiding Eyepiece Head with compound slide No. 186a

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Guiding Eyepiece Head for focussing and locating a star at any point away from the optic axis in the field of view of the guiding telescope of a refractor equipped with astro-camera (pages 36, 37, 41), more especially for fixing the guiding star during prolonged exposures in photographic searches of planetoids, also when photographing comets, nebulae, and the like		
186a	**Guiding Eyepiece Head with compound slide,** Fig 111a. The eyepiece (6) in its sleeve can be displaced at right angles to the axis of the telescope by two micrometer screws (1, 2) at right angles to each other. The eyepiece sleeve is provided with a cross-line diaphragm and an electric lamp attachment for the illumination of the field. The set includes any two of the orthoscopic eyepieces ranging from 25 to 5 mm. (1 to $\frac{1}{16}$ in.) focus, Nos. 260—268, according to choice. Tube shortening: 40 mm. (1 in.). In case	*Asciarum*	51 54 71
186b	**Guiding Eyepiece Head with revolving position collar,** Fig. 112 The eyepiece head is fitted with a slow motion slide for the lateral displacement of the illuminating attachment to the field of view and the cross-lines, the filar plate, and eyepiece sleeve. The slide can be rotated to any extent about the position axis and its angular position read off by an index on a position circle (divided in degrees). The cross-lines can be set equatorially in any angular position of the slide. The price includes a choice of any two of the orthoscopic eyepieces Nos. 260 to 268 of 25 to 5 mm. (1 to $\frac{1}{16}$ in.) focus. Draw-tube shortening: 105 mm. ($4\frac{1}{4}$ in.). In case	*Asciasse*	51 54 81
186c	**Guiding Eyepiece Head with compound slide and position circle,** Fig. 112a. The micrometer eyepiece (11) with cross webs and electric illumination of the field is capable of lateral displacement in two directions at right angles to one another by micrometer screws (1,2). The limit of motion is 80 mm. ($3\frac{1}{4}$ in.) in either direction, the displacements being read by scales and indices. Fractional millimetre readings are furnished by divided drums. The electric lamps are adjusted for 4 volts, 0.4 amps. For adjustment in position angles the attachment is fitted with a graduated position circle and index. A regulating resistance (9) is provided for varying the illumination. The outfit includes any two of the orthoscopic eyepieces Nos. 260 to 268 of 25 to 5 mm. (1 to $\frac{1}{16}$ in.) focus. In case	*Asegurais*	51 54 75

For particulars of dimensions and weights see page 133 — Price List at end of catalogue

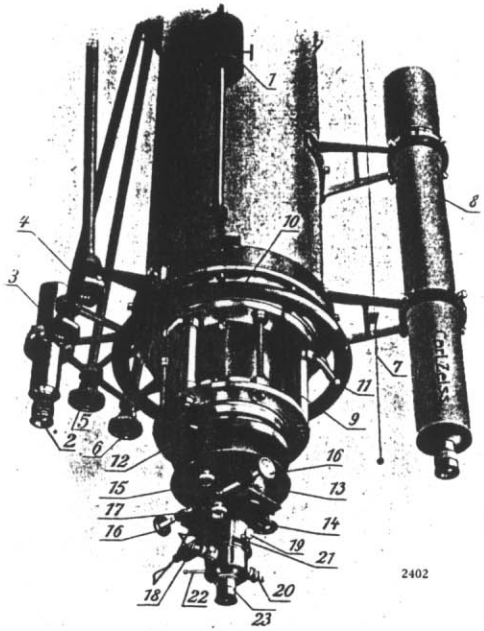


Fig. 112

Eye end of 200-mm. (8-in.) Refractor, pages 34 and 35, **with Guiding Eyepiece Head** No. 186b

Key to Fig. 112:

1 Sliding counterpoise in declination
2 Telescopic reader to declination circle
3 Clamp for motion in R. A.
4 Clamp for motion in declination
5 Slow motion in R. A.
6 Slow motion in declination
7 Draw-cord for opening lens cap
8 Finder with helical focussing mount
9 Eyepiece draw-tube with three-spindle motion
10 Hand wheel for working three-spindle motion
11 Clamp to draw-tube motion
12 Changing device with locking lever

Guiding Eyepiece Head:

13 Position circle
14 Rotation about position axis
15 Position clamp
16 Distance screw motion
17 Clamp to distance motion
18 Plug connector
19 Clamp to rotation about position axis of eyepiece with filar plate
20 4-volt incandescent lamp
21, 22 Change-over switch for field or filar illumination
23 Sliding sleeve with eyepiece of 25 to 5 mm. (1 to $\frac{1}{16}$ in.) focus

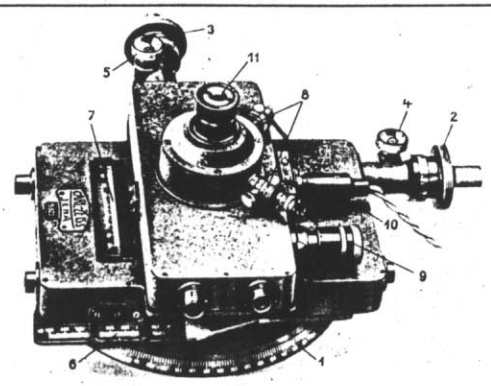
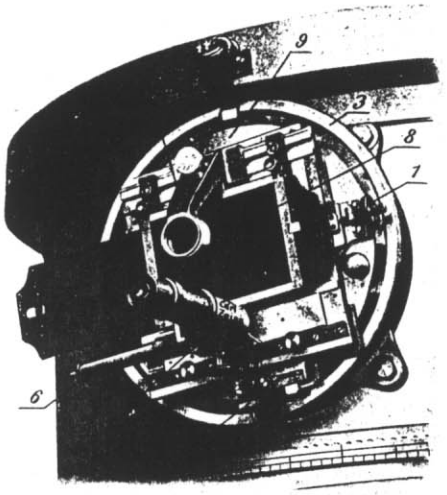


Fig. 112a

Guiding Eyepiece Head with compound slide and position circle No. 186c

Key to Fig. 112a:

1 Graduated position circle with index
2, 3 Micrometer screw heads with divided drums. Limit of motion 80 mm.
4, 5 Clamps to slide motions
6, 7 Millimetre scales with index to read displacements of slides
8 Two electric lamps with mounts for the filar illumination
9 Regulating resistance for varying the intensity of the illumination
10 Plug connector
11 Micrometer eyepiece



2412

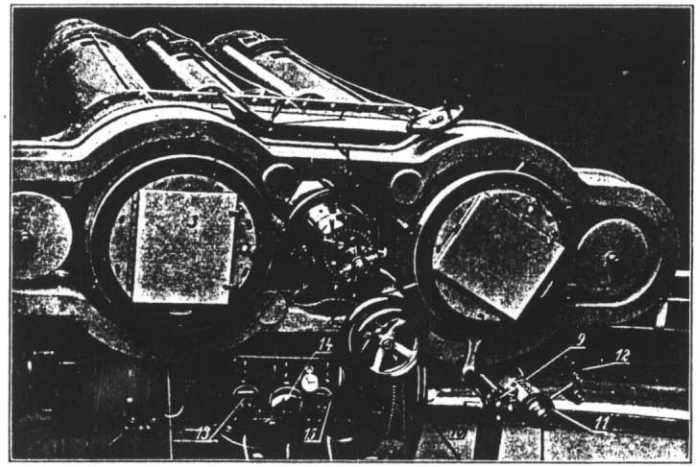
Fig. 114

1, 2 Micrometer screws for displacing slides at right angles to one another
3 Hand wheel with divided circle for focussing the photographic plate
4 Illuminating attachment to the position circle
5 Guiding microscope
6 Filar illuminating attachment to microscope
7 Bracket for microscope (5) for direct observation of the primary object
8 Metal dark-slides for 12 × 9-cm. (4¾ × 3½-in.) plates
9 Position circle

Fig. 114

Double Dark Slide supplied for the 720-mm. (28-in.) Reflector of the Heidelberg Observatory

Fig. 51, page 48



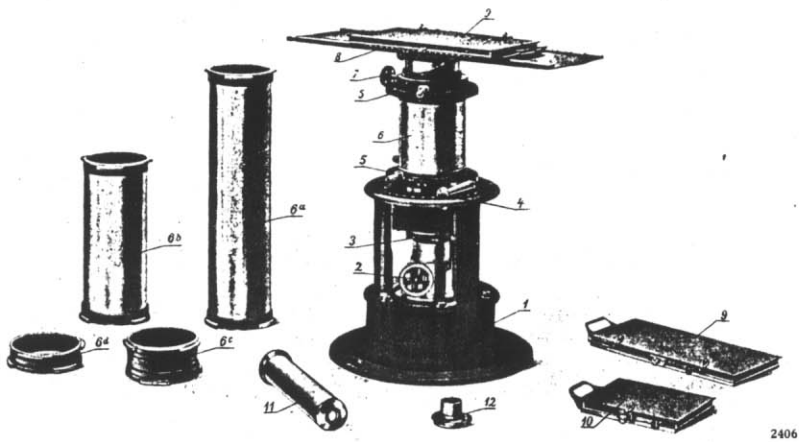
2379

Fig. 115

Triple Photographic Refractor

of the Observatory at Neuenburg (Switzerland), Fig. 43, page 41

Visual guiding telescope, object glass of 300 mm. (12 in.) diameter, 5 metre (16½ ft.) focus; with guiding eyepiece head No. 186b. Two astro-photographic tubes with U. V. triplet o. g. of 360 mm. (14½ in.) diameter and 4.5 metre (14¾ ft.) focus, Fig. 156, page 113, — Three-spindle focussing gear to camera. Metal dark-slides for 30×24-cm. (12×9-in.) plates.



2406

Fig. 113

Planet Camera No. 187

1 Flange for fixing to telescope
2 Hand wheel for displacing the magnifying system
3 Time and instantaneous shutter
4 Graduated collar and clamp for rotation about position axis
5 Changing devices with locking spring
6—6d Camera tubes for various magnifications
7 Helical sharp-focussing motion for plate
8 Dark-slide carriage with millimetre scale
9 Metal dark-slides for 18 × 9-cm. (7 × 3½-in.) plates
10 Metal dark-slides for 12 × 9-cm. (4¾ × 3½-in.) plates
11 Inset tube with reducing system
12 Eyepiece sliding sleeve

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Planet Camera, Figs. 113 and 42, page 40, beeing an astro-photographic camera of special design with magnifying and reducing systems for photographing large planets, the moon, and the like. The planet camera consists of an adapting flange, rack and pinion (2) and helical mount (7) for sharp-focussing, time and instantaneous shutter, five camera tubes with changing devices (6—6d) for various magnifications and reductions, two 18 × 9-cm. (7 × 3½-in.) metal dark-slides, one 12 × 9-cm. (4¾ × 3½-in.) metal dark-slide, magnifying and reducing lenses, and eyepiece sliding sleeve		
187	In case for storing	*Asciassero*	51 54 91

Price List at end of catalogue

1 U.V. Objective prism (50°)
2 Special U. V. Objective of 60 mm. (2⅜ in.) aperture and 40 cm. (15¾ in.) focal length
3 Focussing mount
4 Metal dark-slide for 12×9-cm. (4¾×3½-in.) plates
5 Pivot to rotation about telescope axis
6 Clamps to the latter
7 Base for attachment of spectrograph to telescope

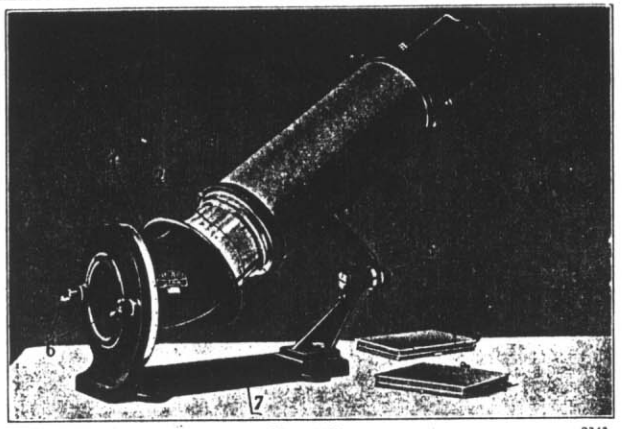


Fig. 117

Objective Prism U. V. Spectrograph No. 188

Fig. 117 2343

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
188	**Objective Prism U. V. Spectrograph,** Fig. 117, with 50° U. V. Prism, special U. V. Objective No. 327 of 60 mm. (2⅜ in.) aperture and 40 cm. (15¾ in.) focal length, 3 metal dark-slides for 12×9-cm. (4¾×3½-in.) plates. In case	*Asciala*	51 56 11

Fig. 118

Two-prism U. V. Spectrograph

as fitted to the 720-mm. (28-in.) Reflector (1:4) of the Heidelberg Observatory Fig. 51, page 48, constructed by Carl Zeiss, Jena

Price: On application

Codeword: *Asedado*

Identification No.: 51 56 21

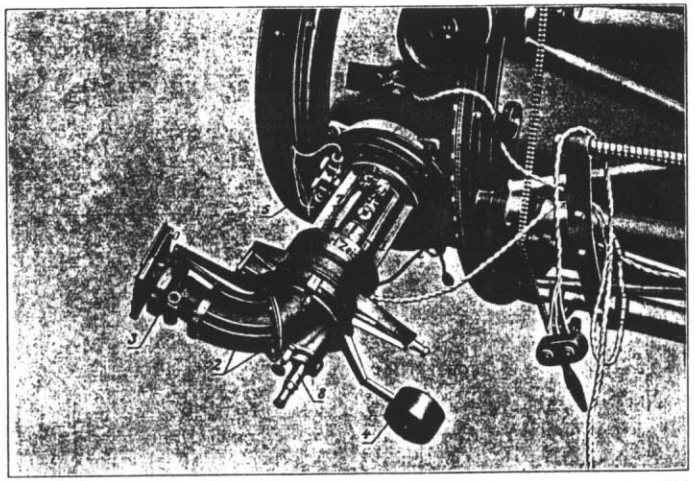
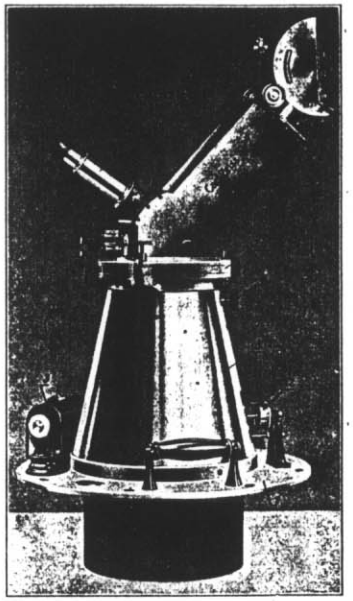


Fig. 118 2341

1 Collimator, 40 mm. (1⁹/₁₆ in.) aperture (1:4)
2 Prism body with two 60° prisms
3 Camera with 12×9-cm. (4¾×3½-in.) plate holders
4 Counterpoise to camera
5 Iron core arc lamp for comparison spectrum
6 Screw head for adjusting the width of the slit
7 Screw head for adjusting the slit boundaries
8 Slit viewing telescope

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

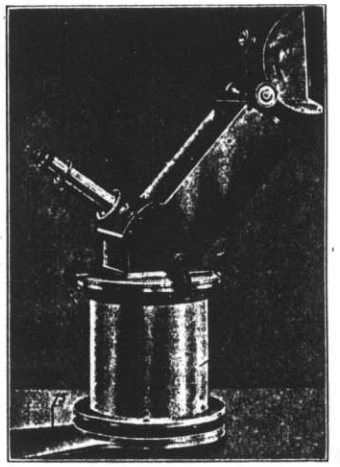


2340

Fig. 119

Single-Prism U. V. Spectrograph

No. 189



2337

Fig. 120

Prism and Camera Part of the Spectrograph

No. 189 arranged as a prismatic objective spectrograph

1 Flange for attachment to telescope
2 Divided drum for adjusting the width of the slit
3 Arc lamp for the comparison prism
4 Mechanism for adjusting the boundaries of the slit
5 Collimator sheathing
6 Screw head for focussing the collimator lens
7 Flange with swivel bolts
8 Sheathing for the prism and camera tubes
9 Guiding telescope
10 Camera focussing pinions
11 Milled head for rotating the camera tube
12 Cylindrical guide for adjusting the inclination of the plate
13 Metal dark-slide for 6½×3-cm. (2½×1¼-in.) plates
14 Tube fitting for attachment of prism with camera
15 Fixing-flange on telescope

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
189	**Single-prism U. V. Spectrograph,** Figs. 119, 120 with 60° quartz prism consisting of two half prisms of 30°, a collimator lens of quartz U. V. glass of 40 mm. (1⁹/₁₆ in.) diam. and 40 cm. (15¾ in.) focus, a camera lens combination consisting of a simple quartz lens of 40 mm. (1⁹/₁₆ in.) diam. and 32 cm. (12⅝ in.) focus, and a metal dark-slide for 6½×3-cm. (2½×1¾-in.) plates. The prism and camera part is readily detachable and may be used independently as a prismatic objective spectrograph. In case for storing	*Asciatarum*	51 56 41

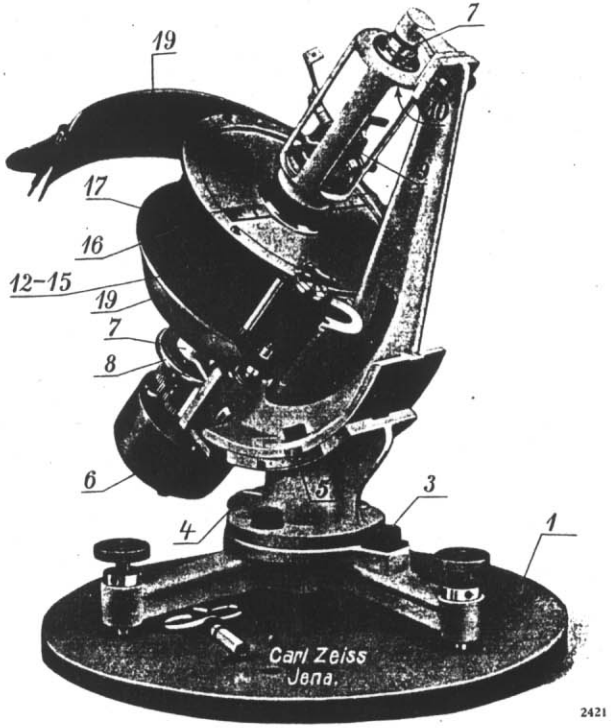


Fig. 121

Dorno's Continuous U. V. Helio Spectrograph for recording the ultraviolet spectrum of the sun.

Cf. "Studie über Licht und Luft des Hochgebirges", by Dr. C. Dorno, published by Vieweg, Braunschweig, 1911.

1 Base
2 Tripod with foot screws
3 Circular spirit level
4 Azimuth correction
5 Adjustment for latitude
6 Spring-driven clock for rotation of spectrograph in keeping with the diurnal motion of the sun
7, 7 Polar axis
8 Clamping wheel for engaging the clock
9 Plane mirror of speculum metal with centre hole
10 Concave mirror of speculum metal
12—15 Quadruple prism quartz spectrograph
16 Colour filter on quartz plate
17 Drum for film ribbon
18, 19 Light-proof casing

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
190	**U.V.Helio Spectrograph** for continuously photographing the ultra-violet-spectrum of the sun's rays, Fig. 121, being an apparatus for ascertaining the permeability to the ultra-violet rays of the earth's atmosphere and its variations during the day. It consists of an equatorially mounted quartz spectrograph which continuously registers the U.V. spectrum of the sun on a photographic film band. In plain case	*Asciatior*	51 56 61

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

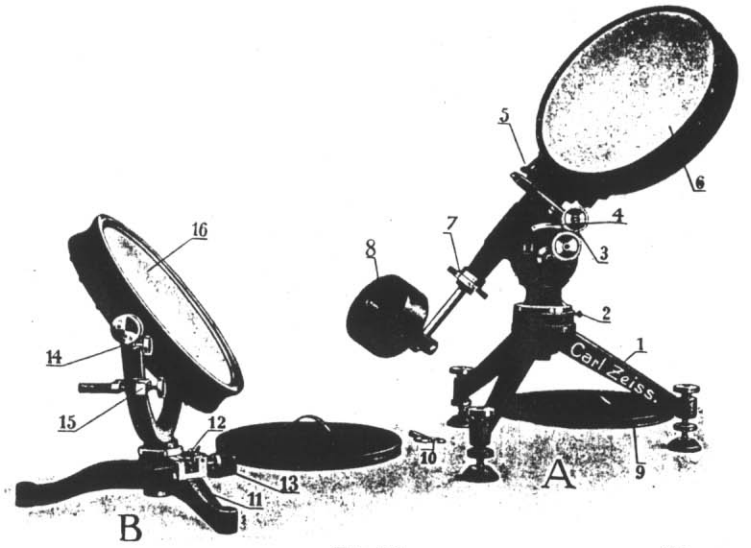


Fig. 122

400-mm. (15¾-in.) Cœlostat (A) and 330-mm. (13-in.) Auxiliary Mirror (B)
Nos. 191 and 192

1 Tripod with foot screws
2 Azimuth correction
3 Spring-driven clock
4 Polar adjustment
5 Clamp for motion in R. A.
6 Plane glass mirror of 400 mm. (15¾ in.) diameter silvered in front
7 Hour circle with vernier
8 Counterpoise
9 Hoods for mirrors
10 Clock winding key
11 Plain tripod
12 Clamp for motion in azimuth
13 Slow motion in azimuth
14 Clamp for motion in altitude
15 Slow motion in altitude
16 Plane glass mirror of 330 mm. (13 in.) diameter silvered in front

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
191	**400-mm. (15¾-in.) Cœlostat,** Fig. 122 (A), for use in conjunction with a stationary telescope or astro-camera, for automatically maintaining the rays of moving stars by reflection at the mirror (6) in the direction of the stationary telescope axis, e. g. when photographing the sun's corona with cameras with very long extensions, and the like. In plain case	*Asciatos*	51 55 11
192	**330-mm. (13-in.) Auxiliary Mirror,** Fig. 122 (B), for sending the rays reflected by the cœlostat in any given direction which cannot be reached by the cœlostat alone. In plain case	*Asciatum*	51 55 21

Price List at end of catalogue

Measuring Apparatus for Astro Photography

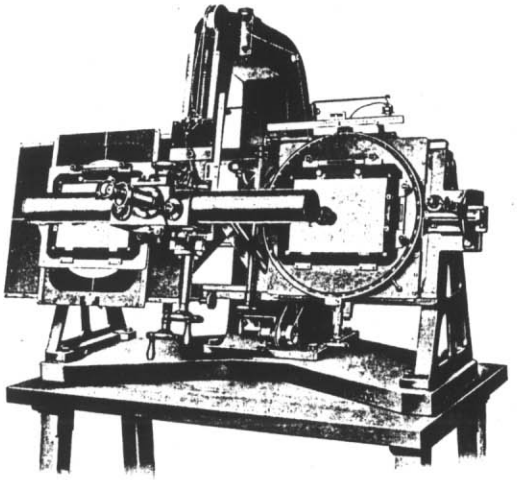


Fig. 123

Pulfrich Stereo Comparator for 30×24-cm. (12×9-in.) plates with Flicker Microscope

for measuring and comparing astro-photographs of all kinds No. 195

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
193	**Abbe Comparator,** Fig. 124, in plain case	*Meationis*	
193a	**Pulfrich Co-ordinate Measuring Apparatus,** Fig. 125a, for 18×18-cm. (7¼×7¼-in.) plates	*Meatorem*	
194	**Hartmann Spectro Comparator,** Fig. 125, in plain case	*Meatknife*	
195	**Pulfrich Stereo Comparator,** Fig. 123, Model A for plates up to 30×24 cm. (12×9½ in.)	*Meato*	
196	**Stereo Comparator** Fig. 123, Model B for plates up to 18×16 cm. (7½×6½ in.)	*Meatometer*	
196a	**Comparison Star Scale** for the determination of magnitudes of stars on photographic negatives. A series of 50 black, sharply confined, photographic circular faces of 0.5 to 0.01 mm. diameter on glass plate 80×12×2.5 mm. with glass cover. Increase of the diameters within the whole scale constant. The comparison stars numbered from 5 to 5 . . . . In case	*Asemblaria*	51 57 16

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

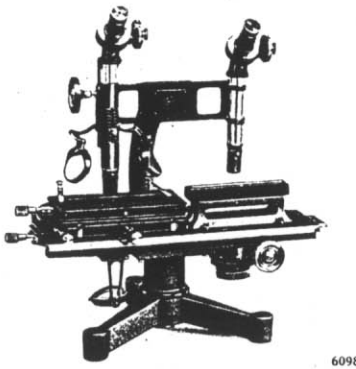


Fig. 124

No. 193. **Abbe Comparator**

The Abbe Comparator is adapted for measuring lengths up to 100 mm. with a degree of accuracy of ± 0.0015 mm. more particularly for evaluating scales, gratings, spectra, star maps, and such like.

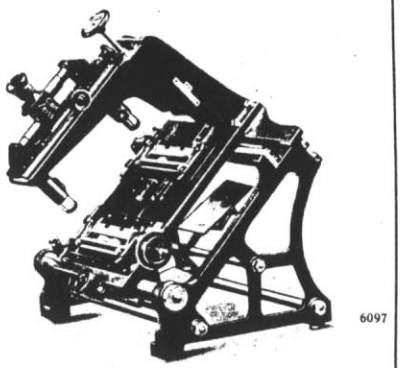


Fig. 125

No. 194. **Hartmann Spectro-Comparator**

The Hartmann Spectro-comparator is adapted for measuring spectrograms, especially for the measurement of displacements of spectrum lines. A detailed description of the instrument will be found in the Zeitschrift für Instrumentenkunde, Vol. 26, 1906, pp. 255, 256, etc.

The Co-ordinate Measuring Apparatus is adapted for measuring astrophotographs in terms of rectangular or polar co-ordinates within plate sizes up to 18×18 cm. (7¹/₄×7¹/₄ in.). The accuracy of linear measurements is ± 0.0015 mm.

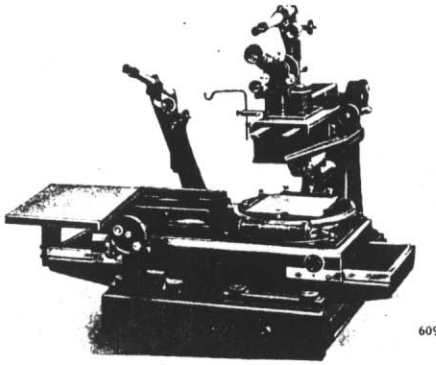


Fig. 125a

No. 193. **Pulfrich Co-ordinate Measuring Apparatus**
for 18×18-cm. (7¹/₄×7¹/₄-in.) plates

Magnifiers and Focussing Microscopes

Special Lists on application

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Focussing Magnifiers, Figs. 126, 129 for focussing the image on the ground glass focussing screen and for viewing photographic negatives		
197	Magnifier A, Fig. 126, magn. × 6	*Fodaveras*	
198	Magnifier A, Fig. 126, magn. × 10	*Fodavero*	
199	Magnifier A, Fig. 126, magn. × 16	*Fodavimus*	
200	Magnifier B, Fig. 129, magn. × 6	*Fodder*	
201	Tripod Focussing Mount for magnifier B, Fig. 130	*Fodem*	
202	Focussing Sleeve for magnifier B, Fig. 128	*Fodera*	
203	Ring Holder with Handle for magnifier B, Fig. 131	*Foderina*	
	Folding Magnifier, Fig. 127 These are pocket magnifiers for use in the hand. In leather pouch		
204	Magnification: ×2.5, diameter of field of view: 100 mm. (4 in.)	*Medehulp*	14 70 50
205	Magnification: ×6, diameter of field of view: 30 mm. ($1^3/_{16}$ in.)	*Medehulpig*	14 70 55
206	Magnification: ×10, diameter of field of view: 15 mm. ($^9/_{16}$ in.)	*Medejagen*	14 70 57
	Magnifying Picture Viewers, Fig. 132 These are simple anastigmatic lenses of small magnifying power for viewing photographs, also useful as reading glasses. In case		
207	Magnification: $\times 1^2/_3$, diameter of field of view: 160 mm. ($6^3/_4$ in.)	*Medagliere*	14 71 00
208	Magnification: $\times 2^1/_4$, diameter of field of view: 130 mm. ($5^1/_8$ in.)	*Medagliata*	14 71 01
209	Magnification: $\times 2^2/_3$, diameter of field of view: 100 mm. (4 in.)	*Medaglia*	14 71 02
210	Magnification: $\times 3^1/_2$, diameter of field of view: 80 mm. ($3^1/_8$ in.)	*Medaba*	14 71 03
	Verant Magnifiers, Fig. 132 These magnifiers satisfy higher requirements regarding the quality of the image (chromatic correction and freedom from distortion). In case		
211	Magnification: $\times 1^2/_3$, diameter of field of view: 160 mm. ($6^3/_4$ in.)	*Medaglista*	14 71 50
212	Magnification: $\times 2^1/_4$, diameter of field of view: 130 mm. ($5^1/_8$ in.)	*Medaglione*	14 71 51
213	Magnification: $\times 2^2/_3$, diameter of field of view: 100 mm. (4 in.)	*Medaglino*	14 71 52
214	Magnification: $\times 3^1/_2$, diameter of field of view: 80 mm. ($3^1/_8$ in.)	*Medaglina*	14 71 53
	Focussing Microscope, Fig. 133 for accurately focussing the image on the ground glass screen. The advantages of the focussing microscope over the focussing magnifiers consist in its higher power, × 28, and the greater distance which it affords between the eye and the		
215	screen	*Fodaturum*	

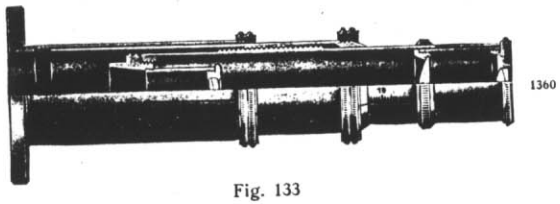


Fig. 133

Focussing Microscope No. 215

a) Clamp for coarse adjustment b) Clamp for fine adjustment

For particulars of dimensions and weights see page 133 — **Price List at end of catalogue**

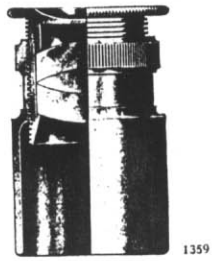


Fig. 126

Focussing Magnifier A, ×6

Nos. 197—199

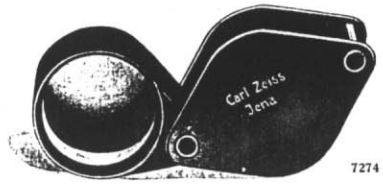


Fig. 127

Folding Magnifier, × 6

Nos. 204—206



Fig. 128

Sliding Sleeve for Focussing Magnifier B

No 202

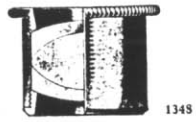


Fig. 129

Focussing Magnifier B, ×6

No. 200

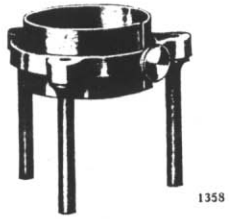


Fig. 130

Tripod Focussing Mount for Magnifier B

No. 201



No. 131

Ring Holder with Handle for using the Focussing Magnifier B as a Picture Viewer

No. 203



Fig. 132

Picture Viewer or Verant Magnifier, ready for use with the right eye

Nos. 207—214

Special pamphlets on Picture Viewers, Folding Magnifiers, Monocular and Binocular Telescopic Magnifiers and Binocular Magnifiers will be sent on application

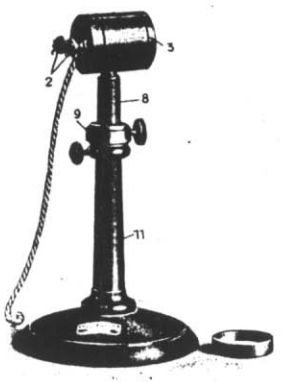
Instruments for Measuring Radiant Energy (Radiomicrometers)

The instruments described in the succeeding paragraphs are provided with thermocouples of a new form. These thermocouples have the following advantages over the well-known types of iron-and-constantan couples:

1. They yield a high thermo-electromotive force associated with the lowest internal resistance compatible with it;
2. Their inertia is remarkably low;
3. The optical and mechanical arrangements enable their adjustment to be made with ease and precision;
4. By the partial use of concave mirrors a maximum of the radiant energy is rendered available for measurement.

Detailed information respecting these instruments will be found in Prof. Voege's paper entitled "Neue Apparate zur Strahlenmessung" published in the physikalische Zeitschrift 21 (1920) 288—296, reprints of which will be supplied free on application.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
215a	**Single Thermocouple,** Fig. 132 a, b, with gilt spherical mirror, resistance 2 to 3 ohms, with mount for screwing in windows of various materials, with holding-down clamps at the back, including standard pin with adjustable screw-collar for insertion in the saddle stands on the optical bench or in the iron foot, together with detachable cover. In case	*Aselho*	51 58 10
215b 215c 215d	**Closing Window** for No. 215 *a*, with **Fluorite Plate,** 12 mm. diam., 2 mm. thick . . . . . . **Plate of Rocksalt** with lacquer film, 12 mm. diam., 2 mm. thick **Quartz Plate,** 12 mm. diam., 2 mm. thick	 *Aselido* *Asella* *Asellarum*	
215e	**Thermopile,** Fig. 132 c, comprising 10 mounted thermocouples arranged in series. The pile has an adjustable slit arranged close to its front. Its length is 15 mm. At a point below its continuation it is fitted with a small ranging magnifier and ruled plate for accurately adjusting the thermopile to specified lines in the visible spectrum. In front of the slit the mount is fitted with a screw-on closing disc with plate glass. The mount of the thermopile is fitted with a standard pin with adjustable screw-collar for insertion in the saddle stands on the optical bench or in the iron foot. The resistance of the ten couples is 20 to 30 ohms. In case	*Aselliana*	51 58 20
215f	**Single Thermocouple for Spectro-photometry,** Fig. 132 d, e. The thermocouple has in front of it an adjustable slit, similar to that of the thermopile No. 215 *e*. In front of the slit the mount is closed by a screw-off plane glass plate of a thickness of 2 mm. At the back of the thermocouple and at a point on its axis there is a concave glass mirror gilt in front and measuring 25 × 10 mm., which can be adjusted from the back by means of a screw. This mirror serves to project the whole of the light corresponding to the spectrum line under investigation upon the thermocouple within a slit up to 3 mm. wide. The mirror should be displaced until a small sharply defined image of the camera lens appears at the back of the thermocouple. The latter is viewed with the aid of a magnifier attached to the back of the mount, which is fitted with a standard pin and screw-collar for mounting on the saddle stands of the optical bench or on the iron foot. The resistance of the thermocouple varies from 2 to 3 ohms. In case	*Asellidae*	51 58 25



9015

Fig. 132 a

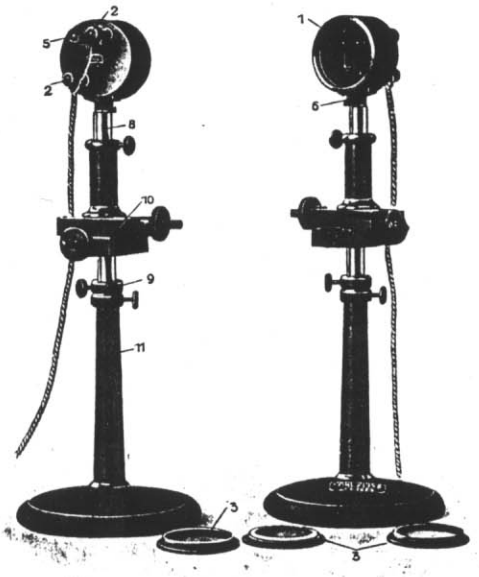


9016

Fig. 132 b

Single Thermocouple with gilt concave mirror No. 215 *a*

1 Thermocouple and concave mirror
2 Terminals
3 Closing window, Nos. 215 *b*—215 *d*
4 Closing cover
8 Standard pin
9 Screw-collar
11 Iron foot with circular base, No. 215 *k*



1 Thermopile
2 Terminals
3 Closing window
5 Ranging magnifier
6 Screw for adjusting width of slit
8 Standard pin
9 Screw-collar
10 Compound slides, No. 215 *l*
11 Iron foot, No. 215 *k*

Fig. 132 c
Thermopile with 10 couples No. 215 *e*

9012

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Closing Window for No. 215 *e*, *f*.		
215 *g*	**Plate of Rocksalt** coated with film of lacquer, 37 mm. diam., 4 mm. thick	*Asellides*	
215 *h*	**Fluorite Plate,** 35×10 mm., 2 mm. thick	*Asellifer*	
215 *i*	**Quartz Plate,** 35×10 mm., 2 mm. thick	*Asellio*	
	Iron Foot, Fig. 132 a—e,		
215 *k*	with circular base and socket for the reception of the standard pin and clamping screw for fixing it in position	*Asellos*	51 40 08
	Compound Slides, Fig. 132 c,		
215 *l*	with socket and clamp for the attachment of parts Nos. 1, 5 and 6, with standard pin fitting the saddle stands on the optical bench or an iron foot with circular base, like No. 215 *k*. The standard pin is provided with a screw collar enabling it to be rotated in azimuth without disturbing the vertical adjustment.	*Asellota*	
	250-mm. Radiation Receiver, Fig. 132 f,		
	with parabolic glass reflector 250 mm. (10 in.) in diameter and 110 mm. (4⅜ in.) focus with silvered front surface. The silvering is protected by a coating of colourless lacquer. The reflector with its mount is contained within a metal casing and has at the centre an unsilvered clearance about 20 mm. in diameter affording a free view from the back for the adjustment of the radiating sources with respect to the thermocouple. The receiver casing is fitted in front with a closing cover in two parts. Within, the casing is provided with a carrier affording a means of adjusting the thermocouples with respect to the optic axis. The receiver casing is mounted within a fork by means of which it can be given any required position in a vertical and horizontal direction. The connection between the thermocouple within the casing and the galvanometer is established through the side of the trunnion fitting. The vertical and lateral motions can be fixed by clamping screws.		
215 *m*	Without stand	*Asellula*	51 58 30
	Single Thermocouple in case. Fig. 132 f, g;		
	vacuum type with metal mount fitting the thermocouple carrier of the radiation receiver, as described under No. 215 *m*. The resistance ranges from 2 to 3 ohms.		
212 *n*	In case	*Asellulos*	51 58 35
	Thermocouple Carrier for fixing No. 215 a		
215 *o*	in the 250-mm. radiation receiver No. 215 *m*	*Asellulum*	
	Closing Window for No. 215 a,		
	for use with No. 215 *m* together with		
215 *p*	**Plate of Rocksalt** coated with protecting lacquer film, 33 mm. in diameter, 4 mm. thick	*Asellus*	
215 *q*	**Quartz Plate,** 33 mm. in diameter, 2 mm. thick	*Asemblais*	
	Tripod, Fig. 132 f,		
215 *r*	with standard socket pin for setting up the 250-mm. (10-in.) radiation receiver No. 215 *m* on a table, stone pier, or such like	*Asemblar*	36 49 10
	Field Stand, Figs. 6—8, (Astro 30, 31)		
215 *s*	two-fold sliding stand of wood with stockhead of light metal and standard pin for operating the receiver outdoors	*Ascaulium*	51 40 16

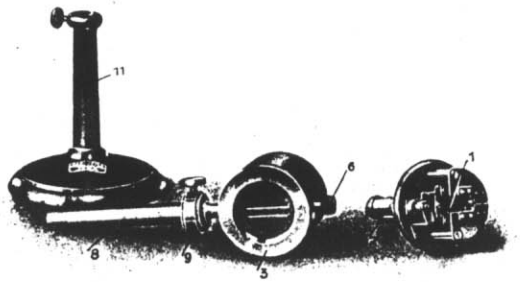


Fig. 132 d 9011

Single Thermocouple for Spectro-photometry

1 Thermocouple with concave mirror
2 Terminals
3 Closing window
5 Ranging magnifier
6 Screw head for adjusting the width of the slit
7 Screw head for adjusting the position of the concave mirror with respect to the thermocouple
8 Standard pin
9 Screw-collar
11 Iron foot

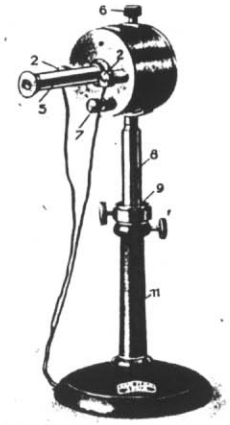
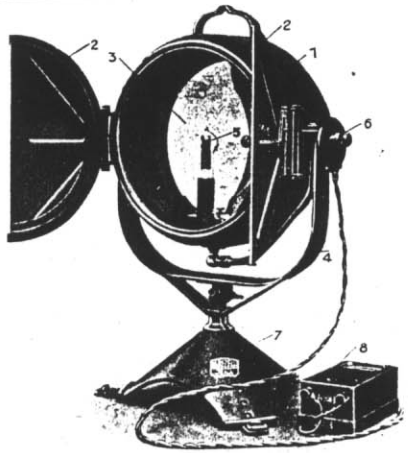


Fig. 132 e 9014

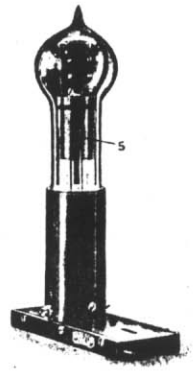


9013

Fig. 132 f

250-mm. Radiation Receiver No. 215 *m*

1 Casing
2 Cover
3 Parabolic glass reflector
4 Fork mount
5 Thermocouple in glass bulb
6 Terminals
7 Tripod No. 215 *r*
8 Galvanometer



9017

Fig. 132 g

Single Thermocouple in glass bulb No. 215 *n*



Fig. 134

Observatory at the Zeiss Works, Jena

Geographical longitude: $0^h\,46^m\,20.5^{sec.}$ Latitude: $50°\,55'\,45''$
Height above sea level: 185 metres (563½ ft.).

Refractor with stress relieving system to telescopes and to equatorial axes, for testing the optical quality of astronomical instruments. Directing telescope with two-lens o. g. of 300 mm. (11¾ in.) aperture and 5 metres (16½ ft.) focal length. Two astro cameras for 30×24-cm. (12×9½-in.) plates with objectives up to 400 mm. (15¾ in.) aperture and 2.5 metres (8¼ ft.) focal length. Dome of 8.5 metres (25 ft.) internal diameter constructed in wood and iron.

Pages 122, 123.

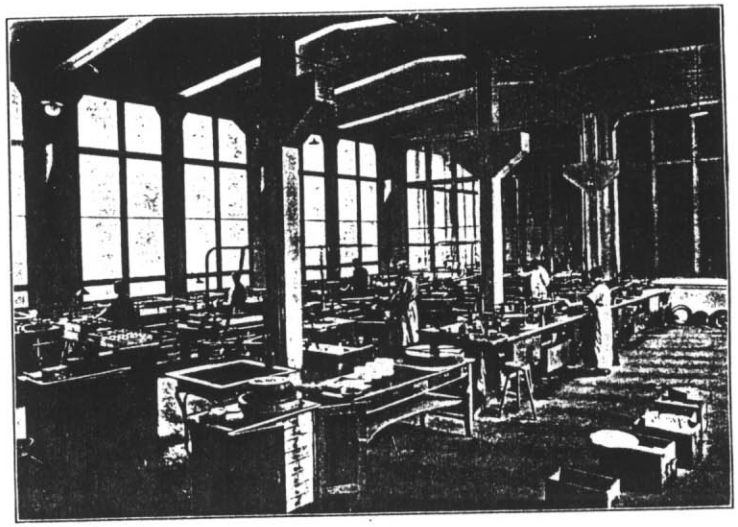


Fig. 135
Astro-optical glass polishing shop

The Astro-optical Equipment

This term applies to the whole of the optical components of astronomical instruments. The subjoined descriptive list embraces only usual sizes and types. Specifications, propositions, and estimates respecting other dimensions and special designs will be submitted on application.

The glass required for the optical parts is furnished by the Jena Glass Works of Messrs. Schott & Co. Before being passed for treatment in the optical workshops the glass is subjected to most exacting tests, any material which does not completly answer the intended purpose being rigorously rejected. In the production of some of the glasses it is impossible, as explicitly pointed out by the makers, to exclude certain slight blemishes of the nature of globules and such like. Care is taken to always select glass of this kind in such a way that the unavoidable presence of these blemishes may have no influence whatever upon the optical quality of the resulting product, and at most are merely imperfections of a purely esthetic order.

On completion, every optical part is subjected to tests conforming to its intended use and under actual working conditions.

No attempt should ever be made to remove any optical part from its mount, in view of the imminent risk of damaging or straining the glass. In all cases where the surfaces cannot be adequately cleaned without removing the optical parts from their mounts it is advisable to entrust the operation to the makers.

Astronomical Telescope Objectives

for direct observation

The **Telescope Objectives** here described are of three types, respectively designated by the letters E, A, and B. Their optical properties may be briefly defined as follows:

The **chromatic aberrations**, or secondary spectrum, may be represented by the deviation from a mean principal focus of the principal foci for the various colours (or wave-lengths). These deviations arise from the dissimilar changes of the refractive index of different types of glass in any given region of the spectrum. By a suitable choice of glasses these deviations can be reduced to a minimum. Fig. 136 exhibits graphically the chromatic deviation obtaining in the three types of objectives E, A, and B. already referred to.

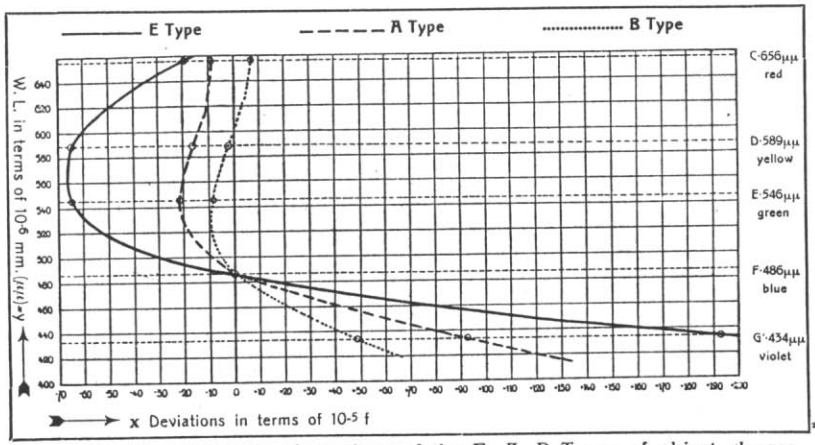


Fig. 136. The chromatic aberrations of the E, A, B Types of object glasses

The distances measured in the direction x (abscissae) represent in $^1/_{100\,000}$ths of the focal length the chromatic deviations from the principal focus with respect to the wave-length 486 (light-blue) taken as the point of reference. The lengths in the direction y (ordinates) represent the wave lengths in $^1/_{1\,000\,000}$ths of a millimetre.

The graphs have been derived from actual measurements upon an extensive number of object glasses. These measurements have furnished the following numerical data:

Chromatic deviations in $^1/_{100\,000}$ths of the focal length:

Type of object glass:	E	A	B
W. L. 656 μμ, red	− 19	− 9	+ 7
„ „ 589 „ yellow	− 65	− 16	− 2
„ „ 546 „ green	− 64	− 22	− 8
„ „ 486 „ light-blue	0	0	0
„ „ 434 „ violet	+ 193	+ 92	+ 48

The **spherical aberrations.** Rays of any given colour entering the object glass in a direction parallel to the optic axis do not strictly meet at a single focus. As a matter of fact, only those rays meet at a point which enter the lens along a circle, or zone, about its centre. The spherical aberrations are the distances of the foci corresponding to the different zones of the lens from a mean principal focus. These deviations do not exceed $^1/_{1000}$th of the focal length.

The **chromatic difference of the spherical aberrations** is the difference of the spherical aberrations with respect to the different colours of the spectrum.

The **aperture ratio** is the ratio of the aperture of the lens (or its effective diameter) and the focal length, for example —

Aperture . . . . . 60 mm.
Focal length . . . . . 850 mm.
Aperture ratio . . . . . $\frac{60}{850} = \frac{1}{14.7}$

The prices of the object glasses include that of the mounts. We do not supply object glasses without mounts. The material and dimensions of the mounts are such as to suit the size of the lenses and the temperature coefficients of the respective glasses.

The focal lengths specified in the subjoined tables represent the standard values. The actual focal lengths are governed by slight variations in the optical constants of the available material and differ by small amounts from these standard values.

The object glasses are attached to the telescope head in either of the following ways:

In the case of object glasses of 60 to 130 mm. ($2\,^3/_8$ to $5\,^1/_4$ in.) aperture by means of a screw collar, Figs. 137, 138;

in that of object glasses of 150 to 200 mm. (6 to 8 in.) aperture by means of a flange with three draw-screws, Fig. 139.

With objectives not exceeding 60 mm. ($2\,^3/_8$ in.) in diameter their central position with respect to the axis of the telescope is ensured by screwing their mounts right up to the shoulder. All object glasses of diameters exceeding 60 mm. ($2\,^3/_8$ in.) are provided with centring attachments consisting of three pairs of draw and pressure screws. The Centring Telescope No. 216 shown in Fig. 137 serves for making the central adjustment and for verifying it.

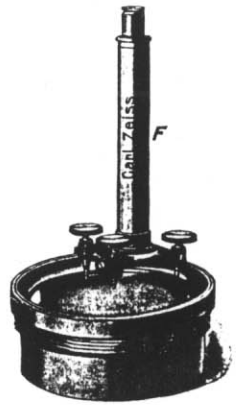


Fig. 137 2328
Centring Telescope F No. 216 as applied to an object glass.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Centring Telescope, Fig. 137, consisting of an astronomical telescope of 20 mm. ($^3/_4$ in.) aperture and magnifying 13×. The eyepiece has a graticule and sliding focussing sleeve. The objective end is attached to a tripod with adjustable foot-screws. The latter are fitted with agate tips by which they rest upon the lens surface.		
216	In case	*Asciatura*	51 55 31

For particulars of dimensions and weights see page 134 — **For Prices see separate List**

E. Two-lens Telescope Objectives of ordinary silicate glasses, Fig. 138

The E Type of object glass is a two-lens telescope combination of silicate glasses having an aperture ratio of f/15.

The chromatic aberrations (Fig. 136, curve E) agree with the aberrations of the objectives made by Fraunhofer.

The spherical aberrations are less than 1/1000 of the focal length for the brightest part of the spectrum corresponding to the D line.

The E Type is available for any species of observation.



Fig. 138 4236

E. Two-lens Telescope Objective

Mount with screw collar for objectives of 60 to 130 mm. (2 3/8 to 5 1/4 in.) aperture
Nos. 217—220

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	E Objectives Aperture mm. / in. — Focal Length cm. / ft.		
217	60 / 2 3/8 — 85 / 2 3/4	*Asciaturos*	51 60 06
218	80 / 3 1/4 — 120 / 4 1/2	*Asciava*	51 60 08
219	110 / 4 1/2 — 165 / 5 1/2	*Asciavamo*	51 60 11
220	130 / 5 1/4 — 195 / 6 1/2	*Asciavate*	51 60 13
221	150 / 6 — 225 / 7 1/4	*Asciaveram*	51 60 15
222	200 / 8 — 300 / 10	*Asciavero*	51 60 20
223	250 / 10 — 375 / 12 1/4	*Asciavimus*	51 60 25
224	300 / 12 — 450 / 14 3/4	*Asciavisse*	51 60 30
225	400 / 15 3/4 — 600 / 19 1/2	*Asciavit*	51 60 40
226	500 / 19 1/2 — 750 / 24 3/4	*Asciburgio*	51 60 50

Prices of Objectives of apertures and focal lengths other than here stated will be quoted on application

A. Two-lens Apochromatic Telescope Objectives, Fig. 139, of glasses without secondary spectrum

The A Type of objective is a two-lens apochromatic telescope combination made of special optical glasses and having an aperture ratio of 1:17.5.

The chromatic aberrations (Fig. 136, Curve A) amount to only one third as compared with those of the E Type in so far as the visual part of the spectrum (C to G') is concerned. The colour defects are sufficiently reduced to justify reference being made to the elimination of the spectrum. This degree of correction ensures a greatly enhanced definition, greater freedom from colour and increased light-transmitting capacity as compared with the E Type. The superiority of the A Type is manifested in a particularly striking manner in the observation of extended bright objects, such as the sun, moon, planets, etc., also when studying on these bodies details requiring extreme definition, and for resolving very close binaries.

The spherical aberrations are of a similar order as those obtaining in the E Type.



Fig. 139 3437

A. Two-lens Apochromatic Telescope Objective

Mount with screw-on flange for objectives of 150 to 200 mm. (6 to 8 in.) aperture, Nos. 231, 232

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	A Objectives Aperture mm. / in. — Focal Length cm. / ft.		
227	60 / 2 3/8 — 105 / 3 1/2	*Ascidia*	51 61 06
228	80 / 3 1/8 — 141 / 4 1/2	*Ascidiados*	51 61 08
229	110 / 4 1/4 — 204 / 6 3/4	*Ascidians*	51 61 11
230	130 / 5 1/4 — 233 / 7 3/4	*Ascidicola*	51 61 13
231	150 / 6 — 267 / 8 3/4	*Ascidiform*	51 61 15
232	200 / 8 — 360 / 11 3/4	*Ascidium*	51 61 20

Prices of Objectives of apertures and focal lengths other than here stated will be quoted on application

For particulars of dimensions and weights see page 134 — For Prices see separate List

B. Three-lens Apochromatic Telescope Objectives, Fig. 140, of glasses without secondary spectrum

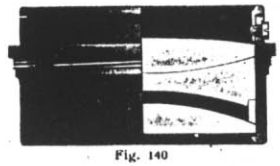
The B Type of object glass is an apochromatic three-lens telescope combination of special optical glasses and has an aperture ratio of f/15.

The chromatic aberrations (Fig. 136, Curve B) amount to only one half of those obtaining in the A Type.

The spherical aberrations are still less in amount as compared with the A Type, whilst the chromatic difference of the spherical aberrations is entirely eliminated.

Thanks to the elimination of the secondary spectrum and the high degree of spherical correction for different colours, the B Type surpasses the A Type in the matter of freedom from colour, difinition, and light-transmitting capacity. The A Type has the further advantage that it requires a shorter tube-length.

The E and B Types of objectives, having the same aperture ratio, are interchangeable on a given telescope tube.



2328

Fig. 140

B. Apochromatic Three-lens Telescope Objective

Mount with screw collar for objectives of 60 to 130 mm. (2 3/8 to 5 1/4 in.) diameter
Nos. 233—236

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	B Objectives		
233	Aperture: 60 mm. 2 3/8 in. — Focal Length: 85 cm. ft. 2 3/4	*Asciem*	51 61 56
234	" 80 " 3 1/4 " — " 120 " " 4 1/2	*Asciemus*	51 61 58
235	" 110 " 4 1/2 " — " 165 " " 5 1/2	*Asciendos*	51 61 61
236	" 130 " 5 1/4 " — " 195 " " 6 1/2	*Ascient*	51 61 63
237	" 150 " 6 " — " 225 " " 7 1/4	*Ascientur*	51 61 65
238	" 200 " 8 " — " 300 " " 10	*Asciera*	51 61 70

C. Two-lens Telescope Objectives of greater aperture ratio

The C Objectives take the place of the E Objectives where a short tube length and great light-transmitting power are the qualities which are primarily needed, as in the case of star and comet finders and terrestrial telescopes. The chromatic and spherical corrections are not equal to those of the E Objectives in view of the greater aperture ratio. Since, however, the C Objectives are used under conditions of lower magnifications the residual defects affect the image in a scarcely appreciable degree.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	C Objectives Aperture: — Focal Length: — Aperture ratio:		
239	25 mm. 1 in. — 20 cm. 8 in. — 1:8	*Ascieranno*	51 62 25
240	30 " 1 1/4 " — 25 " 10 " — 1:8	*Ascierebbe*	51 62 30
241	45 " 1 3/4 " — 36 " 14 1/4 " — 1:8	*Ascietis*	51 62 45
242	60 " 2 3/8 " — 30 " 11 3/4 " — 1:5	*Ascietura*	51 62 60
243	80 " 3 1/4 " — 50 " 19 1/2 " — 1:6	*Ascimada*	51 62 80
244	110 " 4 1/2 " — 130 " 51 1/4 " — 1:12	*Ascimais*	51 62 11
245	130 " 5 1/4 " — 160 " 63 " — 1:12	*Ascimamos*	51 62 13

D. Three-lens Telescope Objectives of greater aperture ratio

The D Objectives are used for similar purposes as the C Objectives that is, in all cases where it is a material advantage to work with large apertures and correspondingly great aperture ratios. The optical properties, notably the chromatic and spherical corrections, surpass those realised in the C Objectives.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
246	**D Objective** of 200 mm. (8 in.) aperture, 133 cm, (4 1/2 ft.) focal length	*Ascimando*	51 62 20

Prices of objectives of apertures and focal lengths other than here stated will be quoted on application.

For particulars of dimensions and weights see page 134 — For Prices see separate List

Eyepieces

for astronomical and terrestrial observations

By the **magnification** due to an eyepiece and a telescope object glass is to be understood the following ratio:

$$\text{Magnification} = \frac{\text{focal length of o. g.}}{\text{focal length of eyepiece}} = \frac{\text{diameter of o. g.}}{\text{exit pupil}}$$ (see Table page 117).

The **magnification,** as here defined, is engraved upon the mounts of the eyepieces supplied with an instrument In subsequent orders for eyepieces to be used with an existing telescope the focal length of the objective should be stated. The resulting magnification will then be engraved on the mount free of charge.

The **apparent field of view** of the eyepiece is determined by the angle subtended by the field stop of the eyepiece at the eye point (the position of the eye).

The **field of vision** of the telescope $\left(\text{roughly} = \frac{\text{apparent f. o. v. of eyepiece}}{\text{magnification}}\right)$ may be defined as the angle subtended at the eye by the object as seen by the unaided eye within the boundary of the eyepiece field stop.

The **exit pupil** $\left(= \frac{\text{aperture of objective}}{\text{magnification}}\right)$ is the diameter, measured in millimetres, of the small bright circle which is visible behind the eyepiece on the telescope when looking upon the latter from a distance of about 8 inches. The square of the exit pupil furnishes a measure of the relative light-transmitting capacity of the telescope when viewing surface-like objects. The relative light-transmitting capacity reaches its upper limit when the exit pupil is equal to the diameter of the pupil of the observing eye (see Table on page 117). The diameter of the exit pupil may be measured with the dynameter No. 248.



2415

Fig. 141

Dynameter
No. 248

The eyepieces have engraved on their mounts the optical type and the focal length ("f = . . . mm.").

The astro eyepieces are mounted in three alternative ways.

The eyepieces of focal lengths ranging from 25 to 5 mm. (1 to 3/16 in.) have a plain cylindrical body by means of which they are readily interchangeable within a sliding sleeve (No. 247, Fig. 142).

Eyepieces having focal lengths ranging from from 30 to 80 mm. (1 3/16 to 3 1/8 in.) are provided with a screw for attachment to the draw-tube.

A number of eyepieces selected for use with ocular or filar micrometers (see page 70) and with finders have helical focussing mounts to the eye lens, as shown in Fig. 145, with a scale of diopters for rapid adjustment to the observer's sight.

The terrestrial eyepieces have a screw-collar for attachment to the draw-tube.

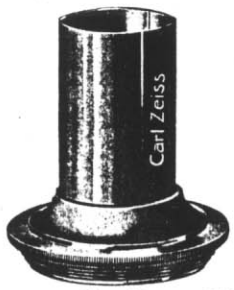


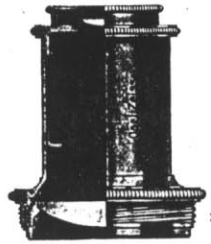
Fig. 142 2414

Eyepiece Sliding Sleeve
No. 247
for astro eyepieces, f = 25 to 5 mm. (1 to 3/16 in.) focus.

When ordering eyepieces for use on telescopes not of our make, a sliding sleeve should be forwarded for fitting the eyepieces or for accurately copying the screw, as the case may be.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
247	**Eyepiece Sliding Sleeve,** Fig. 142, for astro eyepieces, f = 25 to 5 mm. (1 to 3/16 in.) with screw collar for attachment to the draw-tube	*Ascimar*	51 64 91
248	**Dynameter,** Fig. 141, consisting of an eyepiece with helical focussing collar and ocular micrometer (with 1/10 millimetre divisions) in its focal plane. The dynameter serves for measuring the diameter of the exit pupil. In case	*Ascimaras*	51 64 95

For Prices see separate List



2455

Fig. 143
Huygens Eyepiece, f = 40 mm. (1 9/16 in.) with screw socket
No. 251



2459

Fig. 144
Orthoscopic Eyepiece, f = 25 mm. (1 in.) No. 260



2458

Fig. 145
Orthoscopic Eyepiece, f = 18 mm. (11/16 in.) with focussing collar and diopter scale
No. 272

Huygens Eyepieces, Fig. 143

The Huygens Eyepieces consist of two single lenses. The field stop, in the plane of the image, is situated between the lenses. The eyepieces are free from internal reflection. Their apparent field of view embraces an angle of about 50°. They are particularly useful for observations at low and moderate magnifications and where it is desirable to secure a large field of view.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Huygens Eyepieces Focal Length mm. in.		
249	80 3 1/8 with screw socket, Fig. 143	*Ascimardes*	51 64 80
250	60 2 3/8 " " "	*Ascimaria*	51 64 60
250a	50 2 " " "	*Asecla*	51 64 50
251	40 1 9/16 " " "	*Ascimaste*	51 64 40
252	25 1 to fit sliding sleeve No. 247	*Ascimavam*	51 64 25
253	18 11/16 " " "	*Ascimaveis*	51 64 18
254	12.5 1/2 " " "	*Ascimou*	51 64 12
255	9 3/8 " " "	*Asc.ndemmo*	51 64 09
256	7 1/4 " " "	*Ascindendo*	51 64 07

Orthoscopic Eyepieces, Figs. 144, 145

The Orthoscopic Eyepieces consist of a single eye lens and a triple cemented field lens. They are free from internal reflection, colour, and distortion The field stop is situated in front of the field lens. The apparent field of view embraces an angle of about 40°. The excellent spherical and chromatic corrections as well as the great distance of the eye point from the eye lens render these eyepieces particularly well adapted for high magnifications and for work with micrometers. Micrometer eyepieces should be preferably of the type fitted with helical focussing mount and diopter scale. The field stop in the plane of the image is at a relatively great distance in front of the field lens.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Orthoscopic Eyepieces Focal Length mm. in.		
257	50 2 with screw socket, Fig. 143	*Ascindessi*	51 66 50
258	40 1 9/16 " " "	*Ascindeva*	51 66 40
259	30 1 3/16 " " "	*Ascindiamo*	51 66 30
260	25 1 to fit sliding sleeve No. 247	*Ascino*	51 66 25
261	20 3/4 " " "	*Ascinglie*	51 66 20
262	18 11/16 " " "	*Asciula*	51 66 18
263	15 9/16 " " "	*Asciulsi*	51 66 15
264	12.5 1/2 " " "	*Asciolte*	51 66 12
265	9 11/32 " " "	*Asciolvera*	51 66 09
266	7 9/32 " " "	*Ascioner*	51 66 07
267	6 7/32 " " "	*Asciremus*	51 66 06
268	5 3/16 " " "	*Ascirent*	51 66 05
269	40 1 9/16 with diopter focussing mount, Fig. 145	*Ascireris*	51 67 40
270	30 1 3/16 " " " "	*Ascir-tur*	51 67 30
271	25 1 " " " "	*Asc.ro*	51 67 25
272	18 11/16 " " " "	*Asciroide*	51 67 18
273	15 9/16 " " " "	*Asciscam*	51 67 15
274	12.5 1/2 " " " "	*Asciscare*	51 67 12
275	9 11/32 " " " "	*Asciscatis*	51 67 09
276	7 9/32 " " " "	*Asciscatur*	51 67 07
277	5 3/16 " " " "	*Asciscebar*	51 67 05

For particulars of dimensions and weights see page 134 — **For Prices see separate List**

Kellner Eyepieces, Fig. 146



2461

Fig. 146
Kellner Eyepiece No. 283, f = 25 mm. (1 in.) focus

The **Kellner** eyepieces consist of an achromatic two-lens eye lens and a single field lens. These eyepieces are well achromatised and free from distortion. The apparent field of view is about 40°. The field stop, in the plane of the image, is situated in front of the field lens. The eyepieces are also supplied in **diopter focussing mounts** for use with micrometers and terrestrial telescopes.


2460

Fig. 147
Monocentric Eyepiece
No. 296, f = 25 mm. (1 in.)

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Kellner Eyepieces		
278	Focal Length: 80 mm. $3^{1}/_{16}$ in., with screw socket, Fig. 143	*Asciscemur*	51 69 80
279	" " 60 " $2^{3}/_{8}$ " " " " " "	*Asciscenda*	51 69 60
280	" " 50 " 2 " " " " " "	*Ascisceris*	51 69 50
281	" " 40 " $1^{9}/_{16}$ " " " " " "	*Asciscet*	51 69 40
282	" " 30 " $1^{3}/_{16}$ " " " " " "	*Asciscimus*	51 69 30
283	" " 25 " 1 " to fit sliding sleeve No. 247	*Asciscis*	51 69 25
284	" " 20 " $^{4}/_{4}$ " " " " " "	*Asciscito*	51 69 20
285	" " 15 " $^{9}/_{16}$ " " " " " "	*Ascisco*	51 69 15
286	" " 12.5 " $^{1}/_{2}$ " " " " " "	*Asciscunt*	51 69 12
287	" " 9 " $^{11}/_{32}$ " " " " " "	*Ascismare*	51 69 09
288	" " 60 " $2^{3}/_{8}$ " with diopter focussing mount, Fig. 145	*Ascismiamo*	51 70 60
289	" " 50 " 2 " " " " " "	*Ascissa*	51 70 50
290	" " 40 " $1^{9}/_{16}$ " " " " " "	*Ascitam*	51 70 40
291	" " 30 " $1^{3}/_{16}$ " " " " " "	*Ascitans*	51 70 30
292	" " 25 " 1 " " " " " "	*Ascitarum*	51 70 25

Monocentric Eyepieces, Fig. 147

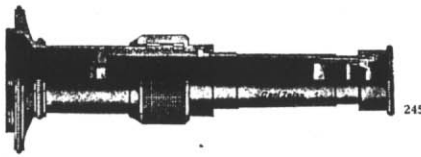
The **Monocentric Eyepieces** consist of a triple cemented lens. They are exceptionally free from internal reflection and are accordingly particularly well adapted for viewing fine markings, such as planetary features. The field stop, in the plane of the image, is situated in front of the lenses, so that the eyepieces are available for use with eyepiece micrometers. The apparent field of view embraces an angle of about 30°.

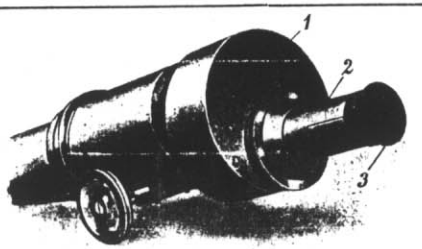
Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Monocentric Eyepieces		
293	Focal Length: 50 mm. 2 in., with screw socket, Fig. 143	*Ascite*	51 72 50
294	" " 40 " $1^{9}/_{16}$ " " " " " "	*Asciterio*	51 72 40
295	" " 30 " $1^{3}/_{16}$ " " " " " "	*Ascitibus*	51 72 30
296	" " 25 " 1 " to fit sliding sleeve, No. 247	*Ascitic*	51 72 25
297	" " 20 " $^{3}/_{4}$ " " " " " "	*Ascitical*	51 72 20
298	" " 18 " $^{11}/_{16}$ " " " " " "	*Asciticos*	51 72 18
299	" " 15 " $^{9}/_{16}$ " " " " " "	*Ascitiora*	51 72 15
300	" " 12.5 " $^{1}/_{2}$ " " " " " "	*Ascitizio*	51 72 12
301	" " 10 " $^{13}/_{32}$ " " " " " "	*Ascitorum*	51 72 10
302	" " 9 " $^{11}/_{32}$ " " " " " "	*Ascitote*	51 72 09
303	" " 7 " $^{9}/_{32}$ " " " " " "	*Asecreta*	51 72 07
304	" " 6 " $^{7}/_{32}$ " " " " " "	*Ascitui*	51 72 06
305	" " 25 " 1 " with diopter focussing mount, Fig. 145	*Ascitura*	51 73 25
306	" " 18 " $^{11}/_{16}$ " " " " " "	*Asciturume*	51 73 18
307	" " 12.5 " $^{1}/_{2}$ " " " " " "	*Asciugai*	51 73 12
308	" " 9 " $^{11}/_{32}$ " " " " " "	*Asciugammo*	51 73 09
309	" " 6 " $^{7}/_{32}$ " " " " " "	*Asciugando*	51 73 06

For particulars of dimensions and weights see page 134 — For Prices see separate List

No. 148

Eyepiece Microscope with variable magnification No. 310


2454



2270

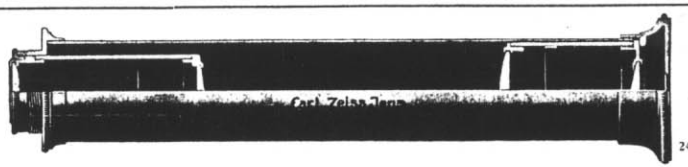
Fig. 149

Erecting Prisms No. 311

1 Prism casing
2 Eyepiece sliding sleeve
3 Astro eyepiece, f = 25 to 5 mm. (1 to $^{1}/_{5}$ in.). Eyepieces of 60 to 30 mm. ($2^{1}/_{5}$ to $1^{1}/_{5}$ in.) focus are screwed to the casing (1) in the place of the sliding sleeve (2)

No. 150

Terrestrial Eyepiece No. 315


2414

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
310	**Eyepiece Microscope** with variable magnification, Fig. 148. This is a special form of microscope which is employed in the place of the simple micrometer eyepieces as a means of transferring the eye point to a greater distance from the micrometer casing (20, Fig. 93) and hence into a more convenient position for observation. The focal length can be varied within a range of 8 to 12 mm. ($^{5}/_{16}$ to $^{1}/_{2}$ in.). In case	*Asciugare*	51 73 51
	Erecting Prisms, Fig. 149, for the erection of the image in conjunction with the astro eyepieces, so as to render these available for terrestrial observations, together with an eyepiece sliding sleeve No. 247. In case. For Eyepieces as follows:		
311	Focal Length: 40—5 mm. Required tube shortening: $1^{9}/_{16}$—$^{3}/_{16}$ in. 90 mm. $3^{1}/_{2}$ in.	*Ascensibus*	51 47 41
312	40—5 " $1^{9}/_{16}$—$^{3}/_{16}$ " 100 " 4 "	*Ascensione*	51 47 43
313	50—5 " 2 —$^{3}/_{16}$ " 120 " $4^{3}/_{4}$ "	*Ascensiora*	51 47 45
314	60—5 " $2^{3}/_{8}$ —$^{3}/_{16}$ " 150 " 6 "	*Ascensius*	51 47 47
	Terrestrial Eyepieces, Fig. 150, consisting of four simple plano-convex lenses, with screw collar for attachment to the draw-tube. The apparent field of view is about 40°. These eyepieces may only be used in combination with objectives having an aperture ratio less than f/9. With short focus telescope objectives of relative apertures of f/5 to f/9 prismatic erecting attachments should be used in conjunction with astro eyepieces.		
315	Terrestrial Eyepieces of 41 mm. $1^{5}/_{8}$ in. focus	*Ascioeras*	51 73 61
316	" " " 34 " $1^{1}/_{4}$ " "	*Ascivero*	51 73 62
317	" " " 27 " $1^{1}/_{16}$ " "	*Asciverunt*	51 73 63
318	" " " 22 " $^{7}/_{8}$ " "	*Ascivimus*	51 73 64

For Prices see separate List

Astro-photographic Objectives

Astro-photographic Objectives, unless otherwise stated or explicitly required to satisfy other conditions, are corrected for the photo-chemically active blue-violet region of the spectrum.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Two-lens Astro-photographic Objectives, composed of ordinary silicate glasses. The formula of these object glasses conforms to that of the E-Objectives. The aperture ratio is 1 : 10 or less. The field of view embraces an angle of about 3°. Prices, according to diameter and focal length, will be quoted on application		
319		*Asciwissem*	
	Two-lens Astro-photographic U. V. Objectives, composed of U. V. glasses which transmit the ultra violet rays to a far greater extent than other types of glass. The aperture ratio is 1 : 16 or less. Field of view about 3°. Prices according to diameter and focal length will be quoted on application		
320		*Asciolt*	
	Astro Petzval Fig. 154, This is an objective of great light-transmitting power and computed for a particularly good central definition, with due regard to its astro-photographic application. Aperture ratio 1 : 4.5 to 1 : 5. Field of view about 10°.		
	Astro Petzval Objectives:		
321	Aperture: 60 mm. 2⅜ in. Focal Length: 27 cm. 10⅝ in.	*Asciviitis*	51 75 46
322	„ 120 „ 4¾ „ „ „ 60 „ 23⅝ „	*Ascizio*	51 75 52
323	„ 160 „ 6¼ „ „ „ 80 „ 31½ „	*Asclepiad*	51 75 56
	Astro Tessar, Fig. 155. an objective of great light-transmitting capacity, differing from the Zeiss Tessar computed for terrestrial photography in that its correction is carried still further at the expense of the field of view. The aperture ratio is 1 : 5 and the field of view embraces an angle of about 15°.		
	Astro Tessars:		
324	Aperture: 60 mm. 2⅜ in. Focal Length: 30 cm. 11¾ in.	*Asclepium*	51 75 66
325	„ 120 „ 4¾ „ „ „ 60 „ 23⅝ „	*Asclerine*	51 75 72
326	„ 160 „ 6¼ „ „ „ 80 „ 31½ „	*Asclero*	51 75 76
	Astro U. V. Special Objective, Figs. 151, 156, a composite objective composed of glasses of unusual transparency for ultra-violet light. Relative aperture f/6.5 to f/9. Field of view about 10°.		
	Astro U. V. Special Objectives:		
327	Aperture: 60 mm. 2⅜ in. Focal Length: 40 cm. 15¾ in.	*Ascletario*	51 75 86
328	„ 120 „ 4¾ „ „ „ 100 „ 39¼ „	*Asco*	51 75 92
329	„ 160 „ 6¼ „ „ „ 150 „ 59 „	*Ascobolo*	51 75 96
	Two-lens Collimator Objectives for Spectrographs, Aperture ratio 1 : 12.		
	Collimator Objectives:		
330	Aperture: 40 mm. 1⁹/₁₆ in. Focal Length: 48 cm. 18⅞ in.	*Ascocarp*	51 76 14
331	„ 60 „ 2⅜ „ „ „ 72 „ 28¼ „	*Ascoceras*	51 76 16
	Two-lens Spectrograph Camera Lenses, Fig. 152, of the "chromatic" type described by Prof. Hartmann, (Zeitschr. f. Instrumentenkunde, 1904, Vol. 24, page 257).		
	Two-lens "Chromatic":		
332	Aperture: 40 mm. 1⁹/₁₆ in. Focal Length: 48 cm. 18⅞ in.	*Ascodaba*	51 76 24
333	„ 60 „ 2⅜ „ „ „ 72 „ 28¼ „	*Ascoforo*	51 76 26
	Three-lens Rapid Spectrograph Camera Lens, Fig. 153, as originated by Schwarzschild (cf. Rep. Preuss. Akad. d. Wissenschaften, Gen.-Vers. 19. 12. 1912).		
	Three-lens Spectro Camera Lenses:		
334	Aperture: 40 mm. 1⁹/₁₆ in. Focal Length: 18 cm. 7⅛ in.	*Ascogastro*	51 76 34
335	„ 60 „ 2⅜ „ „ „ 26 „ 10¼ „	*Ascogone*	51 76 36

Prices for Astro-photographic Objectives of special apertures and focal lengths will be quoted on application

For particulars of dimensions and weights see page 135 — For Prices see separate List



2447

Fig. 151
Special Astro U.V.Objective Nos. 327—329 with U. V. Objective Prism with refracting angle of 50°

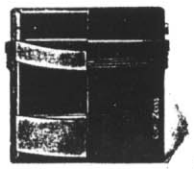

2457

Fig. 152
Two-lens "Chromatic", Nos. 332, 333; Hartmann's formula, Astro-spectrographic Camera Lens

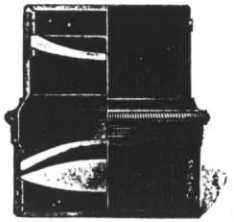

2456

Fig. 153
Rapid Three-lens Camera Lens, Nos. 334, 335; Schwarzschild's formula, for astro-spectrographs

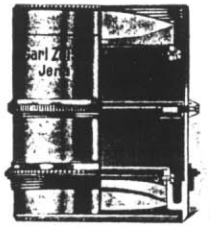
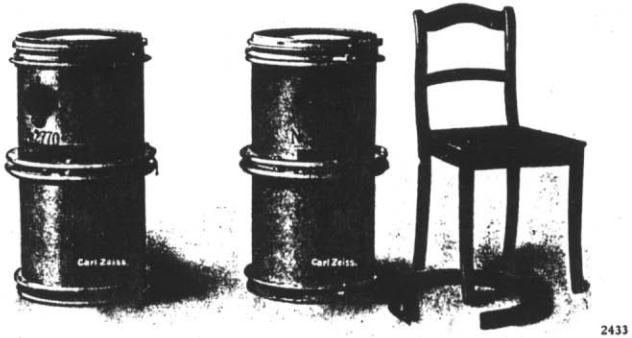

2439

Fig. 154
Astro Petzval Nos. 321—323


2440

Fig. 155
Astro Tessar Nos. 324—326



2433

Fig. 156
Two Special Three-lens U. V. Objectives of 360 mm. (14½ in.) aperture and 4.5 metres (14¾ ft.) focus

Price: On application Codeword: *Ascogonium* Ident. No.: 51 75 97

Silvered Glass Mirrors

These silvered glass mirrors are silvered on their optically worked front surface. If desired, gilding or nickeling may be substituted for the silvering. Unmounted mirrors are supplied in special fitted cases for transport. The prices include these and the silvering. The thickness of the mirrors is about $^1/_6$ to $^1/_{10}$ of the diameter. The back surface is plane and ground to a fine grey.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Parabolic Concave Mirrors for reflecting telescopes, Figs. 45 to 52, with aperture ratio of 1:6 or less. Prices of mirrors of shorter focal lenghts and consequently having an aperture ratio exceeding 1:6 will be quoted on application.		
336	Diameter 110 mm. $4^1/_4$ in., Focal Length 66 cm. $2^1/_4$ ft.	*Ascoli*	51 80 11
337	„ 130 „ $5^1/_4$ „ „ „ 78 „ $2^1/_2$ „	*Ascolicas*	51 80 13
338	„ 150 „ 6 „ „ „ 90 „ 3 „	*Ascolta*	51 80 15
339	„ 200 „ 8 „ „ „ 120 „ 4 „	*Ascoltammo*	51 80 20
340	„ 250 „ 10 „ „ „ 150 „ 5 „	*Ascoltando*	51 80 25
341	„ 300 „ 12 „ „ „ 180 „ 6 „	*Ascoltarci*	51 80 30
342	„ 400 „ $15^3/_4$ „ „ „ 240 „ 8 „	*Ascoltasse*	51 80 40
343	„ 500 „ $19^1/_2$ „ „ „ 300 „ 10 „	*Ascoltavi*	51 80 50
	Spherical Concave Mirrors The required radius of curvature should be stated when ordering.		
344	Diameter 30 mm. $1^1/_4$ in.	*Ascolterai*	51 82 03
345	„ 40 „ $1^1/_2$ „	*Ascoltiamo*	51 82 04
346	„ 50 „ 2 „	*Ascoltino*	51 82 05
347	„ 60 „ $2^1/_2$ „	*Ascoltor*	51 82 06
348	„ 80 „ 3 „	*Ascoma*	51 82 08
349	„ 110 „ $4^1/_4$ „	*Ascondais*	51 82 11
350	„ 130 „ 5 „	*Ascondemmo*	51 82 13
351	„ 150 „ 6 „	*Asconder*	51 82 15
352	„ 200 „ 8 „	*Ascondessi*	51 82 20
353	„ 250 „ 10 „	*Ascondette*	51 82 25
354	„ 300 „ 12 „	*Ascondeva*	51 82 30
355	„ 400 „ $15^3/_4$ „	*Ascondian*	51 82 40
356	„ 500 „ $19^1/_2$ „	*Ascondido*	51 82 50
	Plane Mirrors		
357	Diameter 30 mm. $1^1/_4$ in.	*Ascondono*	51 84 03
358	„ 40 „ $1^1/_2$ „	*Asconidae*	51 84 04
359	„ 50 „ 2 „	*Asconis*	51 84 05
360	„ 60 „ $2^1/_2$ „	*Asconius*	51 84 06
361	„ 80 „ 3 „	*Asconsione*	51 84 08
362	„ 110 „ $4^1/_4$ „	*Asconsivo*	51 84 11
363	„ 130 „ 5 „	*Ascopa*	51 84 13
364	„ 150 „ 6 „	*Ascoparum*	51 84 15
365	„ 200 „ 8 „	*Ascopera*	51 84 20
366	„ 250 „ 10 „	*Ascoperis*	51 84 25
367	„ 300 „ 12 „	*Ascophore*	51 84 30
368	„ 400 „ $15^3/_4$ „	*Ascordus*	51 84 40
369	„ 500 „ $19^1/_2$ „	*Ascorosas*	51 84 50

For use with Newtonian reflectors the plane mirrors are supplied with elliptical contours, so as to fit a cylindrical tube when inclined at 45°. The prices of these mirrors are the same as those of the preceding circular mirrors of a diameter equal to their major axis plus 10%.

Prices of Mirrors of other dimensions and of other material (notably speculum metal) will be quoted on application.

For particulars of dimensions and weights see page 135 — **For Prices see separate List**

Prisms

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Objective Prisms, Figs. 117, 151, 158, of light flint for use in front of the objectives of telescopes or astro-cameras for viewing or photographing star spectra. The prices apply to the prisms in their metal mounts and include fittings for mounting them in front of the objective, for adjusting them to minimum deviation, and for rotation about the axis of the objective.		
370	Refracting angle 5 to 7° Aperture 60 mm. $2^3/_8$ in.	*Ascortai*	51 86 16
371	„ „ 5 „ 7° „ 120 „ $4^3/_4$ „	*Ascortammo*	51 86 22
372	„ „ 5 „ 7° „ 160 „ $6^1/_4$ „	*Ascortando*	51 86 26
373	„ „ 45° „ 60 „ $2^3/_8$ „	*Ascortava*	51 86 36
374	„ „ 45° „ 120 „ $4^1/_4$ „	*Ascortero*	51 86 42
375	„ „ 45° „ 160 „ $6^1/_4$ „	*Ascosaglia*	51 86 46
376	„ „ 60° „ 60 „ $2^3/_8$ „	*Ascosidad*	51 86 56
377	„ „ 60° „ 120 „ $4^3/_4$ „	*Ascoso*	51 86 62
378	„ „ 60° „ 160 „ $6^1/_4$ „	*Ascospore*	51 86 66
	Prisms of 60° for spectroscopes and spectrographs. The refracting angle is accurately 60° within a few minutes of arc. Prisms without mounts:		
	Material — Refr. ind. — Size of side faces		
379	Crown n_D 1.47 42×70 mm. $1^5/_8 \times 2^3/_4$ in.	*Ascol*	51 88 10
380	„ „ 1.47 62×104 „ $2^1/_8 \times 4^1/_4$ „	*Ascouter*	51 88 15
381	„ „ 1.51 42×70 „ $1^5/_8 \times 2^3/_4$ „	*Ascra*	51 88 20
382	„ „ 1.51 62×104 „ $2^1/_8 \times 4^1/_8$ „	*Ascribam*	51 88 25
383	Flint „ 1.65 42×70 „ $1^5/_8 \times 2^3/_4$ „	*Ascribaris*	51 88 30
384	„ „ 1.65 62×104 „ $2^1/_8 \times 4^1/_8$ „	*Ascribatur*	51 89 35
385	U. V. Crown „ 1.50 42×70 „ $1^5/_8 \times 2^3/_4$ „	*Ascribe*	51 88 40
386	„ „ 1.50 62×104 „ $2^1/_8 \times 4^1/_8$ „	*Ascribebas*	51 88 45
387	U. V. Flint „ 1.53 42×70 „ $1^5/_8 \times 2^3/_4$ „	*Ascribemus*	51 88 50
388	„ „ 1.53 62×104 „ $2^1/_8 \times 4^1/_8$ „	*Ascribendi*	51 88 55
	Reflecting Prisms. These are right-angled prisms of crown glass having polished side and hypotenuse faces. The angles are accurate within ± 30″. Accuracy within ± 10″ adds 20% to the standard prices.		
389	Square side faces. Length of side 20 mm. $^3/_4$ in.	*Ascribere*	51 90 20
390	„ „ „ „ „ „ 30 „ $1^1/_4$ „	*Ascribetis*	51 90 30
391	„ „ „ „ „ „ 40 „ $1^1/_2$ „	*Ascribia*	51 90 40
392	„ „ „ „ „ „ 50 „ 2 „	*Ascribimos*	51 90 50
393	„ „ „ „ „ „ 60 „ $2^1/_8$ „	*Ascribing*	51 90 60
394	„ „ „ „ „ „ 75 „ 3 „	*Ascribiria*	51 90 75
395	„ „ „ „ „ „ 90 „ $3^1/_8$ „	*Ascribitor*	51 90 90
396	„ „ „ „ „ „ 105 „ $4^1/_8$ „	*Ascribo*	51 90 10
397	„ „ „ „ „ „ 120 „ $4^3/_4$ „	*Ascribunt*	51 90 12
398	Round side faces. Diameter 20 „ $^3/_4$ „	*Ascripsero*	51 92 20
399	„ „ „ „ 30 „ $1^1/_4$ „	*Ascripta*	51 92 30
400	„ „ „ „ 40 „ $1^1/_2$ „	*Ascriptio*	51 92 40
401	„ „ „ „ 50 „ 2 „	*Ascriptius*	51 92 50
402	„ „ „ „ 60 „ $2^3/_8$ „	*Ascriptum*	51 92 60
403	„ „ „ „ 75 „ 3 „	*Ascrissero*	51 92 75
404	„ „ „ „ 90 „ $3^1/_8$ „	*Ascrissi*	51 92 90
405	„ „ „ „ 105 „ $4^1/_8$ „	*Ascritto*	51 92 10
406	„ „ „ „ 129 „ $4^3/_4$ „	*Ascrittore*	51 92 12

Prices of prisms of glass other than here stated, or with other refracting angles, or apertures will be quoted on application.

For Prices see separate List

Plane Parallel Glasses

These plane-parallel glasses are made of Jena Crown Glasses O.144 or O.60. The standard thickness of the plates is $^1/_{10}$ of their diameter. The accuracy of parallelism does not exceed 3 seconds of arc.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
	Plane-parallel Glasses		
407	Diameter 10 mm. $\frac{3}{8}$ in.	*Ascrivendo*	51 94 01
408	„ 20 „ $\frac{3}{4}$ „	*Ascrivera*	51 94 02
409	„ 30 „ $1\frac{1}{4}$ „	*Ascrivesse*	51 94 03
410	„ 40 „ $1\frac{1}{2}$ „	*Ascriviamo*	51 94 04
411	„ 50 „ 2 „	*Ascrivium*	51 94 05
412	„ 60 „ $2\frac{3}{8}$ „	*Ascrivono*	51 94 06
413	„ 70 „ $2\frac{3}{4}$ „	*Ascrizione*	51 94 07
414	„ 80 „ 3 „	*Ascua*	51 94 08
415	„ 90 „ $3\frac{1}{2}$ „	*Asculani*	51 94 09
416	„ 100 „ 4 „	*Asculanos*	51 94 10
417	„ 120 „ $4\frac{3}{4}$ „	*Asculanum*	51 94 12
418	„ 140 „ $5\frac{1}{2}$ „	*Asculum*	51 94 14
419	„ 160 „ $6\frac{1}{4}$ „	*Ascunha*	51 94 16
420	„ 180 „ 7 „	*Ascusado*	51 94 18
421	„ 200 „ 8 „	*Ascuso*	51 94 20

The prices of Plane-parallel Glasses are subject to advances, as follows:

a) Plates of a higher degree of parallelism:
Tolerance 2″ Add 50 %
„ 1″ „ 100 %
„ $\frac{1}{2}$″ „ 150 %
„ $\frac{1}{4}$″ „ 200 %

b) Plate thickness less than $^1/_{10}$ of the diameter
Thickness $^1/_{25}$ of diam. Add 25 %
„ $^1/_{50}$ „ „ „ 50 %
„ $^1/_{75}$ „ „ „ 75 %

c) Plates made of a glass differing materially in cost and working properties from the Crowns O.144 and O.60 (as listed in the catalogues of Messrs. Schott & Co, Jena) are subject to higher quotations.

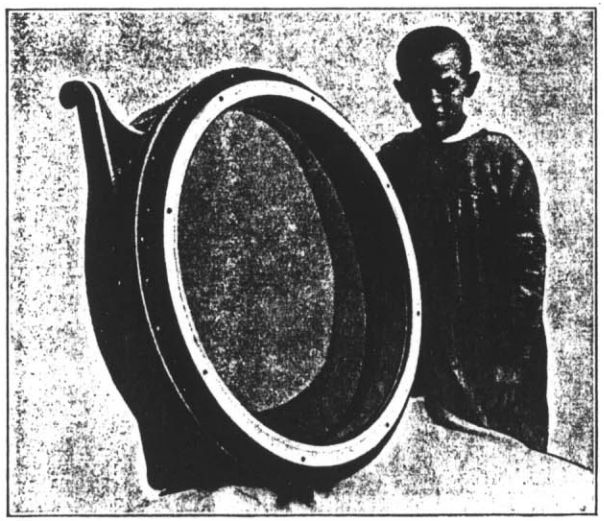


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Fig. 158
Objective Prism as supplied to the Capetown Observatory. Diameter 640 mm. (25¼ in.). Refracting angle 11°.

For particulars of dimensions and weights see page 135 — For Prices see separate List

Tables

of Magnifications, Fields of View, and Exit Pupils

Explanatory notes on magnification, field of view, and exit pupil were given on page 108

Magnifications

Objective: Aperture mm	Objective: Focal Length cm	Eyepiece: Focal Length in millimetres 80	60	50	40	30	25	20	18	15	12.5	9	7	6	5
60	85	11	14	17	21	28	34	43	47	57	68	94	121	142	168
60	105	13	18	21	26	35	42	53	58	70	84	117	150	175	210
80	48	—	8	10	12	16	20	24	27	32	38	53	69	—	—
80	120	15	20	24	30	40	48	60	67	80	96	133	171	200	240
80	141	18	24	28	35	47	56	70	78	94	113	157	201	235	282
110	165	21	27	33	41	55	66	82	92	110	132	184	236	275	330
110	204	25	34	41	51	68	82	102	113	136	164	226	291	340	408
130	195	24	33	39	49	65	78	98	108	130	156	216	279	325	390
130	233	29	39	47	58	78	93	116	130	156	186	259	333	388	466
150	225	28	38	45	56	75	90	112	125	150	180	250	321	375	450
150	267	33	44	53	67	89	106	134	148	178	213	296	381	445	534
200	133	17	22	27	33	44	53	66	74	88	106	148	190	222	266
200	300	38	50	60	75	100	120	150	167	200	240	334	429	500	600
200	360	45	60	72	90	120	144	180	200	240	288	400	514	600	720
250	375	47	62	75	94	125	150	188	208	250	300	416	536	625	750
300	450	56	75	90	112	150	180	225	250	300	360	500	643	750	900
400	600	75	100	120	150	200	240	300	334	400	480	667	857	1000	1200
500	750	94	125	150	188	250	300	375	416	500	600	832	1071	1250	1500

Field of View

$M \tan \frac{w}{2} = \tan \frac{w'}{2}$, where w is the actual field of view; w′ is the apparent field of view; M is the magnification

Type of Eyepiece	Magnifications 10	20	30	40	50	75	100	150	200	400	600	800	1000	1500
Huygens	285′	143′	95′	70′	57′	38′	29′	19′	14′	7.′2	4.′8	3.′6	2.′8	1.′8
Orthoscopic	250	125	83	63	50	33	25	17	12	6.2	4.2	3.1	2.5	1.7
Kellner	250	125	83	63	50	33	25	17	12	6.2	4.2	3.1	2.5	1.7
Monocentric	184	92	61	46	37	25	18	12	9.2	4.6	3.1	2.3	1.8	1.2
Terrestrial	250	125	83	63	50	33	25	17	12	6.2	4.2	3.1	2.5	1.7
	Diameter of field of view in angular measure (minutes of arc)													

Exit Pupil

Objective: Aperture mm	Objective: Focal Length cm	Magnifications 10	20	30	40	50	75	100	150	200	400	600	800	1000	1500
60	85, 105	6.0	3.0	2.0	1.5	1.2	0.8	0.6	0.4	0.3	—	—	—	—	—
80	48, 120, 141	8.0	4.0	2.7	2.0	1.6	1.1	0.8	0.5	0.4	—	—	—	—	—
110	165, 204	—	5.5	3.7	2.8	2.2	1.5	1.1	0.7	0.5	0.3	—	—	—	—
130	195, 233	—	6.5	4.3	3.3	2.6	1.7	1.3	0.9	0.6	0.3	—	—	—	—
150	225, 267	—	7.5	5.0	3.8	3.0	2.0	1.5	1.0	0.7	0.4	0.3	—	—	—
200	120, 300, 360	—	10.0	6.7	5.0	4.0	2.7	2.0	1.3	1.0	0.5	0.3	—	—	—
250	375	—	—	8.3	6.3	5.0	3.3	2.5	1.7	1.2	0.6	0.4	0.3	—	—
300	450	—	—	—	7.5	6.0	4.0	3.0	2.0	1.5	0.7	0.5	0.4	0.3	—
400	600	—	—	—	—	8.0	5.3	4.0	2.7	2.0	1.0	0.7	0.5	0.4	0.3
500	750	—	—	—	—	—	6.7	5.0	3.3	2.5	1.2	0.8	0.6	0.5	0.3
		Diameter of Exit Pupil in millimetres													

Choice of Objectives and Telescopes to suit the nature of the proposed investigation

The subjoined data are only intended to furnish a rough estimate of the optical capacity of the various objectives and telescope combinations. Obviously, this is as much as may be attempted since the telescopic seeing is very largely governed by variable factors, such as varying degrees of visual acuity, changing atmospheric conditions, and the like. The data respecting the visibility of stars and nebulae are given on the supposition that observation is made on a moonless night and in calm air. The limits of visibility are given for an eye with a pupil of 5 mm. in diameter and capable of discerning stars of the fifth magnitude without optical aid. The resolving power as applied to double stars is taken to be $\frac{11''}{\text{aperture of the o. g. in cm.}}$ the components of the binary being alike and of the sixth magnitude. Date respecting double stars refer to the year 1917.

Choice as determined by the aperture of the object glass

Aperture of o. g.	Faintest discernible stars Magnitude	Resolving Power with respect to double stars	Double Stars: Designation	R. A.	Declin.	Magn. M	Magn. M	Position Angle	Distance	Special discernible objects
$2\frac{3}{8}$	9.6	1.″8	γ Virginis	12h 37m	— 1° 0′	3	3	326°	5.″9	The four brightest satellites of Jupiter and Saturn. Great nebulae of Andromeda and Orion
			γ Andromedae	1 59	+ 41 54	3	5	63	10.0	
			τ Ophiuchi	17 59	— 8 11	5	6	260	2.1	
$3\frac{1}{8}$	10.0	1.″4	α Geminorum	7 29	+ 32 4	3	4	221	5.7	The five brightest satellites of Saturn. Polar spots on Mars.
			70 Ophiuchi	18 1	+ 2 32	4	6	140	4.6	
			ξ Bootis	14 48	+ 19 24	5	7	130	2.7	
$4\frac{1}{4}$	10.8	1.0	ε Bootis	14 41	+ 27 25	3	6	330	2.7	The seas on Mars
			5 Lyrae	18 42	+ 39 32	5	6	123	2.4	Granulation of the sun's surface
			ε Arietis	2 55	+ 21 2	5	6	205	1.4	
$5\frac{1}{8}$	11.2	0.85	λ Ophiuchi	16 27	+ 2 10	4	6	70	1.1	Small planets down to 11th magnitude. Star cluster in Hercules 4230
			η Orionis	5 20	— 2 28	4	5	83	2.0	
			ι Leonis	11 20	+ 10 59	4	7	47	1.6	
6	11.6	0.73	ζ Herculis	16 38	+ 31 45	3	6	110	1.5	Annular nebulae in Lyra. The six brightest satellites of Saturn. Details on surface of Mars.
			η Coronae	15 20	+ 30 35	5	6	70	0.9	
			14 Orionis	5 3	+ 8 24	6	7	155	0.9	
$7\frac{1}{8}$	12.2	0.55	δ Cygni	19 42	+ 44 56	3	8	280	1.7	Small planets
			λ Cygni	20 44	+ 36 10	5	6	55	0.8	Dumb-bell nebula in Vulpecula
			ϑ Aurigae	5 54	+ 37 12	3	7	330	2.5	Spiral nebula in Canes Venatici

Choice as determined by Manifying Power

Magnifying Power	Double Stars: Designation	R. A.	Declin.	Magnitude M	Magnitude M	Position Angle	Distance	Special discernible objects
20—30	ε,5 Lyrae	18h 42m	+ 39° 35′	5	5	173°	208″	Lunar mountains and fissures
	17 Canum Venaticorum	13 6	+ 38 56	5	6	297	290	Great nebula in Andromeda
	β Lyrae	18 47	+ 33 16	3	7	150	46	Pleiades
	ι Cancri	8 42	+ 29 4	4	6	307	30.5	The four brightest satellites of Jupiter
50	ζ Ursae Majoris	13 21	+ 55 22	2	4	150	14.4	The larger sun spots
	α Canum Venaticorum	12 52	+ 38 46	3	6	227	19.9	Ring of Saturn
	γ Arietis	1 49	+ 18 53	4	4	0	8.3	Venus recognisable as a disc
	γ Andromedae	1 59	+ 41 54	3	5	63	10.0	Venus visible by day
100	The Polar Star	1 25	+ 88 53	2	9	215	18.2	Details of sun spots
	γ Virginis	12 37	— 1 0	3	3	326	5.9	Belts of Jupiter
	α Herculis	17 11	+ 14 29	3	6	112	4.7	Details on moon's surface
	α Geminorum	7 29	+ 32 4	3	4	221	5.7	Uranus recognisable as a disc
200	γ Leonis	10 16	+ 20 16	2	4	118	3.6	Cassini's division on Saturn's ring
	ε Lyrae	18 42	+ 39 35	5	6	10	3.2	Details on moon's surface
	5 Lyrae	18 42	+ 39 32	5	6	123	2.4	Annular nebula in Lyra
	μ Draconis	17 4	+ 54 35	5	5	135	2.2	Granulation of sun's surface
300	ζ Orionis	5 37	— 1 59	2	5	159	2.5	Details on surface of Mars
	γ Ceti	2 39	+ 2 55	3	7	291	2.9	Small planets
	ε Arietis	2 55	+ 21 2	5	6	205	1.4	Neptune distinctly recognisable as disc
	ι Leonis	11 20	+ 10 59	4	7	47	2.6	Jupiter's satellites I-IV recognisable as discs
400	ι Cassiopeiae	2 22	+ 67 3	4	7	245	2.2	Resolution of close binaries
	η Orionis	5 20	— 2 28	4	5	83	1.0	
	ζ Herculis	16 38	+ 31 45	3	6	110	1.5	
	5 Aurigae	4 55	+ 39 17	6	10	257	3.1	
500	ϑ Aurigae	5 54	+ 37 12	3	7	330	2.5	Resolution of close binaries
	δ Cygni	19 42	+ 44 56	3	8	280	1.7	
	25 Canum Venaticorum	13 34	+ 36 43	5	7	122	1.5	
	λ Cygni	20 44	+ 36 11	5	6	55	0.8	

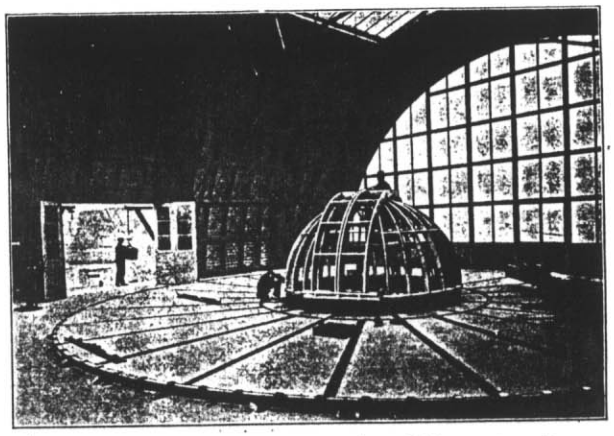

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Fig. 159. Workshop for the Construction of Observatory Domes.

Observatory Domes

The design and structural arrangements of observatory domes are governed by architectural contingencies, climatic conditions, and individual requirements, etc. It is therefore not an easy matter to arrive at general constructive principles such as may be adaptable under all circumstances. In the subjoined illustrations a number of observatories are shown which have been actually errected, and it may be interesting to note the various means adopted to bring the design into line with existing buildings and surroundings.

The fundamental form of the dome is that of a hemisphere surmounting a low cylindrical extension above the live ring.

The material varies according to the size of the dome. We employ accordingly
Wood only for domes up to 6 metres (20 ft.) in diameter,
Wood and iron for domes 6 to 10 metres (20 to 33 ft.) in diameter,
Iron for domes over 10 metres (33 ft.) in diameter.

Domes up to 10 metres (33 ft.) in diameter are sheathed with rubberoid millboard, or, if preferred, with sheet copper; whilst larger domes are sheathed with sheet steel.

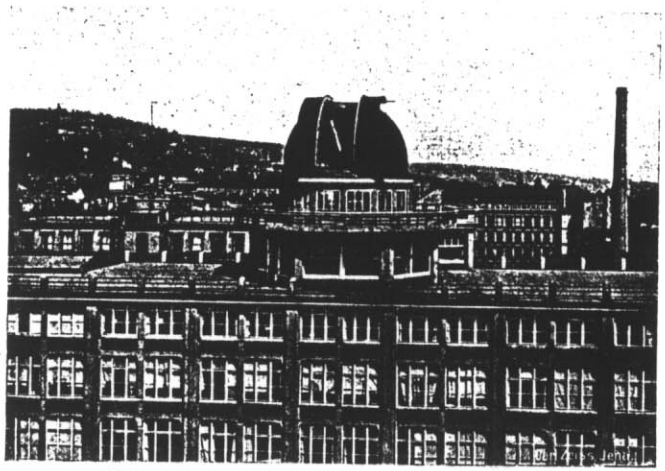
Domes up to 6 metres (20 ft.) in diameter run on balls, whilst larger domes revolve on roller bearings.

The slit shutter extends from the horizon to the zenith in one or two parts, as may be preferred.

The width of the slit is determined by the type and aperture of the refractor. For astro-photographic work it is advisable to provide as wide a slit opening as may be. The domes are either made to revolve by hand gear, or, if desired, by electro-motors.

For the adaptation of the domes to the understructure and the instrument we supply free of cost dimensioned drawings of the required arrangements of the containing walls and the instrument piers.

Enquiries relating to domes for existing refractors should be accompanied by particulars of the total length of the telescope with dew cap and accessories in position; also the height of the equatorial pillar and the available area for the accomodation of the dome. In the event of the telescope being equipped with astro-cameras the position of the cameras on the telescope, the diameter of the camera lenses, the focal length and the plate size should be stated as these determine the width of the observing slit.



A 89

Fig. 160
Observatory Dome of 8.4 metres (27½ ft.) internal diameter constructed of wood and iron, over the Offices of the Zeiss Works, at Jena

Domes of 3 to 6 metres (10 to 20 feet) Diameter

Figs. 161—168

The frame work consists of wooden ribs, Fig. 159, whilst the sheathing is made up of boarding and roof felting with an outermost layer of rubberoid.

The dome runs on a ball race and is made to revolve by hand gear. The sliding shutter is in one or two parts, as may be required, and is operated by rope gear. Plumbing comprising rain gutters and the requisite weatherproof jointing to the slit and dome is included in the price; whilst cornice flashings are not included.

The price of the dome includes the services of a fitter during the period of erection. The purchaser bears the cost of packing, freight and delivery of dome parts and fittings to the place of erection, the travelling expenses of the fitter and wage equivalents whilst travelling both ways, also the cost of scaffolding and incidental labour.

The prices conform to standard quotations and are subject to variation according to the state of the timber and iron market. Particulars respecting these variations will be supplied on application.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
422	Dome of 3 metres 10 ft. inside diameter	*Asdod*	51 96 10
423	„ „ 3.5 „ 11½ „ „ „	*Asdrubal*	51 96 15
424	„ „ 4.0 „ 13 „ „ „	*Aseaba*	51 96 20
425	„ „ 4.5 „ 14¾ „ „ „	*Aseabamos*	51 96 25
426	„ „ 5.0 „ 16½ „ „ „	*Aseadme*	51 96 30
427	„ „ 5.5 „ 18 „ „ „	*Aseamose*	51 96 35
428	„ „ 6.0 „ 20 „ „ „	*Aseando*	51 96 40

Prices of domes of other dimensions, or with copper sheathing, motor gearing, Venetian shutter slits, or constructed in iron will be quoted on application.

For particulars of dimensions and weights see page 136 — For Prices see separate List

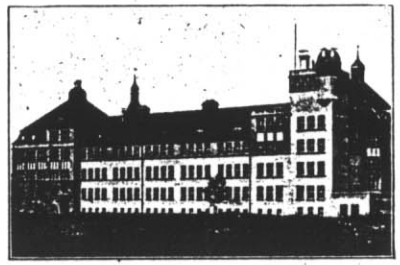


Fig. 161. Bismarck School (Upper Modern Division) at Hannover. Wooden dome of 4 metres (13 ft.) diam. with rubberoid sheathing.

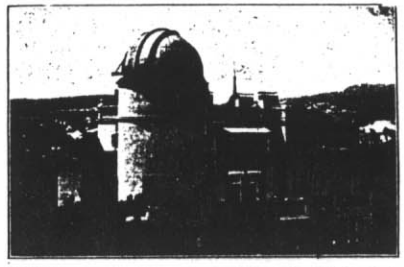


Fig. 162. Private Observatory of Herr Rudolf König at Wien. Wooden dome of 5.8 metres (19 ft.) diam. with rubberoid sheathing.



Fig. 163. Private Observatory of Dr. Rosenberg at Tübingen. Wooden dome of 4.3 metres (14 ft.) diam. with rubberoid sheathing.

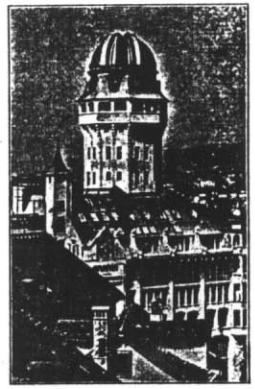


Fig. 164. "Urania" Observatory at Zürich. Copper-covered wooden dome of 8.4 metres (27½ ft.) diam.



Fig. 165. Observatory of the State High School (modern subjects), Erfurt. Copper-covered wooden dome, 4.9 metres in diameter (16 ft.) with Venetian slit shutter.



Fig. 166. Observatory of the State High School (modern subjects) at Weissenfels. Copper-covered wooden dome of 2.8 metres (9 ft.) diam. with Venetian slit shutter.



Fig. 167. Observatory of the University of Münster (Westphalia). Copper-covered wooden dome of 6 metres (20 ft.) diam.

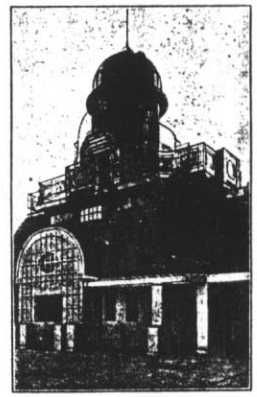


Fig. 168. Roof platform with observatory of the "Reform-Gymnasium" (State High School, classical subjects) at Charlottenburg. Copper-covered dome of 3.5 metres (11½ ft.) diam. with Venetian slit shutter.

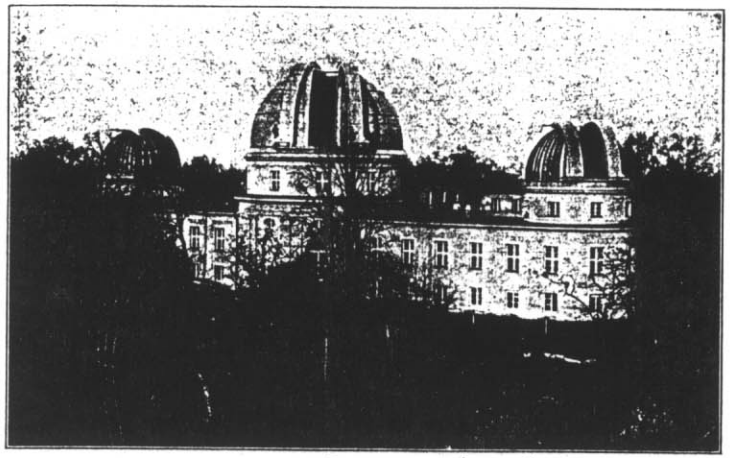


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Fig. 169

Observatory at Babelsberg near Berlin. Central dome of 14.5 metres (47½ ft.) diam., constructed in iron; end domes of 8.3 metres (27 ft.) diam., constructed in wood and iron and sheathed with rubberoid.

Domes of 6 to 10 metres (20 to 33 ft.) diameter

Figs. 169—172

The frame consists of an iron ring, main girders of iron, and wooden ribs. The dome is covered with boards, roof felting and an outermost sheathing of rubberoid. The domes revolve on rollers in ball bearings attached to the movable part of the dome and running on a circular iron track resting on the stone work. They are kept within the track by side rollers. They are rotated by a circular rack and hand wheel, and the slit shutter is operated by rope gearing.

The price includes plumbing comprising water-tight jointing to the slit and dome with respect to the containing wall, and the rain gutter. It does not include cornice jointing.

The price of the dome includes the services of a fitter during erection, exclusive of travelling expenses and wages during the journey, the cost of scaffolding, and incidental labour, freight, and cost of delivery to the place of erection, all of which go to the account of the purchaser.

Prices of domes of other diameters, or covered with sheet copper, operated by motors, or designed in iron (without wood) will be quoted on application.

The prices of domes are based on standard quotations and are subject to variation according to the state of the timber and metal markets. Particulars of the variations ruling at any time will be furnished on application.

Astro No. 30	Description	To be quoted when ordering: Codeword	Identification No
429	Dome of 6 metres (20 ft.) internal diam.	*Asear*	51 96 50
430	„ „ 7 „ (23 „) „ „	*Asearas*	51 96 55
431	„ „ 8 „ (26 „) „ „	*Asearemos*	51 96 60
432	„ „ 9 „ (29 „) „ „	*Asearia*	51 96 65
433	„ „ 10 „ (33 „) „ „	*Asearon*	51 96 70

Prices of **barrel roofs for meridian circles** (Fig. 173), **buildings for transit instruments** (Fig. 174), and other **types of sliding roofs** (Fig. 175) on application.

For particulars of dimensions and weights see page 136 — **For Prices see separate List**

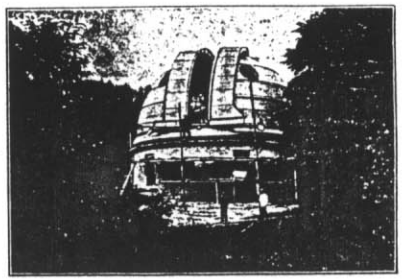


Fig. 170

Observatory at Babelsberg near Berlin

Dome construction of iron, 13 metres (42½ ft.) in diam., for the 1.2-metre (47½-inch) Reflector; Fig. 52, page 49.

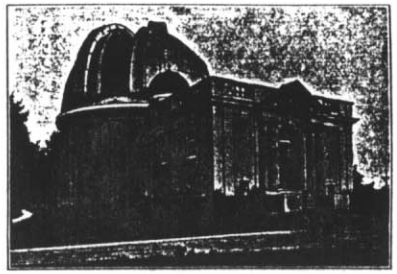


Fig. 171

Hamburg Observatory at Bergedorf

Dome construction of iron, 12.7 metres (41½ ft.) in diam., for the 60-cm. (23½-inch) Refractor.

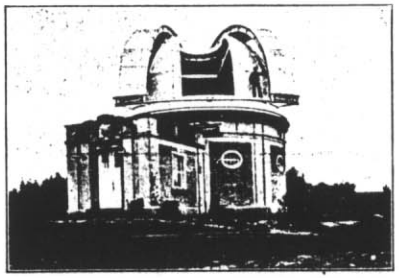


Fig. 172

Hamburg Observatory at Bergedorf

Dome construction of iron, 9.5 metres (30 ft.) in diameter for the 100-cm. (39½-inch) Reflector, Figs. 48—50, pages 46, 47.

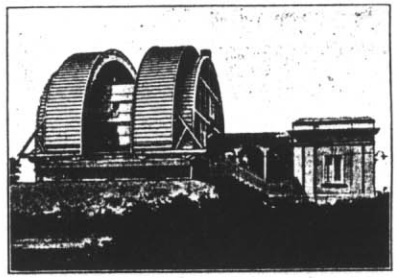


Fig. 173

Hamburg Observatory at Bergedorf

Barrel roof covering an area of 10×8 metres (33×26 ft.), for the large Meridian Circle.

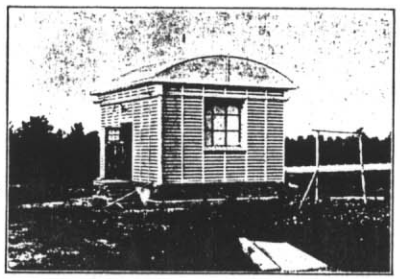


Fig. 174

Hamburg Observatory at Bergedorf

Transit House covering area of 6×5 metres (20×16½ ft.).

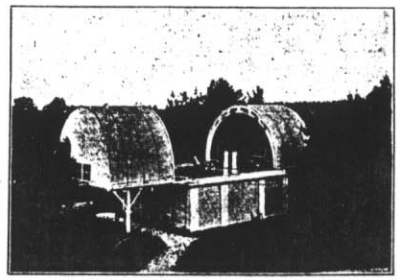
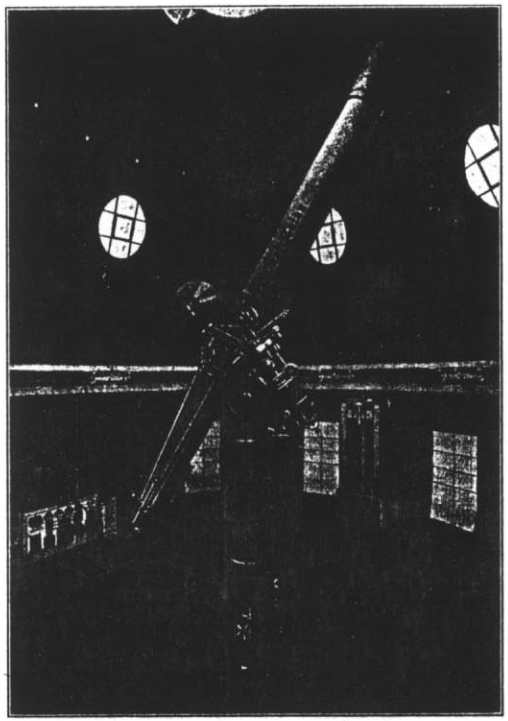


Fig. 175

Hamburg Observatory at Bergedorf

Cabin covering area of 6×6 metres (20×20 ft.) for portable instruments.



2417

Fig. 176

Observatory at Babelsberg near Berlin

Refractor of 650 mm. (25½ in.) aperture and 10.5 metres (34½ ft.) focal length, showing the rising floor in its lowest position.

Price: On application. Codeword: *Asechome.* Ident. No.: 51 35 65

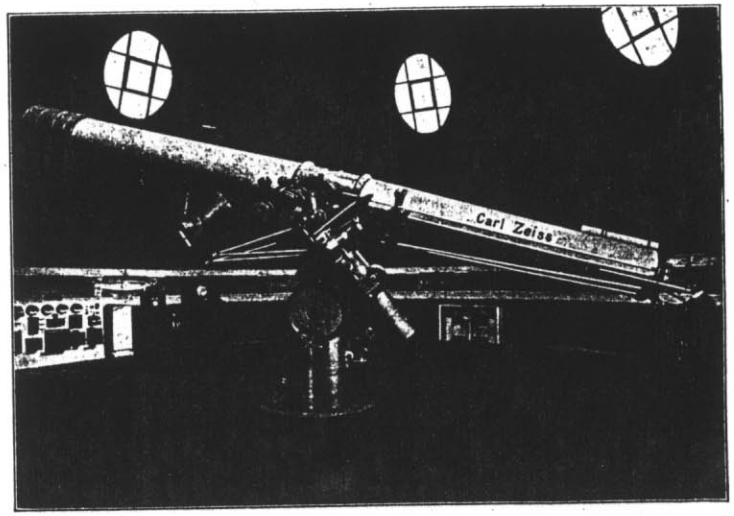
Rising Floors and Platforms

Rising floors for large astronomical instruments are either arrangements in which the floor rises and descends as a whole, as shown in Figs 176 to 178, or small platforms, as shown in Fig. 48, page 46. They enable the observer under all circumstances to work without discomfort.

Smaller platforms are controlled by hand gear, whereas large floors are operated from the eye end of the instrument by motors set in motion by push switches. If required, two speeds are provided.

Large rising floors are designed for a full human load. The ascent and descent is effected by the simultaneous operation of three vertical screw spindles, upon which the floor is balanced against the load and its own weight, which completely obviates the possibility of an accidental descent.

Prices of Observation Platforms and Rising Floors on application.

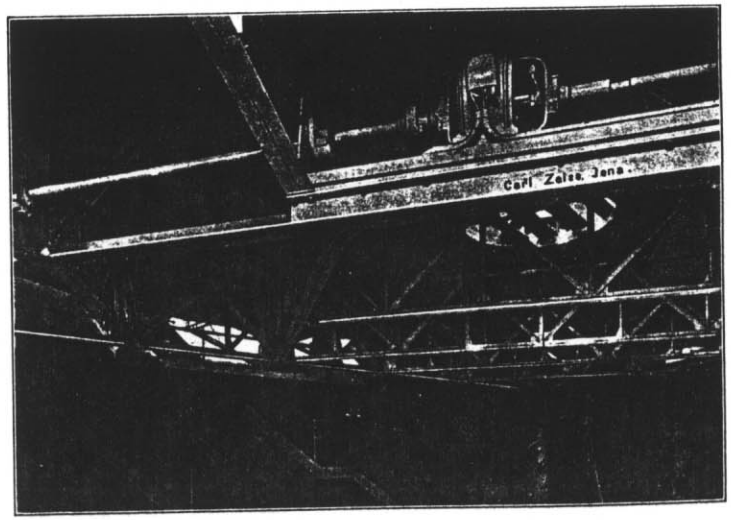


2380

Fig. 177

Observatory at Babelsberg near Berlin

Refractor of 650 mm. (25½ in.) aperture and 10.5 metres (34½ ft.) focal length, showing the floor near its highest position.



2378

Fig. 178

Observatory at Babelsberg near Berlin

Rising floor of the 650-mm. (25½-inch.) Refractor as seen from below.



Fig. 179 2393
Revolving Observation Platform for small refractors

Revolving Observation Platforms for small refractors, enabling the observer to follow without trouble the eye end of the telescope in every conceivable position.

The stage revolves on a ball race similar to that employed with domes of 3 to 6 metres (10 to 20 ft.) diameter. A small raised stage arranged in steps enables the observer to occupy various levels. The whole is surrounded with iron railings for his protection. The platform has an opening in the floor, through which it may be reached by a spiral staircase or ladder.

Observation Ladders

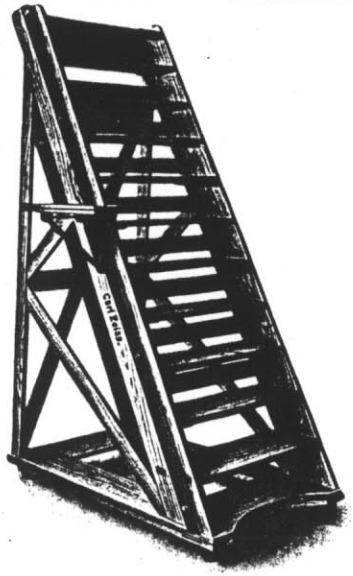
Figs. 180—183

The design of observation ladders is so largely governed by the peculiarities of the telescope, the available space, and individual requirements that in the majority of cases it is found necessary to submit a separate design in every case. Small instruments of up to 200 mm. (8 in.) aperture are adequately served by ladders of simplest design. These are provided with trip-up treads of Polish pine and fitted with casters, so that they may be freely moved about.

Astro 30 No.	Description	To be quoted when ordering: Codeword	Identification No.
434	**Observation Ladder** with 7 tip-up treads, Fig. 181 . .	*Aseaseis*	51 98 10
435	**Observation Ladder** with 11 tip-up treads, Fig. 180. .	*Aseasen*	51 98 15
436	Cost per **additional tread** fitted to Nos. 434 or 435. .	*Asebebia*	51 98 20
437	**Movable writing desk at side**, Fig. 180, including attachment to observation ladder	*Asebi*	51 98 30
438	**Simple movable seat**, Fig. 182, to slip over treads so as to raise the seat by fractions of a rise	*Asebiam*	51 98 40
439	**Observation Ladder** with sliding seat and writing desk, Fig. 183, and 12 fixed treads	*Asebilum*	51 98 50

Prices of Observation Ladders of dimensions, designs, and material other than here stated will be quoted on application

For particulars of dimensions and weights see page 136 — **For Prices see separate List**



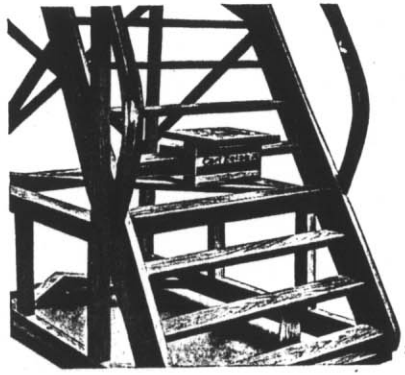
2374

Fig. 180
Observation Ladder with 11 tip-up treads and sliding desk Nos. 435 and 437.



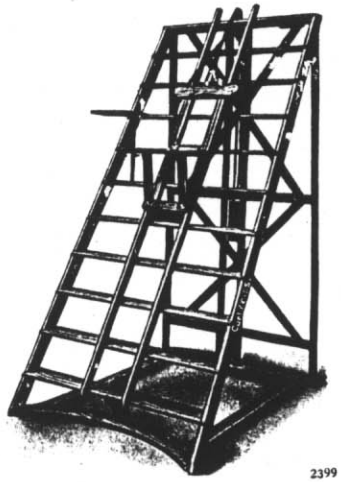
2398

Fig. 181
Observation Ladder with 7 tip-up treads, No. 434.



2411

Fig. 182
Movable Seat for Observation Ladders, No. 438.



2399

Fig. 183
Observation Ladder with 12 fixed treads, sliding seat, and writing desk, No. 439.

Dimensions and Weights of Telescopes in Altazimuth Mounts

Astro 30 No-	Dimensions, Figs. 184—187						Weights						
	A	B	C		Fitted Case		Nett				Gross		Cubical measure of Packing
	Least Length of Telescope	Eyepiece drawtube extension	Height of Telescope fork above base		Length Width Height	Radius of base of Stand R	Telescope	Eyepiece and Accessories	Stand with elevating gear	Fitted Case	Telescope with case	Stand with elevating gear	
			Least	Greatest									
	inches	inches	inches	inches	in. in. in.	inches	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	cub. ft.
1	36¼	6 5/16	26	26	40 12¼ 9½	7	9 7/16	1¾	22	30¾	121	—	13¾
2	41¼	6 5/16	26	26	45 12¼ 9½	7	15 3/16	1¾	22	39½	143	—	13¾
3	36¼	6 5/16	26	26	40 12¼ 9½	7	9 7/16	1¾	22	30¾	121	—	13¾
4	52½	6 5/16	32¼	32¼	55½ 15¾ 11¾	10¼	29¾	1¾	35¼	33	198	—	17¼
5	60½	6 5/16	32¼	32¼	67 15¾ 11¾	10¼	33	1¾	35¼	44	242	—	17¼
6	52½	6 5/16	32¼	32¼	55½ 15¾ 11¾	10¼	29¾	1¾	35¼	33	198	—	17¼
7	36¼	6 5/16	59	71	40 11 8	17¾	13¼	1¾	11	20¾	110	—	3½
8	41¼	6 5/16	59	71	44½ 11 8	17¾	15 3/16	1¾	11	23⅛	132	—	7
9	36¼	6 5/16	59	71	40 11 8	17¾	13 3/16	1¾	11	20¾	110	—	3½
10	36¼	6 5/16	59	71	40 11 8	17¾	12⅛	1¾	10 3/16	20¾	110	—	3½
11	41¼	6 5/16	59	71	44½ 11 8	17¾	14 3/16	1¾	10 3/16	23⅛	132	—	7
12	36¼	6 5/16	59	71	40 11 8	17¾	12 5/16	1¾	10 3/16	20¾	110	—	3½
13	52½	6 5/16	61	77	55½ 11½ 8¼	17¼	30¾	2	88	33	154	198	41½
14	60½	6 5/16	61	77	63¾ 11½ 8¼	17¼	35¼	2	88	44	176	198	48¼
15	52½	6 5/16	61	77	55½ 11½ 8¼	17¼	30¾	2	88	33	154	198	41½
16	52½	6 5/16	59	75	55½ 11½ 8¼	15¾	30¾	2	66	33	154	154	31
17	61½	6 5/16	59	75	63¾ 11½ 8¾	15¾	35¼	2	66	44	176	154	34½
18	52½	6 5/16	59	75	55½ 11½ 8¼	15¾	30¾	2	66	33	154	154	31
19	72¼	6 5/16	61	77	75 14 9¾	17¼	44	6⅛	99	61½	264	198	62
20	88	6 5/16	61	77	90½ 14 9¾	17¼	55	6⅛	121	77	308	220	65½
21	72¼	6 5/16	61	77	75 14 9¾	17¼	46¼	6⅛	99	61½	264	198	62
22	72¼	6 5/16	59	75	75 14 9¾	15¾	44	6⅛	77	61½	264	176	45
23	88	6 5/16	59	75	90½ 14 9¾	15¾	55	6⅛	99	77	308	198	48¼
24	72¼	6 5/16	59	75	75 14 9¾	15¾	46¼	6⅛	77	61½	264	176	45
25	87	6 5/16	63	79	90½ 16 11¾	17¼	55	6 5/8	110	99	330	220	86¼
26	102½	6 5/16	67	82¾	106 16 11¾	21¼	77	6 5/8	121	110	374	308	110½
27	87	6 5/16	63	79	90½ 16 11¾	17¼	57¼	6 5/8	110	99	330	220	86¼
28	87	6 5/16	67	82¾	90½ 16 11¾	22¼	55	6 5/8	88	99	330	220	72½
29	102½	6 5/16	67	82¾	106 16 11¾	22¼	77	6 5/8	99	110	374	264	96½
30	87	6 5/16	67	82¾	90½ 16 11¾	22¼	57¼	6 5/8	88	99	330	220	72½
31	25½	1¾	61	77	28¾ 10 5/8 7⅛	17¼	16½	3¾	88	16½	99	198	34½
32	25½	1¾	59	75	28¾ 10 5/8 7⅛	15¾	16½	3¾	66	16½	99	154	20¾

For descriptions see pages 9—19 — Prices in separate List

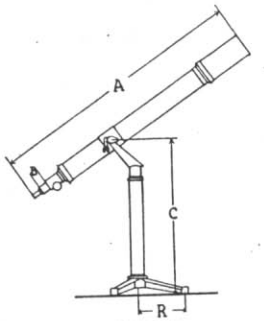


Fig. 184

60 and 80-mm. (3⅛ and 3¼-inch) Telescopes on Table Claw Stands
Nos. 1—6

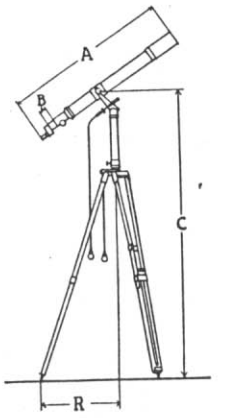


Fig. 185

60-mm. (2⅜-inch) Travelling Telescopes
Nos. 7—12

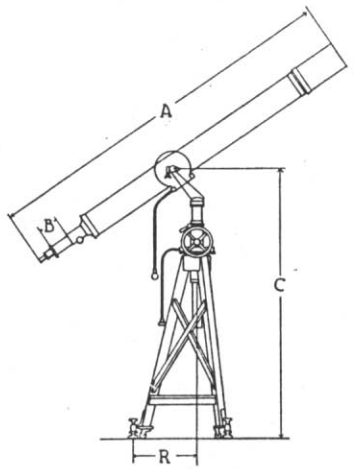


Fig. 186

80—130-mm. (3¼ to 5¼-inch) Telescopes in Altazimuth Mounts on Pyramid Stands
Nos. 13—32

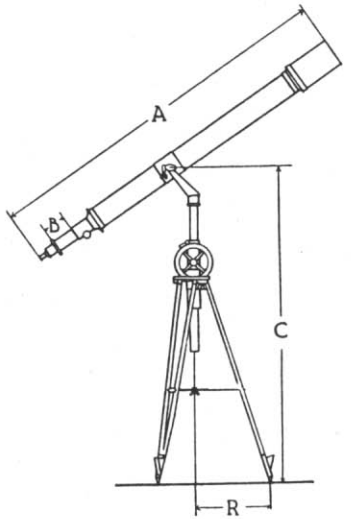


Fig. 187

80 to 130-mm. (3¼ to 5¼-inch) Telescopes in Altazimuth Mounts on Field Tripods
Nos. 13—32

Dimensions and Weights
of Equatorially Mounted Telescopes, Refractors and Reflecting Telescopes

Astro 30 No.	Dimensions, Figs. 188—191						Dome, Fig. 191					Weights						Cubical measure of Packing
	A Least Length of Telescope	B Eyepiece draw-tube extension	C Height of Tripod up to point of intersection of axes	R Radius of base of Stand	Fitted Case Length Width Height	Number of steps in observation ladders	d	D	h	H	P	Nett: Telescope	Nett: Eyepieces and Accessories	Nett: Tripod Stand (Pillar) and Equatorial Head	Nett: Fitted Case	Gross: Telescope and Accessories with case	Gross: Tripod Stand (Pillar) with Equatorial head	
	in.	in.	in.	in.	in. in. in.		in.	in.	in.	in.	in.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	cub. ft.
33	65	$6\frac{5}{16}$	$55\frac{1}{8}$	$17\frac{1}{8}$	$7\frac{1}{8}$ $5\frac{7}{8}$ 4		130	145	$19\frac{3}{8}$	$37\frac{1}{2}$		44	$3\frac{5}{16}$	1210	$4\frac{3}{8}$	264	1760	138
34																264		$17\frac{1}{4}$
35							130	145	$19\frac{3}{8}$	$37\frac{1}{2}$						1540		$310\frac{1}{8}$
36	$52\frac{1}{2}$	$6\frac{5}{16}$	$73\frac{3}{8}$	$17\frac{1}{8}$	57 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	$5\frac{1}{8}$	33	$\frac{7}{8}$	121	44	176	330	$65\frac{1}{8}$
37	$60\frac{1}{2}$	$6\frac{5}{16}$	$73\frac{3}{8}$	$17\frac{1}{8}$	65 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	$5\frac{1}{8}$	$37\frac{1}{2}$	$\frac{7}{8}$	121	55	198	352	$72\frac{1}{8}$
38	$52\frac{1}{2}$	$6\frac{5}{16}$	$73\frac{3}{8}$	$17\frac{1}{8}$	57 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	$5\frac{1}{8}$	33	$\frac{7}{8}$	121	44	176	330	$65\frac{1}{8}$
39	$52\frac{1}{2}$	$6\frac{5}{16}$	$73\frac{3}{8}$	$17\frac{1}{8}$	57 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	$5\frac{1}{8}$	33	$\frac{7}{8}$	66	44	176	308	$55\frac{1}{4}$
40	$60\frac{1}{2}$	$6\frac{5}{16}$	$73\frac{3}{8}$	$17\frac{1}{8}$	65 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	$5\frac{1}{8}$	$37\frac{1}{2}$	$\frac{7}{8}$	66	55	198	330	62
41	$52\frac{1}{2}$	$6\frac{5}{16}$	$73\frac{3}{8}$	$17\frac{1}{8}$	57 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	$5\frac{1}{8}$	33	$\frac{7}{8}$	66	44	176	308	$55\frac{1}{4}$
42	$52\frac{1}{2}$	$6\frac{5}{16}$	75	$17\frac{3}{4}$	57 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	4	33	$\frac{7}{8}$	154	44	220	418	69
43	$60\frac{1}{2}$	$6\frac{5}{16}$	75	$17\frac{3}{4}$	65 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	4	$37\frac{1}{2}$	$\frac{7}{8}$	165	55	242	440	76
44	$52\frac{1}{2}$	$6\frac{5}{16}$	75	$17\frac{3}{4}$	57 $13\frac{1}{4}$ $9\frac{7}{8}$	6	118	147	$15\frac{3}{4}$	63	4	33	$\frac{7}{8}$	154	44	220	418	69
45	$72\frac{1}{4}$	$6\frac{5}{16}$	77	$17\frac{3}{4}$	75 $17\frac{3}{4}$ $11\frac{3}{4}$	6	118	147	$15\frac{3}{4}$	65	4	$46\frac{1}{4}$	$1\frac{1}{8}$	187	55	242	484	$89\frac{3}{4}$
46	88	$6\frac{5}{16}$	77	$17\frac{3}{4}$	$90\frac{1}{8}$ $17\frac{3}{4}$ $11\frac{3}{4}$	8	138	167	$15\frac{3}{4}$	65	4	$57\frac{1}{2}$	$1\frac{1}{8}$	187	66	264	528	$96\frac{1}{2}$
47	$72\frac{1}{4}$	$6\frac{5}{16}$	77	$17\frac{3}{4}$	75 $17\frac{3}{4}$ $11\frac{3}{4}$	6	118	147	$15\frac{3}{4}$	65	4	$48\frac{1}{2}$	$1\frac{1}{8}$	187	55	242	484	$89\frac{3}{4}$
48	$72\frac{1}{4}$	$6\frac{5}{16}$	77	$17\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	6	118	147	$15\frac{3}{4}$	65	4	$46\frac{1}{4}$	$5\frac{3}{4}$	528	$4\frac{3}{8}$	242	1012	$93\frac{1}{4}$
49	88	$6\frac{5}{16}$	77	$17\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	8	138	167	$15\frac{3}{4}$	65	4	$57\frac{1}{4}$	$5\frac{3}{4}$	528	$4\frac{3}{8}$	286	1012	$103\frac{1}{8}$
50	$72\frac{1}{4}$	$6\frac{5}{16}$	77	$17\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	6	118	147	$15\frac{3}{4}$	65	4	$48\frac{1}{2}$	$5\frac{3}{4}$	528	$4\frac{3}{8}$	242	1012	$93\frac{1}{4}$
51	87	$6\frac{5}{16}$	77	$17\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	8	138	167	$15\frac{3}{4}$	65	4	$59\frac{1}{2}$	6	660	$4\frac{3}{8}$	352	1188	$96\frac{1}{2}$
52	$98\frac{1}{2}$	$6\frac{5}{16}$	77	$17\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	8	157	187	$17\frac{3}{4}$	63	4	77	6	660	$4\frac{3}{8}$	374	1188	$117\frac{1}{4}$
53	87	$6\frac{5}{16}$	77	$17\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	8	138	167	$15\frac{3}{4}$	65	4	$61\frac{1}{4}$	6	660	$4\frac{3}{8}$	352	1188	$96\frac{1}{2}$
54	$96\frac{1}{2}$	$6\frac{5}{16}$	$94\frac{1}{2}$	$19\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	10	157	187	$17\frac{3}{4}$	81	4	154	8	1364	$4\frac{3}{8}$	484	2420	$155\frac{1}{4}$
55	116	$6\frac{5}{16}$	$94\frac{1}{2}$	$19\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	10	197	226	$19\frac{3}{8}$	79	4	187	8	1364	$4\frac{3}{8}$	506	2420	$172\frac{1}{8}$
56	$96\frac{1}{2}$	$6\frac{5}{16}$	$94\frac{1}{2}$	$19\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	10	157	187	$17\frac{3}{4}$	81	4	154	8	1364	$4\frac{3}{8}$	484	2420	$155\frac{1}{4}$
57	130	$6\frac{5}{16}$	$104\frac{3}{4}$	$21\frac{3}{4}$	$15\frac{3}{4}$ $7\frac{1}{8}$ $7\frac{1}{8}$	12	197	226	$19\frac{3}{8}$	$88\frac{1}{2}$	4	242	$8\frac{1}{4}$	2420	$6\frac{3}{8}$	836	3520	$172\frac{1}{8}$
58	153	$6\frac{5}{16}$	$104\frac{3}{4}$	$21\frac{3}{4}$	$15\frac{3}{4}$ $7\frac{1}{8}$ $7\frac{1}{8}$	12	236	266	$21\frac{3}{8}$	$86\frac{1}{2}$	4	297	$8\frac{1}{4}$	2420	$6\frac{3}{8}$	880	3520	207
59	130	$6\frac{5}{16}$	$104\frac{3}{4}$	$21\frac{3}{4}$	$15\frac{3}{4}$ $7\frac{1}{8}$ $7\frac{1}{8}$	12	197	226	$19\frac{3}{8}$	$88\frac{1}{2}$	4	253	$8\frac{1}{4}$	2420	$6\frac{5}{8}$	836	3520	$172\frac{1}{8}$
60	63	$6\frac{5}{16}$	73	$27\frac{1}{8}$	$15\frac{3}{4}$ $11\frac{3}{4}$ $7\frac{1}{8}$	6	118	147	$15\frac{3}{4}$	65	8	220	11	1540	11	616	2420	$103\frac{1}{8}$
61	$90\frac{1}{2}$	$1\frac{5}{16}$	67	$19\frac{3}{4}$	$11\frac{3}{4}$ $7\frac{1}{8}$ $5\frac{1}{8}$	8	157	187	$17\frac{3}{4}$	$53\frac{1}{4}$	4	220	$1\frac{1}{8}$	2200	$4\frac{3}{8}$	440	2640	$172\frac{1}{8}$

For descriptions see pages 21—43 — Prices in separate List

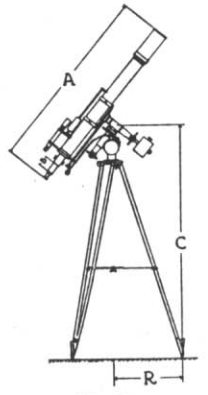


Fig. 188

80-mm. ($3\frac{1}{4}$-inch) Equatorial Telescopes Nos. 36—41

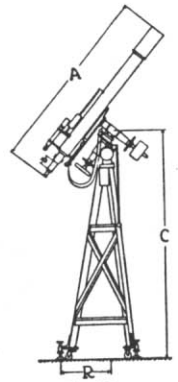


Fig. 189

80 and 100-mm. ($3\frac{1}{4}$ and $4\frac{1}{4}$-inch) Equatorial Telescopes, Nos. 42—47

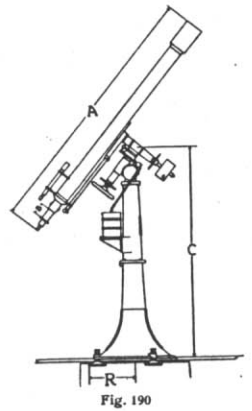


Fig. 190

110 and 130-mm. ($4\frac{1}{4}$ and $5\frac{1}{4}$-inch) Equatorial Telescopes, Nos. 48—53

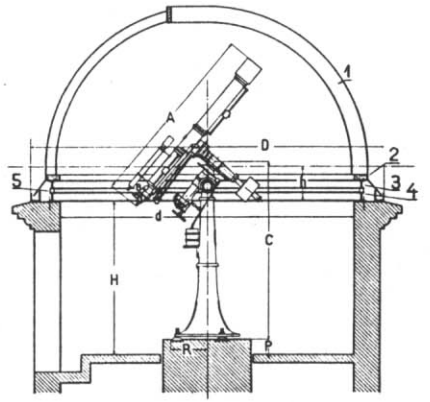


Fig. 191

150 and 200-mm. (6 and 8-inch) Refractors Nos. 54—59

d Inside diameter of dome
D Outside diameter of dome
h Height of dome centre above cornice
H Height of cornice above floor level
A Least length of telescope
B Eyepiece draw-tube extension
C Height of stand (or pillar) measured from its sole to the centre of oscillation of the telescope
P Height of brick pier above the floor level

1 Wooden ribs
2 Dome ring
3 Upper live ring fixed to dome
4 Lower live ring fixed to brick work
5 Ring of steel balls

Dimensions and Weights of Accessories

Astro 30 No.	Length (Diameter) Height in.	Weights Nett Instrument lbs.	Weights Nett Case lbs.	Weights Gross lbs.	Cubical measurement of Packing cub. ft.
62	(3 1/4) 3/4	1/2			
63	(2 3/8) 3/8	1/8			
64	(4) 3/4	1/8			
65	(3 1/4) 3/8	1/2			
66	(6 1/4) 1 3/16	3/4			
67	(5 1/4) 3/4	1/2			
68	(7 1/4)	17 5/8	11	55	
69	(9)	17 5/8	11	66	
70	(9)	17 5/8	11	66	
71	(4) (5 1/8)	3 1/4			
72	(6 1/4) 1 3/16	1 3/4			
73	7 1/4				
74	10 1/4				
75	10 1/4				
76	(4 3/4) 7 1/8	5 1/2		13 1/4	
77	(8 5/8) 11 3/4	121	15 3/8	220	3 1/2
78	(11 3/4) 14 1/2	154	55	264	10 1/2
79	(4 3/4) 6 3/4	3 3/4			
80	(6 1/4) 2 3/8	2 3/8			
81	(7 7/8) 3 9/16	3 1/4			
82	6 3/4 4 5 7/8	6 5/8		11	
83	21 37 1/2 78 3/4	1650		2860	69
84	(14 1/8) 26	22		35 1/4	3 1/2
85	(20 1/2) 32 1/4	35 1/4		59 1/2	3 1/2
86	(35 1/2) 59 3/8	11		17 5/8	
87	(35 1/2) 59 3/8	11		17 5/8	
88	(34 3/4) 61	88		176	34 1/2
89	(34 3/4) 61	99		198	41 1/2
90	(37 1/2) 65	110		220	41 1/2
90 a	(34 3/4) 61	88		176	34 1/2
91	(31 1/2) 59	66		132	13 3/4
92	(31 1/2) 59	88		176	13 3/4
93	(44 3/4) 63	99		198	17 1/4
94	(31 1/2) 59	66		132	13 3/4
95	39 1/4 7 7/8 7 7/8	12 1/8	22	44	7
96	45 1/4 7 7/8 7 7/8	14 5/16	24 1/4	77	7
97	55 11 3/4 7 7/8	28 1/2	30 3/4	143	10 1/2
98	63 11 3/4 7 7/8	33	39 3/4	165	10 1/2
99	75 12 5/8 9 7/8	41 3/4	57 1/4	242	10 1/2
100	90 1/2 12 5/8 9 7/8	50 8	70 8	286	
101	90 1/2 14 1/2 11 3/4	48 8	77	286	
102	106 14 1/2 11 3/4	66	88	330	
103	39 1/4 7 7/8 7 7/8	12 5	22	44	

Astro 30 No.	Length (Diameter) Height in.	Weights Nett Instrument lbs. oz.	Weights Nett Case lbs. oz.	Weights Gross lbs.	Cubical measurement of Packing cub. ft.
104	45 1/4 7 7/8 7 7/8	14 6	24 4	77	
105		6 10			
106	4 4 3/8 2 3/8	12 1/4	14 1/4		
107	(1 9/16) 2 3/8	1 1 3/4			
108		1/4			
109	6 3/4 4 5 7/8	6 10		11	
110	(2 3/8) 4				
111	(3 1/8) 4 3/4	1 7	10 1/2	11	
112	(4) 5 7/8	2 10	2 10		
113	(2 3/4) 4 3/8	13 1/2	7		
114	(3 9/16) 4 3/8	1 8 3/4	14 1/4		
115	(4 3/8) 4 3/8	2 14	1 1 3/4	13 1/4	
116	(5 1/8) 5 1/2	5 8	1 12 1/4	22	
117	11 3/4 2 3/8 5 1/2	1 15 1/2			
118	15 3/4 2 3/4 5 1/2	2 10			
119	19 5/8 3 1/8 6 3/4	4 6		11	
120	35 1/2 4 7 7/8	6 13		17 5/8	
121	4 2 3/4 7 7/8	1 1 3/4			
122	(1 3/16) 3/4	3/4			
123	(3 9/16) 2 3/8	7 3/4	4 1/2		
124	(4 3/4) 3 1/8	1 2 3/4	10 1/2		
125	7 1/2 4 3/4 2 3/4	2 10	1 1 3/4		
126	(1 3/16) 3/4	3/4			
127	(1 3/16) 3/4	3/4			
128	(1 3/16) 3/4	3/4			
129	(1 3/16) 3/4	3/4			
130	(1 3/16) 3/4	3/4			
131	(1 3/16) 3/4	3/4			
132	(1 3/16) 3/4	3/4			
133	(1 3/16) 3/4	3/4			
134	(1 3/16) 3/4	3/4			
135	(1 9/16) 3/4	1 1/4	1		
136	2 3/8 1 3/16 3/8	1	1		
137					
138	4 3/4 3 1/8 4	1 8 3/4	7		
139	6 1/4 4 5/16 6 1/4	4 1/4	2 5/8		
140	3 1/8 2 3/8 3 9/16	5/8	3/8		
141	3 1/2 3 1/8 4 3/4	1 1/2	7/8		
142	(4 5/16) 4 5/16	2 1/4	2 1/4	11	
143	(6 1/4) 7 1/2	5 1/2	4 1/2	22	
144	(7 7/8) 21 5/8	1			
145	(11 9/4) 31 1/2	3 1/4			
146	(15 3/4) 39 1/2	5 1/2		11	

Dimensions and Weights of Accessories

Astro 30 No.	Length Width (Diameter) Height in.	Weights Nett Apparatus lbs.	Weights Nett Case lbs.	Weights Gross lbs.	Cubical measurement of Packing cub. ft.
147	(1 3/16) 3/8				
148	(1 3/16) 3/8				
149	(1 3/16) 3/8				
150	(1 3/16) 3/8				
151	(1 3/16) 3/8				
152	(1 3/16) 3/8				
153	3 1/8 3 1/8 1 9/16	5/8	1/2		
154	(7 7/8) 6 1/4	8 7/8	5 1/2	26 3/8	3 1/2
155	(15) 8 5/8	26 3/8	22	88	3 1/2
156	(11) 6 1/4	8	5 1/2	26 3/8	3 1/2
157	23 5/8 17 3/4 8 5/8	55	44	176	7
158		12 3/8	2 5/8	35 1/4	
159		17 5/8	5 1/2	55	
160		18 3/4	7 1/8	57 1/4	
161		18 3/4	7 1/8	57 1/4	
162		12 1/8	3	35 1/4	
164		22	11	66	
165		24 1/4	11	66	
166	(1 3/16) 2	1/8	1/8		
167	5 7/8 4 3/4 5 7/8	7/8	1 1/2		
169	(5 7/8) 13 3/4	6 7/8	6 5/8	22	3 1/2
170	(5 7/8) 13 3/4	8	7 3/4	22	3 1/2
171	11 3/8 17 1/4 6 1/4	7 3/4	9 1/2	33	3 1/2
172	13 3/8 9 1/2 7 7/8	7 3/4	10 1/4	33	3 1/2
173	9 7/8 5 1/8 3 15/16	7 3/4	8 7/8	33	3 1/2
174	27 1/2 8 5/8 7 7/8	26 3/8	22	88	7
175	29 11 3/4 9 1/2	28 5/8	24 1/4	99	7
176	(6 3/4) 19 3/8	9 3/4		22	
177	(7 7/8) 19 5/8	13 1/4		26 3/8	
178	(7 7/8) 22	22		33	
179	(11 3/8) 37 1/2	44		88	3 1/2
180	(11 3/8) 39 1/4	55		132	3 1/2
181	(11 3/8) 55	66		176	7
182	(11 3/8) 51 1/4	55		110	7
183	(11 3/8) 47 1/4	66		132	7
184	(11 3/8) 78 3/4	88		198	7
185a	8 9 1/8 7 1/8	6 5/8		17 5/8	3 1/2
186a	(7 1/8) 3 1 5/16	3 1/4		13 1/4	
186b	(7 1/8) 8 5/8	8 7/8	4 3/8	33	3 1/2
187	23 5/8 13 3/4 6 1/4	22	7 3/4	55	3 1/2
188	23 5/8 7 1/8 18 7/8	22	11	44	3 1/2
189	(17 1/4) 32 3/4	33	13 1/4	66	7
190	(15 3/4) 19 5/8	26 3/8	13 1/2	66	3 1/2

Astro 30 No.	Length Width (Diameter) Height in.	Weights Nett Apparatus lbs.	Weights Nett Case lbs.	Weights Gross lbs.	Cubical measurement of Packing cub. ft.
191	(29 1/2) 36 1/4	165	99	330	20 3/4
192	(19 5/8) 20 1/2	66	55	220	17 1/4
193	15 9 7/8 15 3/8	24 1/4	15 3/8	88	7
193a	33 1/2 25 1/2 29 1/2	308	110	616	57 3/4
194	17 3/4 20 7/8 18 7/8	72 5/8	44	220	13 3/4
195	53 1/4 33 1/2 41 1/4	638		880	55 1/4
196	39 1/4 33 1/2 27 1/2	286		616	34 1/2
197	(1 9/16) 2 3/8	3/16			
198	(1 9/16) 2 3/8	3/16			
199	(1 3/16) 2 3/8	1/8			
200	(1 3/16) 1 3/8	1/8			
201	(2) 1 9/16	1/16			
202	(1 3/16) 1 9/16	1/16			
203	(1 1/8/16) 5 7/8	1/8			
204	(2 3/8) 3/8	3/16			
205	(1 9/16) 1 3/8	1/8			
206	(1 3/16) 1 3/8	1/16			
207	5 7/8 1 9/16 1 3/16	1/8			
208	5 7/8 1 9/16 1 3/16	1/8			
209	5 7/8 1 9/16 1 3/16	1/8			
210	5 7/8 1 9/16 1 3/16	1/8			
211	6 1/4 1 9/16 1 9/16	3/16			
212	6 1/4 1 9/16 1 9/16	3/16			
213	6 1/4 1 9/16 1 9/16	3/16			
214	6 1/4 1 9/16 1 9/16	3/16			
215	(3 1/8) 7 1/2	1/8			
215a	4 5/16 2 3/8 1 9/16	5/8	5/8		
215b	(1 9/16) 3/8	1/16			
215c	(1 9/16) 3/8	1/16			
215d	(1 9/16) 3/8	1/16			
215e	4 3/4 5 1/2 2 3/8	7/8	7/8		
215f	4 3/4 5 1/2 2 3/8	1 3/8	7/8		
215g	(2 3/8) 3/8	1/8			
215h	(2 3/8) 3/8	1/8			
215i	(2 3/8) 3/8	1/8			
215k	(4 5/16) 4 3/4	1 3/4			
215l	5 1/16 3 1/16 3 1/16	1 3/4			
215m	19 5/8 16 9	22 5/8		55	7
215n	4 5/16 2 3/8 1 9/16	5/8	1/2		
215o	3 1/16 2 3/4 1 9/16	1/2			
215p	(1 9/16) 3/8	1/16			
215q	(1 9/16) 3/8	1/16			
215r	(9 1/2) 3 1/16	3 3/4		13 1/4	
215s	(35 1/2) 59 3/8	11		17 5/8	

Dimensions and Weights of Astro-optical Components

Astro 30 No.	Diameter Height in.	in.	Weights Nett Apparatus lbs.	oz.	Nett Case lbs.	Gross lbs.	Cubical measurements of Packing cub. ft.
216	3 1/16	8 3/8		12	1 1/8		
217	3 1/8	1 3/16		12			
218	3 1/32	1 3/16	1	4			
219	5 1/8	1 3/16	2	14	2		
220	5 1/32	2	4	6	3 1/4	13 1/4	
221	7 1/8	2	7	12	6 3/4	33	3 1/2
222	9 1/8	2 3/4	11		7 3/4	44	3 1/2
223	11 1/8	3 1/4	22		11	77	3 1/2
224	14 1/8	3 1/16	39	12	22	110	7
225	18 1/8	3 1/32	88		33	220	7
226	23 1/8	5 1/32	154		44	330	7
227	3 1/4	1 3/16		10	1/2		
228	3 1/32	1 3/16	1	4	1/8		
229	5 1/4	1 3/16	2	10	1 1/4		
230	5 1/32	2	4		3 1/4	13 1/4	
231	7 1/8	2	6	10	3 1/4	33	3 1/2
232	9 1/4	2 1/8	13	4	9 1/8	44	3 1/2
233	3 1/4	1 3/16	1		1 1/4		
234	3 1/32	2	2	4	1 1/4		
235	5 1/8	2 1/8	4	6	3 1/8	17 3/8	
236	6 1/4	3 1/4	6	14	3 1/4	26 3/8	
237	7 1/8	3 1/8	9	14	8 1/4	44	3 1/2
238	9 1/4	3 1/8	17	10	8 1/4	66	3 1/2
239	1 3/16	1/8			1/8		
240	1 1/8	1/8		2			
241	2 1/8	1 3/16		6			
242	3 1/8	1 3/16		12 1/4	1/4		
243	3 1/32	1 3/16	1	4	1/8		
244	5 1/8	1 3/16	2	14	2		
245	5 1/8	1 3/16	4	6	3 1/4	13 1/4	
246	9 1/8	3 1/8	19	14	8 1/8	66	3 1/2
247	2	2 1/8		2 1/4			
248	1/32	1 3/16		3 1/2	1/8		
249	3 1/16	4 1/4	1	4			
250	2 1/4	3 1/16		10 1/4			
250a	2 3/4	3 1/4		8 3/4			
251	2	2 1/8		4 1/2			
252	1 3/16	1 3/16		1 1/4			
253	1 1/16	1 1/16		1 1/4			
254	1 3/16	1 1/16		1 1/4			
255	1 1/16	1		1 1/4			
256	1 1/16	1/16		1			
257	2	4 1/16		12			
258	2	3 1/4		7			
259	2	2 3/4		5 1/4			
260	1 1/16	2		2 1/2			
261	1 1/16	2		2			
262	1 1/16	1 1/4		2			
263	1 1/16	1 1/16		2			
264	1 1/16	1 1/8		1 3/4			
265	1 1/16	1 1/16		1 1/4			
266	1 1/16	1		1			
267	1 1/16	1		1			
268	1 1/16	1/32		1			
269	2	2 1/4		10 1/2			
270	1 3/4	2		8 3/4			
271	1 3/8	1 9/16		4 1/4			
272	1 3/8	1 3/8		3 1/2			
273	1 3/8	1 1/16		3 1/4			
274	1 3/8	1		2 3/4			
275	1 3/8	1		2 1/2			
276	1 3/8	1		2			
277	1 3/8	1		2			
278	2 3/4	4 5/16		15 3/4			
279	2 1/4	4 1/16		11 1/4			
280	1 3/4	3 5/16		8 1/2			
281	2	3 1/8		7			
282	2	2		5			
283	1 1/16	1 3/4		2			
284	1 1/16	1 1/16		1 3/4			
285	1 1/16	1 3/8		1 1/4			
286	1 1/16	1		1 1/4			
287	1 1/16	1		1			
288	2 3/4	4 5/16		14 1/4			
289	2	3 5/16		10 1/2			
290	2	2 3/4		10 1/4			
291	1 3/8	2		3 1/2			
292	1 3/8	1 1/16		3 1/4			
293	2	3 1/8		10 1/2			
294	2	3 1/8		7			
295	1 1/16	2 3/8		2			
296	1 1/16	2		2			
297	1 1/16	2		1 3/4			
298	1 1/16	1 3/8		1 3/4			
299	1 1/16	1 3/8		1 1/4			
300	1 1/16	1 1/16		1 1/4			
301	1 1/16	1 1/16		1 1/4			
302	1 1/16	1 1/16		1 1/4			
303	1 1/16	1 1/16		1 1/4			
304	1 1/16	1 1/16		1 1/4			
305	1 3/8	1 3/16		4 1/4			
306	1 3/4	1 3/8		3 1/2			
307	1 3/4	1 3/16		3 1/4			
308	1 3/4	1		2 1/2			
309	1 3/4	1		2			
310	2	5 1/16		5 1/4			
311	2 1/4	4 1/16		13 1/2			
312	3 1/16	4 1/16	1	8 1/4	1/4		
313	4 5/16	4 5/16	2	14	1 1/4	13 1/4	
314	5 1/16	5 1/2	5	8	1 3/4	22	
315	3 1/16	14 1/2	2	6			
316	3 1/8	15	1	15 3/4			
317	2 3/8	11 3/4	1	1 3/4			
318	2	9 1/2		10 1/2			

For descriptions see pages 105—111 — For Prices see separate List

Dimensions and Weights of Astro-optical Components

Astro 30 No.	Diameter Height in.	in.	Weights Nett Apparatus lbs.	Nett Case lbs.	Gross lbs.	Cubical measurements of Packing cub. ft.
321	3 1/8	5 1/16	2 1/8	1 1/8		
322	6 1/16	10 1/2	13 1/4	2 1/2	26 3/8	
323	7 1/8	16 1/2	17 5/8	8 1/2	55	3 1/2
324	3 1/8	3 1/8	3 1/4	1 1/8		
325	6 1/16	6 1/16	13 1/4	2 1/2	26 3/4	
326	7 1/8	8 1/2	17 3/8	11	66	3 1/2
327	3 1/8	7 1/8	5 1/2	2 1/2	13 1/2	
328	7 1/8	13 3/8	21 1/8	8 1/2	66	3 1/2
329	7 1/8	15 3/4	26 3/8	11	88	3 1/2
330	2 1/8	1 3/16				
331	3 1/8	1 3/16				
332	2 1/8	2				
333	3 1/16	2 1/4	1 1/8			
334	2 1/8	2 1/4				
335	3 1/16	3 1/16	2 3/8			
336	4 5/16	1/16	1 3/8			
337	5 1/8	1/16	1 3/4			
338	5 1/16	1	2 1/8	1 1/4		
339	7 1/8	1 1/16	8 3/8	4 1/8	26 3/8	
340	9 1/4	1 1/16	14 1/4	6 1/2	44	
341	11 1/16	2	19 1/4	8 1/2	55	3 1/2
342	15 1/4	2 1/8	44	17 3/8	110	7
343	19 3/8	2 1/4	77	33	176	10 1/2
344	1 3/16	3/16	1/16			
345	1 1/16	1/4	1/8			
346	2	1/4	1/8			
347	2 1/8	1/4	1/8			
348	3 1/8	1/4	1/8			
349	4 5/16	1/16	1/8			
350	5 1/8	1/16	1/8			
351	5 1/32	1	2 1/8	1 1/8		
352	7 1/8	1 1/8	8 1/8	4 1/8	26 3/8	
353	9 1/8	1 1/16	14 1/4	6 1/2	44	
354	11 1/16	2	19 1/4	8 1/2	55	3 1/2
355	15 1/4	2 1/8	44	17 3/8	110	7
356	19 3/8	2 1/8	77	33	176	10 1/2
357	1 3/16	3/16	1/16			
358	1 1/16	1/8	1/8			
359	2	1/8	1/8			
360	2 1/8	1/8	1/8			
361	3 1/8	1/8	1/8			
362	4 5/16	1/16	1/8			
363	5 1/8	1/16	1/8			
364	5 1/32	1	2 1/4	1 1/8		
365	7 1/8	1 1/16	8 1/4	4 1/8	26 3/8	
366	9 1/16	1 1/16	14 1/4	6 1/2	44	
367	11 1/16	2	19 1/4	8 1/2	55	3 1/2
368	15 1/4	2 1/4	44	17 3/8	110	7
369	19 3/8	2 1/4	77	33	176	10 1/2
370	3 1/8	2	2 1/4	1/8		
371	(5 1/8)	2	6 1/8	2 1/4	13 1/4	

Astro 30 No.	Length	Width	Diameter Height in.	in.	in.	Weights Nett Apparatus lbs.	Nett Case lbs.	Gross lbs.	Cubical measurements of Packing cub. ft.
372	(7 1/16)		3 1/8			11	4 1/8	33	
373	(3 1/32)		3 1/32			6 3/8		13 1/4	
374	(7 1/16)		7 1/8			22		44	3 1/2
375	(15 1/32)		11 1/32			44		88	7
376	(3 1/32)		4 1/4			8 3/4		22	
377	(7 1/16)		7 1/8			33		66	7
378	(15 1/32)		11 1/32			55		110	7
379	1 9/16	1 9/16	2 3/4			3/8			
380	2 3/8	2 3/8	3 1/32			1			
381	1 9/16	1 9/16	2 3/4			3/8			
382	2 3/8	2 3/8	3 1/32			1 1/8			
383	1 9/16	1 9/16	2 3/4			3/8			
384	2 3/8	2 3/8	3 1/32			1 1/8			
385	1 9/16	1 9/16	2 3/4			3/8			
386	2 3/8	2 3/8	3 1/32			1 1/8			
387	1 9/16	1 9/16	2 3/4			3/8			
388	2 3/8	2 3/8	3 1/32			1 1/8			
389	1/16	1/16	1/16			1/16			
390	1 1/16	1 1/16	1 3/8			1/8			
391	1 1/16	1 1/16	1 1/16			1/8			
392	2	2	2			3/4			
393	2 3/8	2 3/8	2 3/8			1 1/4			
394	2 1/16	2 1/16	2 1/16			2 1/8			
395	3 1/16	3 1/16	3 1/16			4 3/8		13 1/4	
396	4 1/8	4 1/8	4 1/8			6 1/2		13 1/4	
397	4 1/8	4 1/8	4 1/8			9 1/8		22	
398	1/16	1/16	1/16			1/16			
399	1 1/16	1 1/16	1 1/16			1/8			
400	1 9/16	1 9/16	1 9/16			3/8			
401	2	2	2			3/4			
402	2 3/8	2 3/8	2 3/8			1 1/4			
403	2 1/16	2 1/16	2 1/16			2 1/8			
404	3 1/16	3 1/16	3 1/16			4 3/8		13 1/4	
405	4 1/8	4 1/8	4 1/8			6 1/2		13 1/4	
406	4 1/8	4 1/8	4 1/8			9 1/8		22	
407	(3/8)		1/32						
408	(1 1/8)		1/16						
409	(1 1/16)		1/8						
410	(1 1/16)		3/32						
411	(2)		1/16			1/16			
412	(2 1/8)		3/32			1/16			
413	(2 1/8)		1/8			1/8			
414	(3 1/8)		1/32			1/4			
415	(3 1/16)		1/16			1/8			
416	(3 1/32)		1/32			1/8			
417	(4 1/8)		1/16			1/4			
418	(5 1/32)		1/16			1 1/8			
419	(6 1/16)		1/16			1 1/8			
420	(7 1/16)		3/32			2 1/8			
421	(7 1/8)		1/16			3 1/2		13 1/4	

For descriptions see pages 112—116 — For Prices see separate List

Dimensions, Weights and Choice

Domes, Figs. 192, 193

Astro 30 No.	Dimensions in inches d	D	h	H	Cubical measurements of Packing cb. ft.	Nett (Gross) Weight in lbs. Wood parts	Iron parts	Sheathing material Rubberoid	Choice suitable for a focal length of in.	suitable for refractors No. No.
422	118	147	15¾	63	276	1100 (1430)	1100 (1210)	220 (308)	63—71	42—45 47 48 50
423	138	167	15¾	65	345	1470 (1980)	1650 (1830)	308 (440)	71—88	46 49 51 53
424	157	187	17¾	79	448½	6200 (3300)	2200 (2420)	396 (572)	79—94	52 54 56
425	177	207	17¾	86½	586½	2090 (3750)	2750 (3040)	484 (682)	88—102	55
426	197	227	19⅝	86½	759	2420 (4180)	3300 (3630)	572 (792)	94—118	55
427	216	246	19⅝	90½	966	2860 (4840)	4400 (4840)	704 (1012)	110—128	57 59
428	236	266	21⅝	90½	1207½	3520 (5500)	5500 (6050)	880 (1230)	118—138	57 59
429	236	300	43¼	90½	1276½	3520 (5500)	13200 (14740)	880 (1230)	118—138	57 59
430	276	338	43¼	102	2070	4620 (6150)	17600 (19800)	1230 (1760)	128—167	58
431	314	378	43¼	110	3105	5720 (7250)	23100 (26400)	1650 (2090)	157—207	
432	354	418	51¼	118	4312½	7050 (8800)	29700 (33000)	2155 (2860)	197—246	
433	394	457	59	138	5520	8360 (11000)	37400 (40700)	2815 (3520)	236—285	

Particulars of dimensions, weights, choice and prices of domes of sizes other than here stated will be quoted on application.

Enquiries respecting domes for existing refractors should be accompanied by particulars of the total length of the telescope including dew cap and accessories, height of refractor pillar and space available for the dome.

In the event of the telescope being fitted with astro-cameras, particulars should be given of their arrangement on the telescope, their aperture, and field of view for determining the proper width of the slit.

Observation Ladders, Figs. 194, 195

Astro 30 No.	No. of treads	Dimensions in inches h	S	t	b	Cubical measurements of Packing in cb. ft.	Nett (Gross) Weights lbs.	Choice Focal lengths for which adapted in.	suitable for refractors No. No.
—	6	47¼	7⅞	43¼	31½	20¾	110 (132)	47¼—88½	36—53
434	8	63	7⅞	47¼	31½	31	132 (154)	94½—106	51—56
—	10	79	7⅞	59	35½	48¼	187 (220)	118 —138	55 57 59
435	12	94½	7⅞	67	39¼	69	275 (319)	138 —157	57—59
438	—	8⅝	8⅝	15¾	13¾	3⅓	11 (22)	47¼—157	36—59
439	12	94½	7⅞	67	51¼	89¾	396 (462)	138 —157	57—59

For other sizes of observation ladders, particulars of dimensions, weights and choice are furnished on application.

Enquiries respecting observation ladders for existing refractors and domes should be accompanied by particulars of the dimensions d, H, h (Figs. 192, 193), length of telescope and height of refractor pillar.

For descriptions see pages 119—127 — **For Prices see separate List**

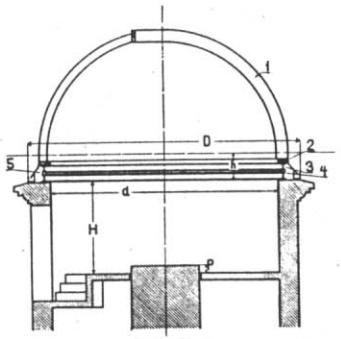


Fig. 192

Domes of 3 to 6 metres (10 to 20 ft.) diameter. Nos. 422—428.

d Inside diameter
D Outside diameter
h Height of dome centre above cornice
H Height of cornice above floor
1 Wood ribs
2 Dome ring
3 Upper live ring fixed to dome
4 Lower live ring fixed to brickwork
5 Ring of steel balls

Domes of 6 to 10 metres (20 to 33 ft.) diameter. Nos. 429—433.

d Inside diameter
D Outside diameter
h Height of dome centre above cornice
H Height of cornice above floor
1 Iron ribs
2 Iron dome ring
3 Rollers running on ball bearings attached to dome
4 Track fixed on brickwork
5 Side rollers

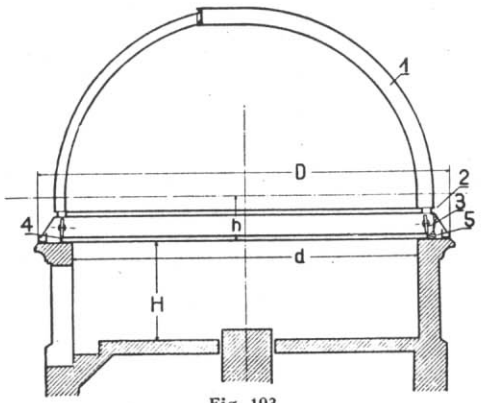


Fig. 193

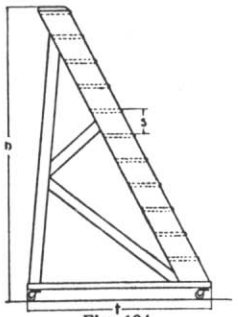


Fig. 194
Side Elevation

Observation Ladders Nos. 434—439.

h Height s Rise of tread
t Stride b Width

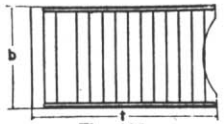


Fig. 195
Plan View

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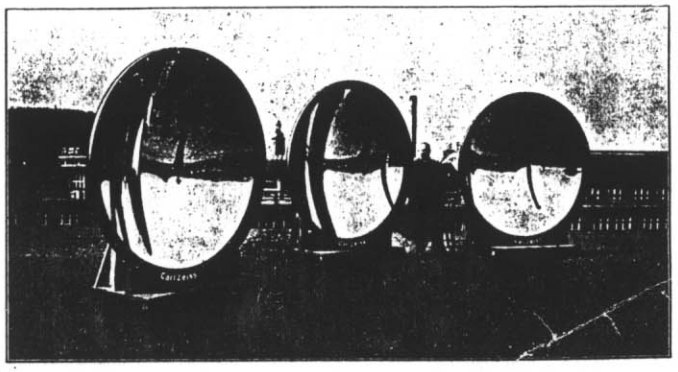

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