English Edition

No. 27.

Carl Zeiss

Optische Werkstätte

Jena

Catalogue
of
Microscopes Objectives
and apparatus

QH200
1885
C27M


22900339105

C. BAKER
OPTICIAN
244, High Holborn
LONDON.

No. 27.

MICROSCOPES

AND

MICROSCOPICAL

ACCESSORIES

MANUFACTURED

BY

CARL ZEISS

JENA.

ESTABLISHED 1846.

1885.

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Every article specified in this Catologue will be supplied singly or otherwise at the prices subjoined.

The price of completely fitted Microscopes is in all cases the sum-total of the individual items.

Payment must be made in ready money without discount, either in cash or bills drawn upon a chief town in Germany, Cheques drawn upon English Banks also accepted.

Goods are forwarded, value declared, at the risk and cost of the receiver—foreign orders are despatched by the shortest route and with every precaution.

It is requested that the name and destination be plainly written in all orders and to prevent any mistakes please quote the number or date of this Catalogue.

Jena, 1885.

Carl Zeiss,

Optische Werkstätte.

Dr. Carl Zeiss. Dr. Roderich Zeiss.

A selection of completely fitted Microscopes for the most varied requirements will be found at the end of this list.

Contents.

page

Microscope Stands 7
Objectives 29
Eye-pieces 38
Apparatus for Measuring and Drawing 40
Illuminating Apparatus 49
Spectroscopes 55
Polarising Apparatus 58
Various Optical and Mechanical Accessories 62
Apparatus for Micro-photography 67
Dissecting Microscopes and Lenses 73
Microtomes and Mounting Instruments 81
Slips and Covers 85
Complete Microscopes 88

Those pieces of apparatus indicated by an asterisk before their corresponding number are such as have originated in our factories, *i.e.* either introduced by us as absolutely new or at any rate first made by us in the manner here described.

Microscope Stands.

The following Stands, like most others of Continental design, are modelled on the type first introduced by Oberhäuser and developed by Hartnack. So far then they offer nothing original. The construction of all important parts of our larger instruments however, particularly the coarse and fine adjustments, the mounting of the mirror and other devices for illumination, are peculiar to our factory and the result of many years' personal effort to render perfect the mechanical arrangements of the Microscope.

In the subjoined list the stands are specified, with some few alterations of recent date, by the numbers introduced in 1876.

The coarse adjustment of the larger stands I to IV is effected by rack and pinion, from V to VIII by the body sliding in a jacket, in IX and X by rack and pinion of simpler construction.

The fine adjustment in all stands up to VIII inclusive consists of a carefully made and durable micrometer movement working on the prism-

shaped pillar carrying the body. In the larger ones up to IV inclusive the head of the micrometer screw is engraved with divisions and the exact value of one whole rotation of the thread, thus making it available for measuring the thickness of cover-glasses or preparations.

In the *larger stands* I to V^{a} ***the illumination*** is effected by the Abbe Condenser, which is acknowledged to be the most efficient instrument for producing every degree of central and oblique light as well as a rapid and convenient means of changing one kind of illumination for another.

It is replaced in the *smaller stands* by the ordinary mirror, which up to VIII is not only moveable laterally but also anteriorly out of the axis so that oblique light can be thrown from any direction; on such of these latter stands as are provided with cylinder diaphragms (V^{b} to VII^{a}) a form of condenser for *central* illumination (see No. 83) is available as a make-shift for the Abbe Illuminator in certain investigations.

The bodies of our Microscopes are provided with the "universal thread" introduced by the Royal Microscopical Society of London and made as closely as possible to the standard gauge; as this is now adopted by most opticians, objectives of various makers may be used without further trouble and any having the narrow gauge can very easily be fitted by means of an adapter.

The length of the body from the attachment of the objective to the upper end is 155 Mm. Stands I to VII^{a} have ***draw-tubes,*** which from I to V^{a} are marked in millimeter divisions so that the exact length of withdrawal can be read off.

We do not undertake any alterations to stands of other makers with the exception of fitting our objectives to the body, which will be done gratis.

The Cases for all stands are of mahogany, (box-form) well and strongly made and with locks. These are included in the price of the stand, as is also the packing of the eye-pieces, objectives and other apparatus except such as are in separate etuis.

Cases of particular design can be made if desired at an extra charge.

The handles are solid brass, nickel platod. They are included with the larger stands I to IV but when required for the smaller sizes will be charged 7.50 Mk. extra.

If two extra strong handlos are desired for particularly large cases 15 Mk. must be added to the price.

Metal name plates, including engraving Mk. 5.

Metal corner-pieces for large cases Mk. 10 per set.

Leather travelling cases from Mk. 10—20 according to sizo.

Glass shades for protecting the stands on the work table, with thick felt underlay. Mk. 10.

No.		*Mark*
1	**Stand I.** Large stand with heavy horse-shoe foot, inclinable, tho body and stage revolving round tho optic axis. Coarse adjustment by rack and pinion; micrometer screw with divided head; draw-tube with millimetor divisions. ABBE's Illuminating Apparatus No. 80 with condonser of 1.20 numerical aperture. Also, for use with tho ordinary mirror,	

No. | *Mark*

a substage (Fig. 1) to replace the Abbe Illuminator, turning on an arm under the stage, with rack and pinion motion and centering adjustments for receiving cylinder diaphragms and other apparatus.

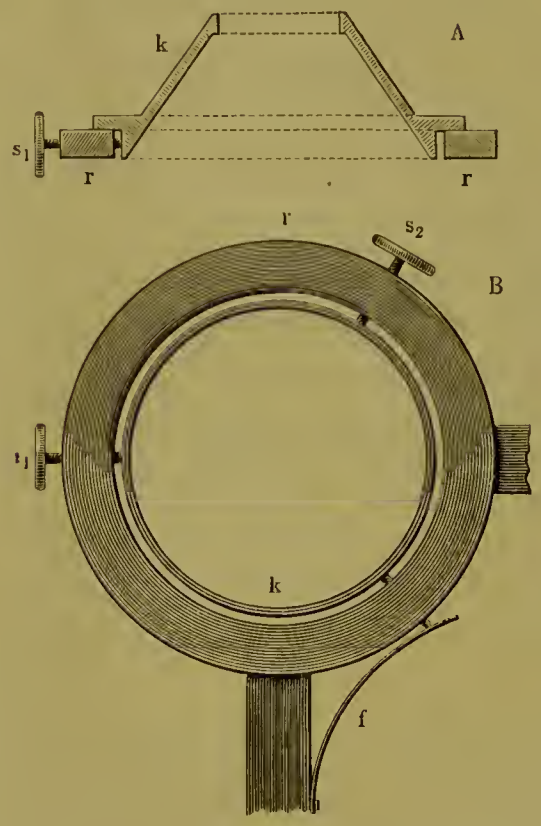


Fig. 1.
Section and plan of the Substage.
(actual size.)

Height of the instrument from table to eye-piece with medium length of draw-tube about 33 Cm. Size of stage 103 × 94 Mm. (Fig. 2) 300

If a second Condensor of 1.40 N. aperture be desired for the Abbe Illuminator (No. 81) 25 Mk. must be added.

If objectives adjusted to the English 10 inch body are to be used on this stand, a lengthening piece (100 Mm.) can be supplied if desired to screw into the body under the draw-tube jacket for 5 Mk.

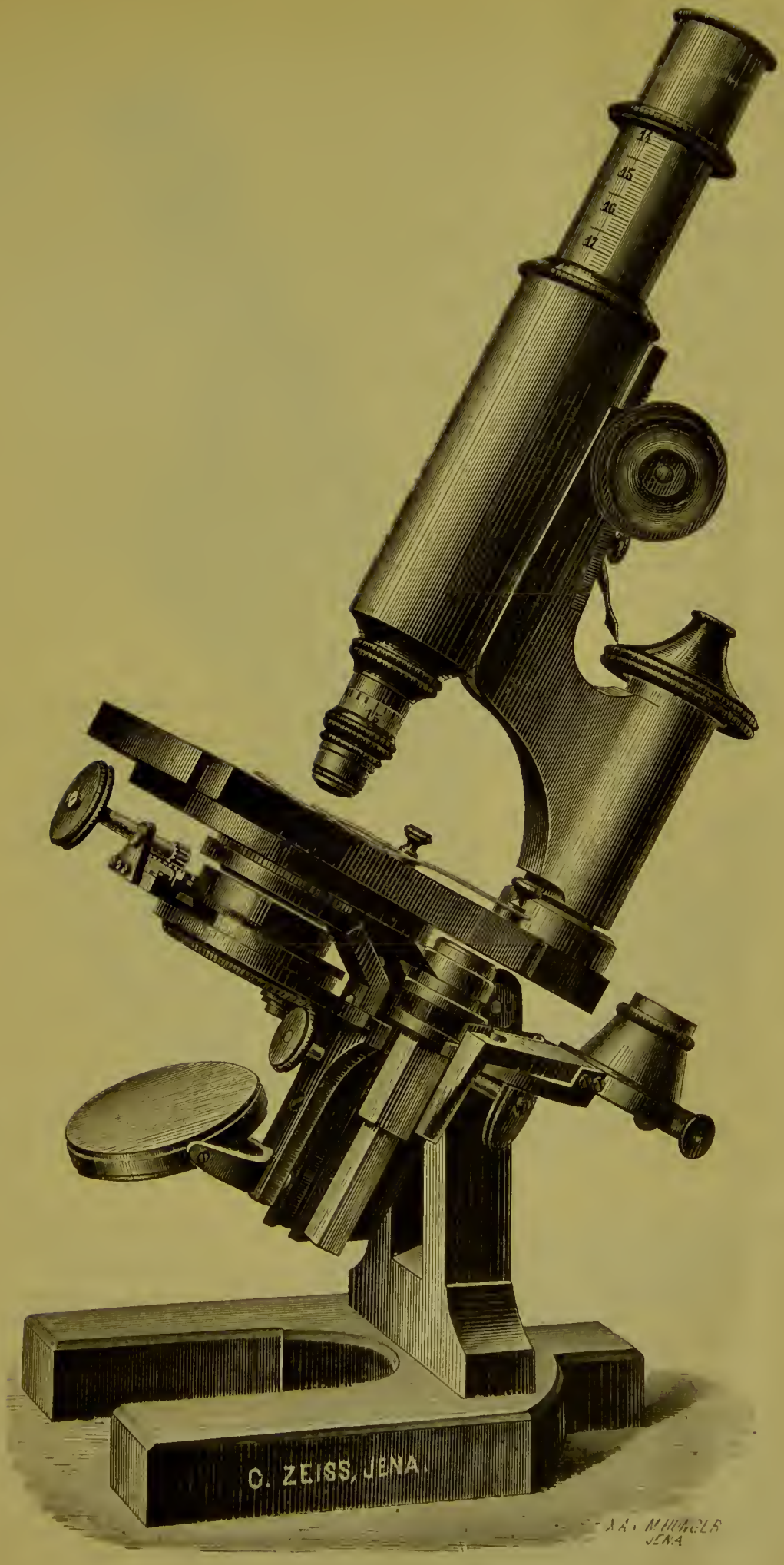
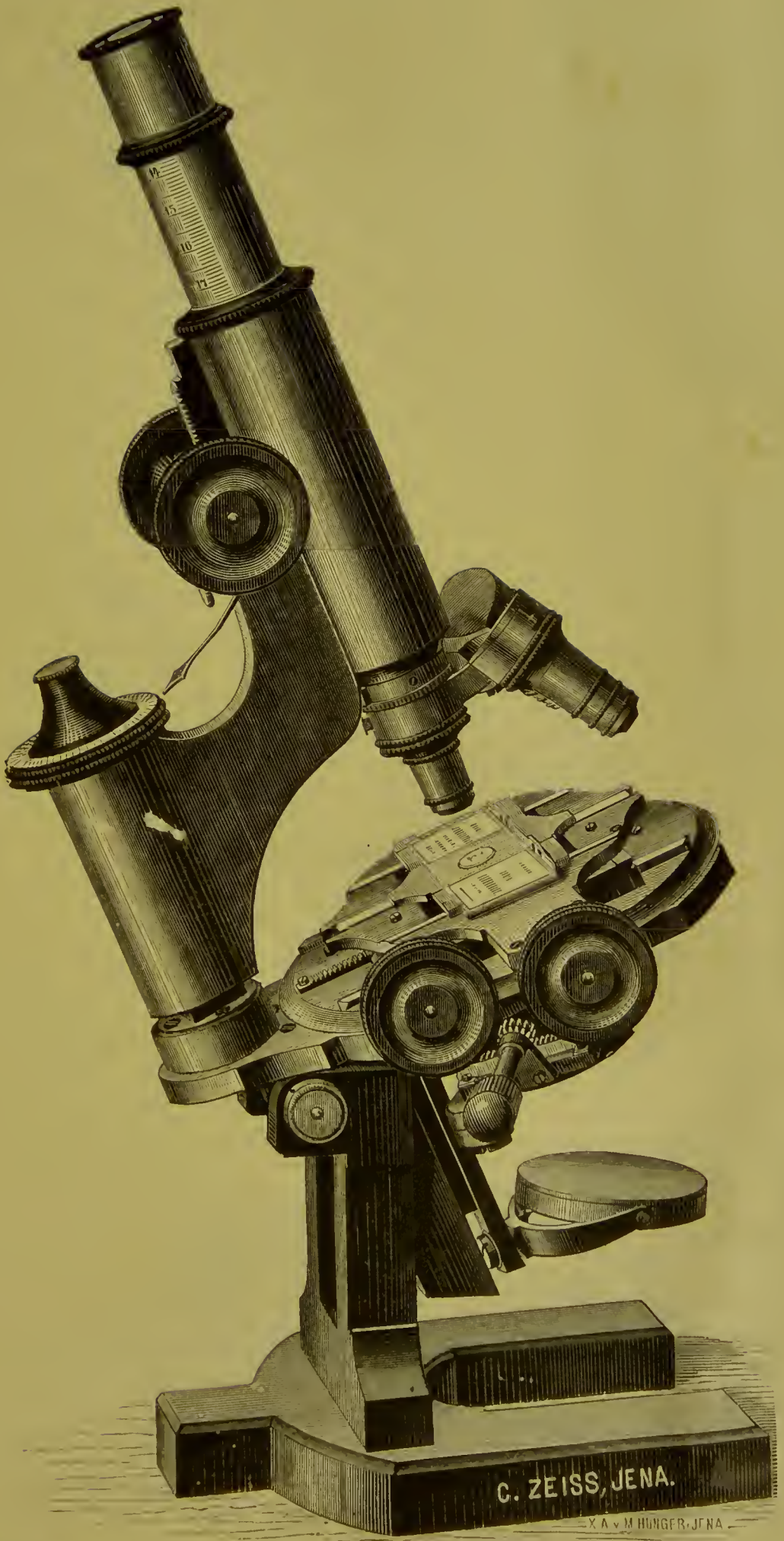


Fig. 2. **Stand I** ($\frac{2}{3}$ actual size).

No.		*Mark*
2	**Stand I[a].** Shape and dimensions as No. I, inclinable, but without the revolution of the whole upper part round the optic axis. Large firm stage containing a disc of vulcanite 120 Mm. in diameter revolving in the optic axis. ABBE's Illuminator with vertical motion by rack and pinion and condensor of 1.20 num. apert., which can easily be removed and replaced by an ordinary cylinder diaphragm, the mirror of the ABBE Illuminator remaining in situ. The substage described in No. I is not included with this stand but can easily be added if desired; if subsequently ordered however the stand must be returned for the purpose	250
	The same, with a mechanical stage having rectangular movements which is easily fitted in place of the vulcanite disc .	340
3	**Stand II,** of similar model to Stand I only somewhat smaller and of lighter build: inclinable and revolving round the optic axis; rack and pinion coarse adjustment, micrometer screw with divided head, divided draw-tube, and ABBE's Illuminating apparatus. Also cylinder diaphragms fitting in grooves of the ordinary pattern and mirror with universal motions in place of the Condenser. Height of the instrument with draw-tube half out about 32 Cm. Stage 81 × 83 Mm.	250
4	**Stand III.** Horse-shoe stand same size as the above, specially adapted for mineralogical and similar purposes; rack and pinion to coarse adjustment and inclinable, but with fixed upper portion. In place of the movement round the optic axis the stage alone revolves and consists of a circular disc with its edge divided into degrees and an index for reading off. The body is without a draw-tube to ensure an	



Stand I[a] with moving stage and revolving nosepiece for three objectives.

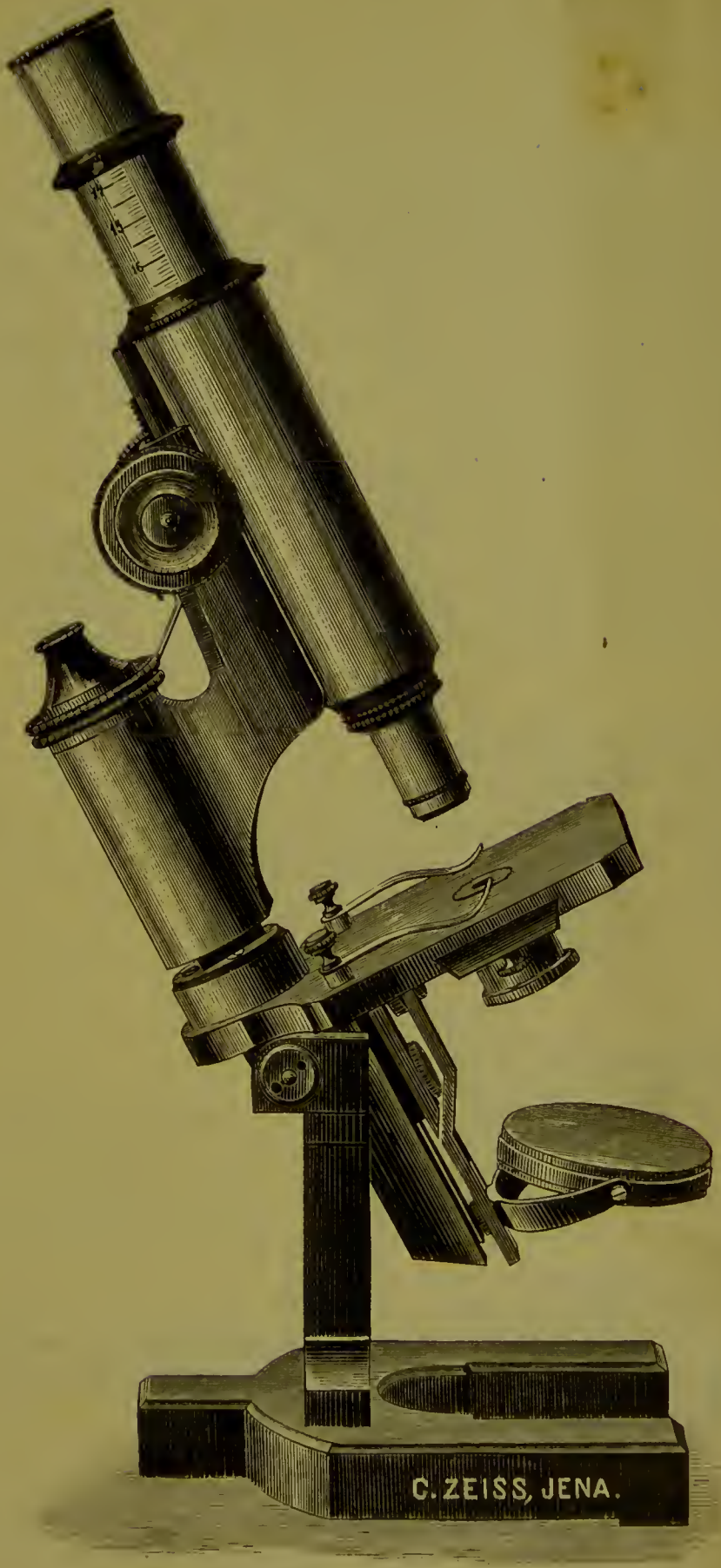


Fig. 3. **Stand IV** ($\frac{2}{3}$ actual size).

No.		*Mark*
	invariable orientation with an analysing or goniometer eye-piece. At the lower end of the body is an adapter to take the objectives, which by means of two milled-head screws permits each objective being accurately centered with the revolving stage. Plane and concave mirrors with universal motions. Rotating arm under stage to carry cylinder diaphragms, NICOL prism etc.	210
	(See p. 24 Mineralogical Microscope, with figure.)	
	Stand III in former catalogues with rotation round optic axis and sliding coarse adjustment will no longer be made, as such a large stand without rack and pinion movement cannot be regarded as a practical instrument.	
	Stand IV. Of the dimensions of Stand II, inclinable, but without revolution round optic axis: rack and pinion coarse adjustment, micrometer screw with divided head, body with divided draw-tube, cylinder diaphragm sliding in grooves; mirror with universal movements.	
5	1) Including ABBE's Illuminator	205
6	2) Without ditto (Fig. 3)	150
7	3) Including ABBE's Illuminator but without the ordinary sliding cylinder diaphragms, which can be replaced by a simple arrangement fitting in lieu of the condenser. The ordinary mirror is not supplied, that of the illuminating apparatus being used instead	175
	If a vertical movement to the Abbe Illuminator by rack and pinion be desired to the above stand (IV, 3) 10 Mk. must be added to the price stated.	
	Stand V[a]. Horse-shoe foot of nearly the same dimensions as II and IV and like these inclinable but not revolving	

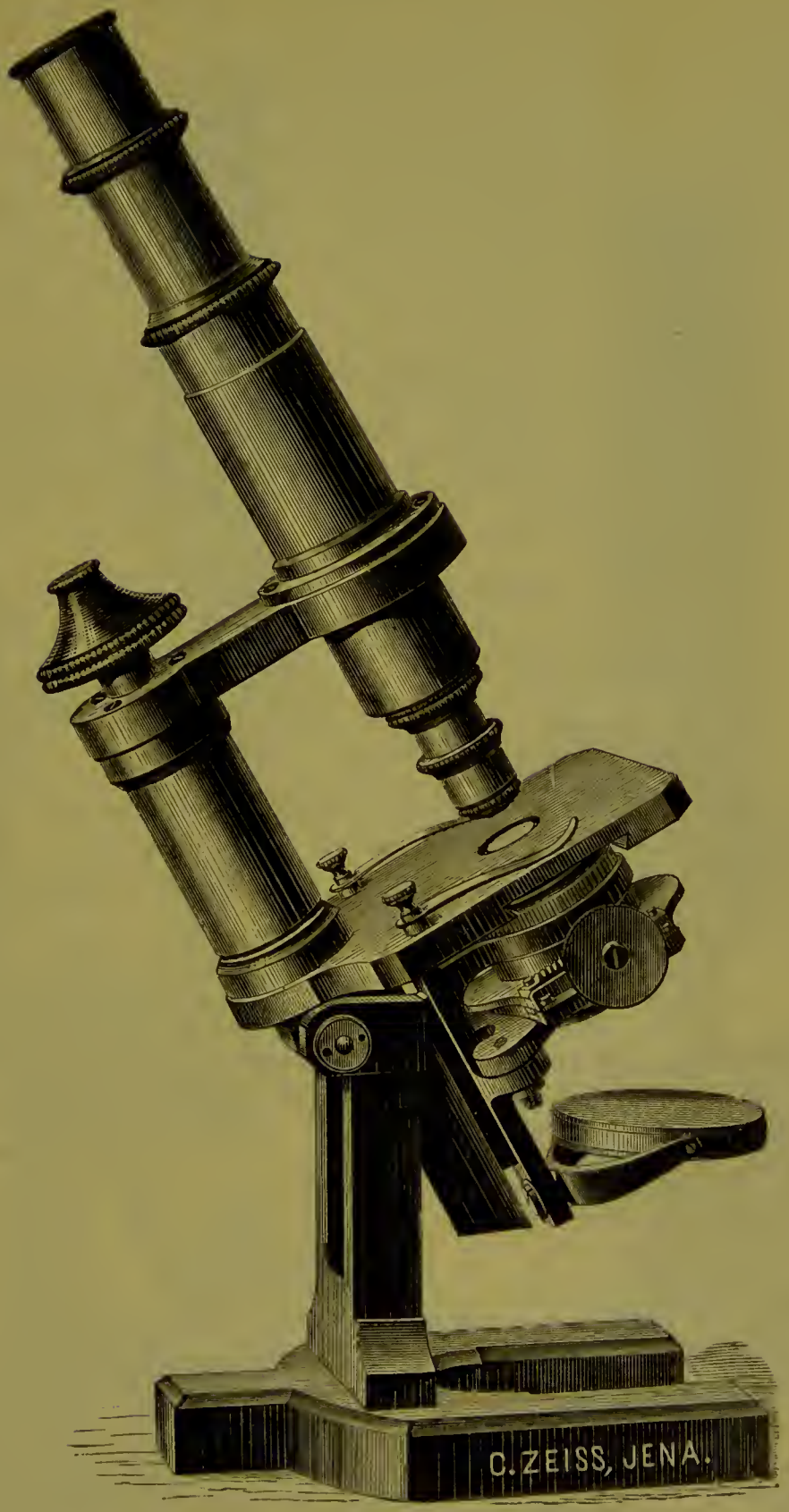


Fig. 4.
Stand V[a] with Abbe's Illuminator
($\frac{2}{3}$ actual size).

No.		*Mark*
	round the optic axis. Coarse adjustment by sliding the body in its jacket; draw-tube; cylinder diaphragms in grooves. Height of the eye-piece above the table 31 Cm.; size of stage 82 × 83 Mm.	
8	1) Including ABBE's Illuminator (Fig. 4)	150
9	2) Without ditto	95
10	3) Including ABBE's Illuminator but without the ordinary cylinder diaphragms in grooves, which can be replaced by a simple arrangement fitting in lieu of the condenser. The ordinary mirror is not supplied, that on the illuminating apparatus being used instead	120
11	**Stand V^{b}.** Of exactly the same dimensions as V^{a} but non-inclining, draw-tube. Coarse adjustment by sliding the body. Cylinder diaphragms in grooves, these can be replaced by the condenser described under No. 83. (Fig. 5) . . .	75
12	**Stand VI.** Compact stand with horse-shoe foot. Height 27 Cm., stage 63 × 69 Cm. Non-inclining but with re-	

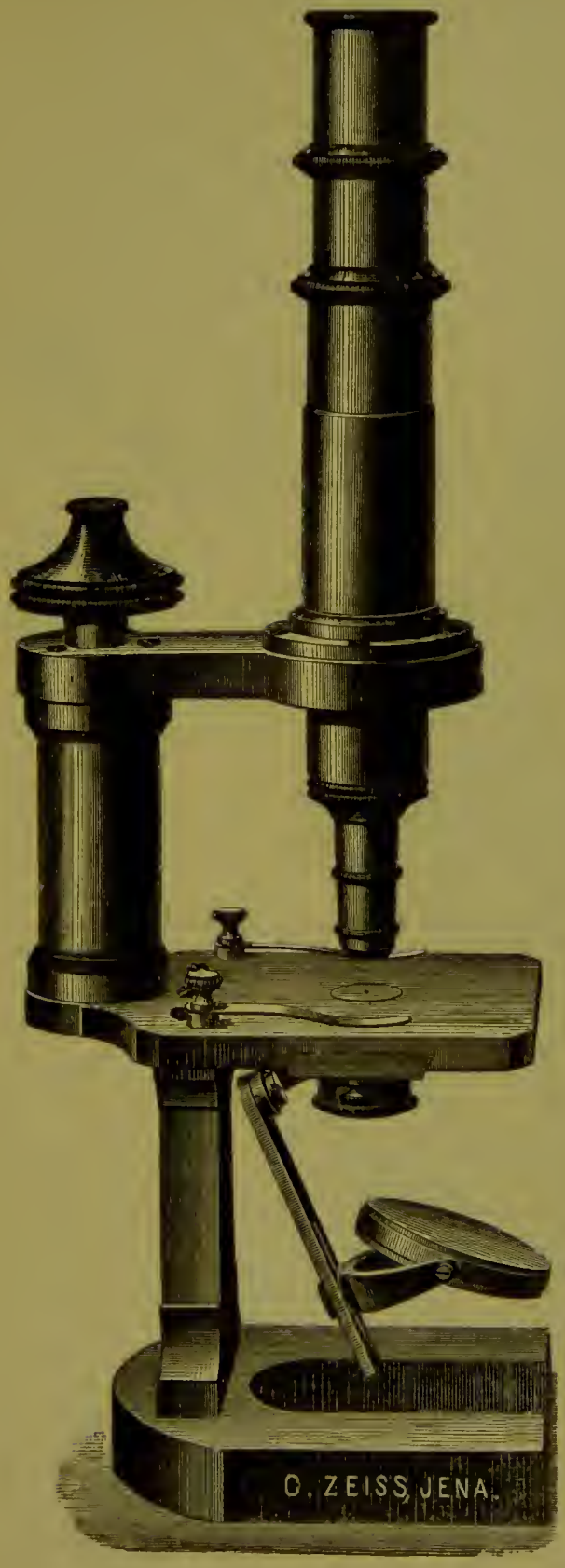


Fig. 5.
Stand V^{b}
($\frac{2}{3}$ actual size).

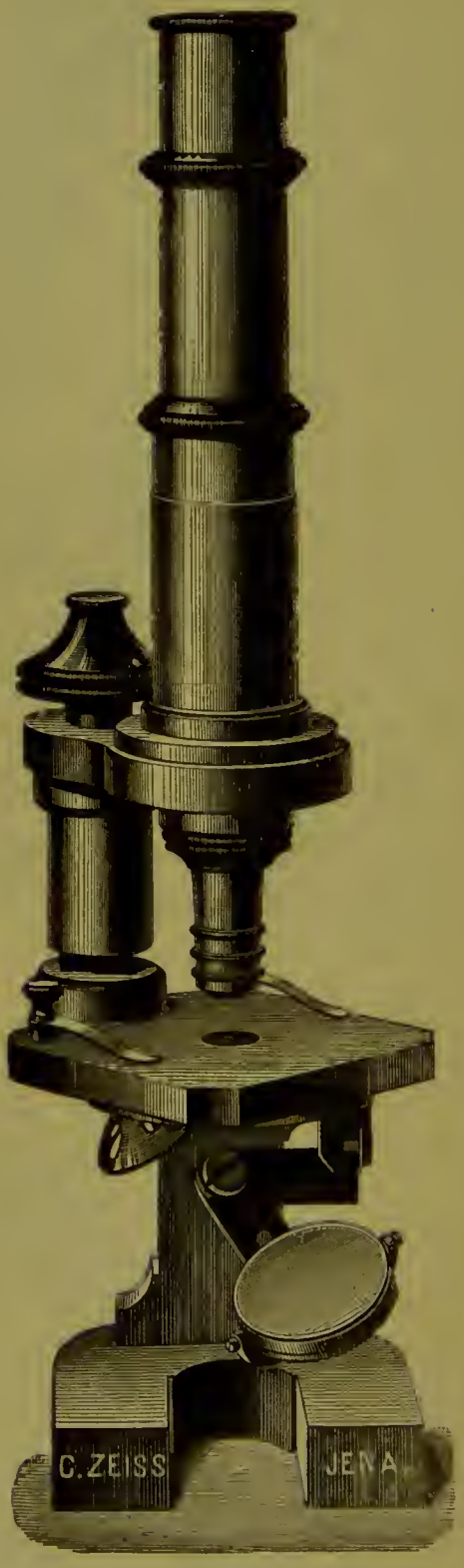


Fig. 6.
Stand VI
($\frac{2}{3}$ actual size).

No.		*Mark*
	volution of the upper part round the optic axis. Coarse adjustment by sliding the body; without draw-tube. Calotte	

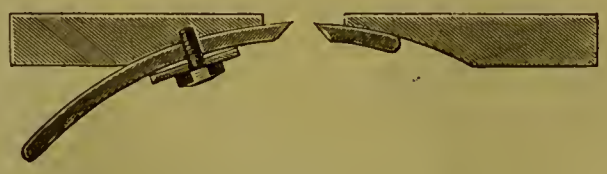


Fig. 7.

	diaphragm, which brings the openings nearly up to the level of the stage. (Fig. 6)	75



Fig. 8. **Stand VI^{a}** ($\frac{2}{3}$ actual size).

No.		*Mark*
13	**Stand VI^{a}.** Corresponding in model and dimensions to Stand VI, without the revolving movement but inclinable and with draw-tube. (Fig. 8.)	65

No.		*Mark*
14	**Stand VII[a].** Stand of medium size, height 28 Cm., stage 67 × 72 Mm. Fixed stage; cylinder diaphragms in grooves; coarse adjustment by sliding the body; draw-tube. Rather massively built and especially suitable for laboratory use, and from the fineness and solidity of the micrometer movement can be used with the highest powers. The cylinder diaphragms may be replaced by the condenser described under No. 83. (Fig. 9.)	60
15	**Stand VII[b].** Precisely as above but with calotte diaphragm; no draw-tube	55
16	**Stand VIII.** Small stand with horse-shoe foot. Height 27 Cm., stage 60 × 69 Cm. Fixed stage: coarse adjustment by sliding body. Calotte diaphragm; plane and concave mirrors with universal movements as in the above. (Fig. 10.)	48

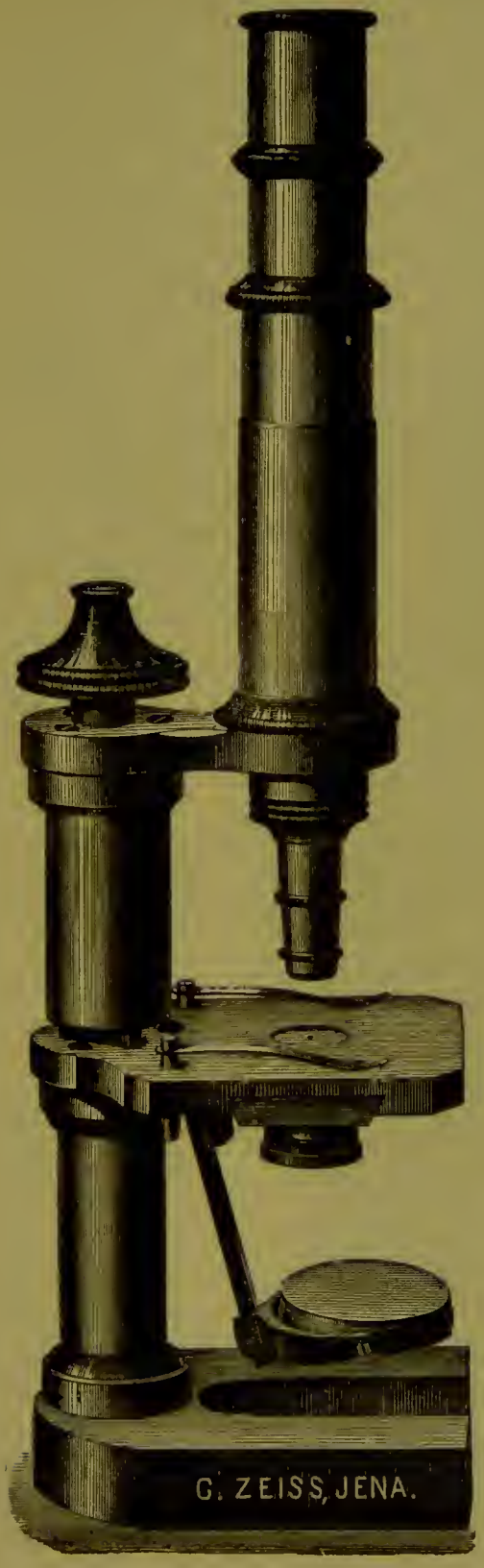


Fig. 9.
Stand VII[a]
(⅔ actual size).

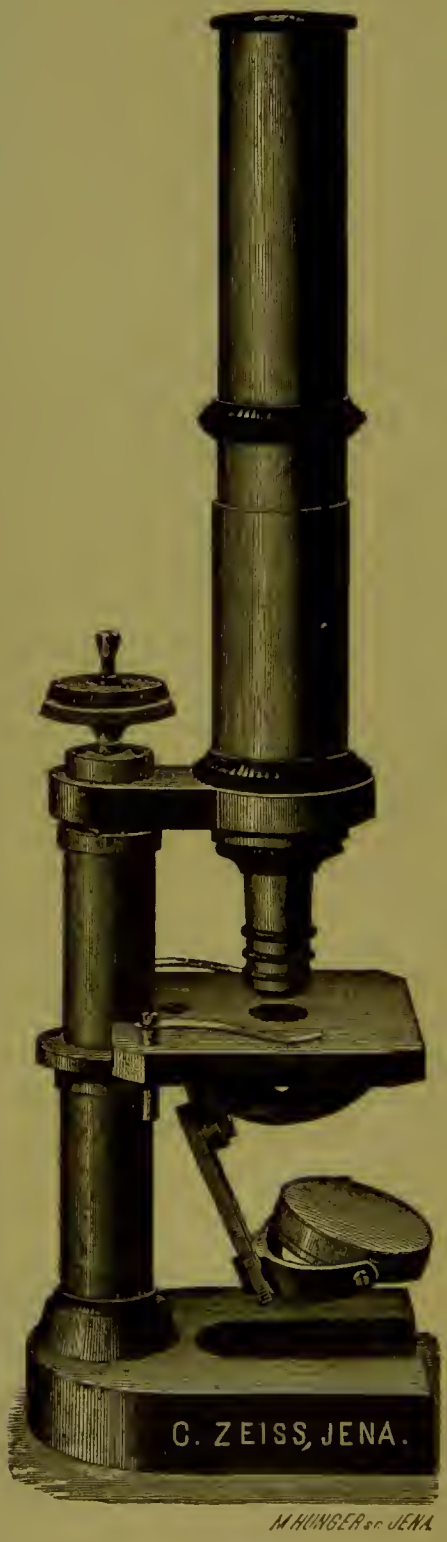


Fig. 10.
Stand VIII
(⅔ actual size).

No.		*Mark*
17	**Stand IX.** Stand with horse-shoe foot of cast iron, coarse adjustment by rack and pinion of simple construction. Lever fine adjustment, obtained by a screw acting on the pillar carrying the stage and body. Concave mirror with lateral movements out of the axis only; revolving wheel of diaphragms under the stage. Height of the whole microscope 28 Cm.; stage 75 × 85 Mm.	40
18	**Stand X.** Of the same construction and dimensions as IX but without the fine adjustment; fixed stage. Only adapted for medium powers—up to about 250 diameters. (Fig. 11.)	30

The smaller stands IX, X and XI of former Catalogues are no longer made as the two last described fully supply their place.

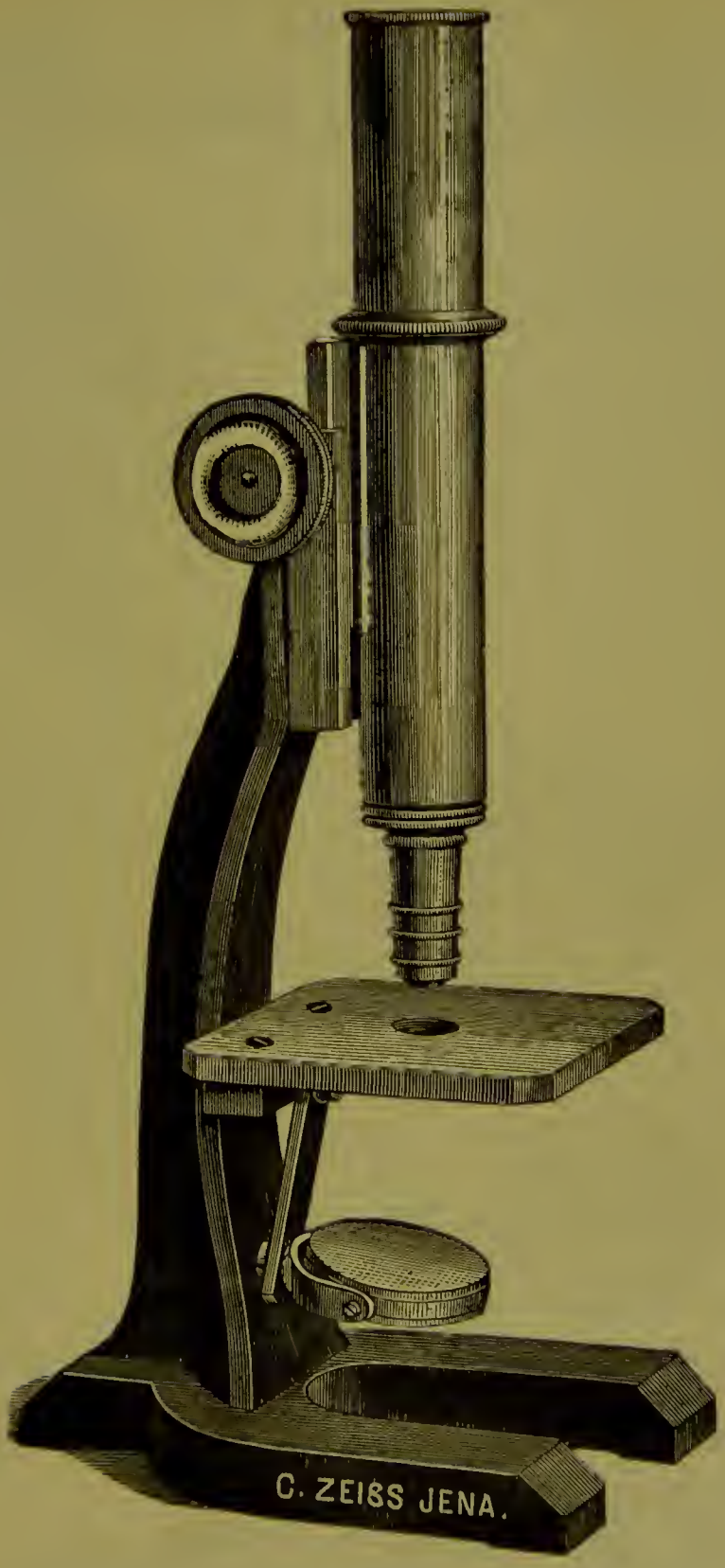


Fig. 11.

Stand X.

($\frac{2}{3}$ actual size).

Microscope Stands for special purposes.

No.		Mark
19	**Mineralogical Microscope.** Stand III as described on page 12 with the following special arrangements for petrological and mineralogical studies. Fixed divided circle at the upper end of the body; to this is attached a revolving jacket with vernier, which carries an analysing prism (Prazmowski's supra-ocular form) and between this and the eye-piece a slot to admit a plate of calc-spar and its fitting, for stauroscopic purposes (included). Also a crossed-thread eye-piece with pins to ensure its always occupying the same position relative to the divided circle. Under the stage is a rotating arm bearing at one end the cylinder diaphragms and at the other the polariser (Nicol prism with condensing lens), which arrangement allows a rapid interchange of polarised and non-polarised light. By means of a lever the polariser can be rotated in the axis of the microscope, the four quadrants of a revolution being indicated by a toothed spring. All parts are so adjusted that the principal sections of polariser and analyser in the negative position are both parallel to one another and to one of the threads of the eye-piece above described. Contrivance for observing the axial images by means of a condenser of large angular aperture and an intermediate fitting to connect with the eye-piece. At the lower end of the body is also a slide containing a Klein's Quartz plate which can be inserted or withdrawn at pleasure. (Fig. 12.)	
	The stand as above including the apparatus described but without objectives or ordinary eye-pieces	320

(See list of complete Microscopes.)

In the figure the analysing eye-piece formerly employed, with the prism between the lenses, is represented instead of the supra-ocular Prazmowski prism.



Fig. 12.

Mineralogical Stand No. 19

($\frac{2}{3}$ actual size).

No.		Mark
20	**Mineralogical Microscope.** Having the same general arrangements as the above but with ABBE's Illuminating Apparatus made as a fixture to the stand, the rotating arms for polariser and diaphragms being done away with. The polarising NICOL is placed in the diaphragm carrier of the ABBE Condenser and rotated with this, the cardinal positions being indicated by a toothed spring (which is removable when the condenser is required for other purposes). Corresponding otherwise in all parts to No. 19 but without the arrangement for observing the axial images	340
*21	**Travelling Microscope** after STRASBURGER. Very compact stand constructed essentially on the model of Stand VI and having the same details but with such modifications, as favour convenience of transport and applicability to a variety of purposes. The body is made to telescope and is easily removable from the arm which then takes a series of lenses for dissecting etc. This series (No. 125, achromatic doublet with concave eye-piece, giving two magnifications) which with its necessary fitting is included with the stand, is placed in the body when packed. A small nose-piece for four objectives (No. 106) is also included but is only available for such objectives as can be unscrewed from the adapter (see page 65), and a drawing prism (No. 71). The whole packing in a case 21 Cm. high and 10 Cm. broad and deep. With the above accessories (without objectives and eye-pieces)	180

(See list of complete Microscopes.)

The illustration Fig. 13 shows the travelling Microscope as arranged for packing into its case. The square foot represented has recently been replaced by one of horse-shoe form, the camera and nose-piece being otherwise disposed of.

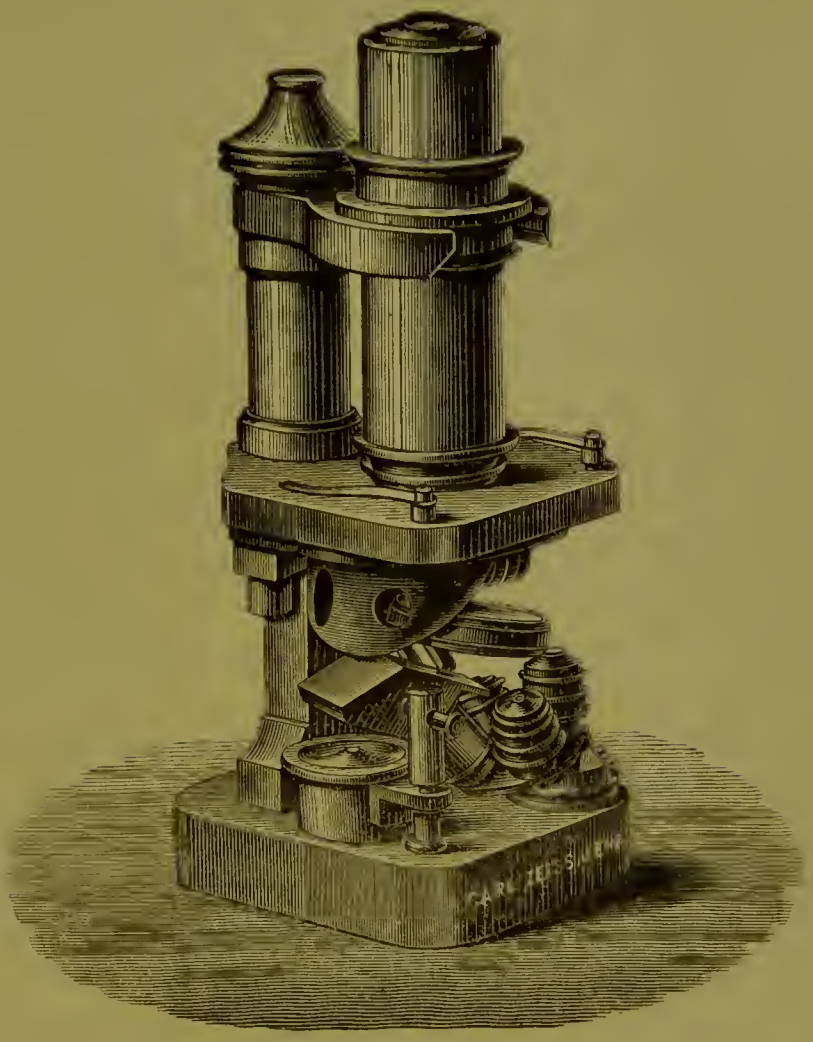


Fig. 13.
Travelling Microscope No. 21
($\frac{1}{2}$ actual size).

No.		*Mark*
22	**Hand Microscope** fer class demenstratien. A stage plate with spring clips te secure the specimen carries a jacket and bedy tube, which after being adjusted te the object may be firmly fixed by a clamping ring. If necessary a fine adjustment is obtainable by sliding the eye-piece, the tube being sprung for the purpese. In use the microscepe is directed towards a window or lamp. Suitable for objectives up te D. Price without objectives or eye-pieces	15

No.		*Mark*
23	**Stand for Micro-photography.** For use with the photographic Camera No. 112. Same dimensions as Stand I with the following modifications: upper part not revolving round the optic axis; extra large (140 × 120 Mm.) mechanical stage with circular and rectangular motions. The body, with rack and pinion adjustment, is shorter and of greater diameter than that of Stand I so as to interfere as little as possible with the cone of rays transmitted by the objective; at its upper end is a screw thread to take either a light excluding arrangement to connect the camera with the stand, for photographing without an eye-piece (this is described later on with the camera) or a graduated draw-tube for photographing with an eye-piece. The draw-tube is also tapped at its lower end with the ordinary objective thread to receive when required a photographic correcting lens, to correct the objective as ordinarily adjusted for a picture 1 to $1\frac{1}{2}$ meters distant. The ABBE Illuminator is moveable by rack and pinion and so arranged that the condenser can be easily removed and replaced by another series or by a cylinder diaphragm. Mirror and sub-stage as in Stand I; the latter is of importance for receiving the monochromatic Illuminator No. 84, the use of which is recommended for experiments in micro-photography	300

Objectives.

The following Objectives are all constructed on the formulas of Prof. ABBE of JENA and subject to his constant supervision.

Every detail of their construction being mathematically formulated, combined with exact mechanical procedure, and a systematic control of each phase of their manufacture obviates all testing, and guarantees an extraordinary uniformity of our glasses from the highest to the lowest, at the same time altogether excluding specimens of inferior quality.

All objectives are uniformly free from spherical aberration up to the marginal zone (proper thickness of cover with the higher powers being understood) and as far as possible perfectly corrected for colour. Special consideration is also given to the removal of aberrations outside the axis and to flatness of field.

Owing to the importance of a good working distance for the convenient and safe employment of the higher lenses particular attention is paid to this factor in calculating the formula of the various glasses. Our stronger objectives—from CC upwards—possess therefore an unusually large amount of working distance in comparison with their focal length and aperture. All, even the very highest, may be used with cover glasses of 0.2 Mm. (0.008 in.) or more in thickness.

The whole series of objectives are provided with the standard gauge, but at the same time in the series from A to J and

also in DD, when not fitted with correction adjustment, the mount containing the lenses is made to unscrew from the adapter and if required used with the narrow gauge thread.

The name of the firm is engraved on all the mounts and they are sold *separately* in engraved brass drop-boxes.

In ordering please state explicitly whether the desired lens is for use with the continental (short) or with the English (long) body tube.

List of Objectives.

No.		Designation	Numerical aperture (and air angle)	Equivalent focal length	Price without correction	Price with correction
24.		a_1	—	40mm	Mk. 12	Mk. —
25.		a_2	—	36mm	„ 12	„ —
26.		a_3	—	28mm	„ 12	„ —
*27.		a^*	—	42—28mm	„ 40	„ —
28.		aa	0,17 (20°)	27mm	„ 27	„ —
29.		A	0,20 (24°)	18mm	„ 24	„ —
30.		AA	0,31 (36°)	18mm	„ 30	„ —
31.		B	0,34 (40°)	11mm	„ 30	„ —
32.		BB	0,50 (60°)	11mm	„ 42	„ —
33.		C	0,42 (50°)	7mm	„ 36	„ —
34.		CC	0,71 (90°)	7mm	„ 48	„ —
35.		D	0,60 (74°)	4,3mm	„ 42	„ —
36.		DD	0,82 (110°)	4,3mm	„ 54	„ 74
37.		E	0,85 (116°)	2,8mm	„ 66	„ 86
38.		F	0,85 (116°)	1,85mm	„ 84	„ 104
39.	Water Immersion	G	1,15—1,17	3,0mm	„ 90	„ 110
40.	„	H		2,4mm	„ 110	„ 130
41.	„	J		1,8mm	„ 144	„ 164
42.	„	K		1,35mm	„ —	„ 200
43.	„	L		1,0mm	„ —	„ 270
*44.	Homog. Immersion	$\frac{1}{8}$	1,25—1,30	3,0mm	„ 240	„ 270
*45.	„ „	$\frac{1}{12}$		2,0mm	„ 320	„ 360
*46.	„ „	$\frac{1}{18}$		1,25mm	„ 400	„ 450

Magnification

of the Objectives with the several Huyghenian Eye-pieces

and with a body-length of 155mm.

Eye-pieces:	1	2	3	4	5	
a_1	7	11	15	22		a_1
a_2	12	17	24	34		a_2
a_3	20	27	38	52		a_3
a*		4—12	7—17	10—24		a*
aa	22	30	41	56	75	aa
A, AA	38	52	71	97	130	A, AA
B, BB	70	95	130	175	235	B, BB
C, CC	120	145	195	270	360	C, CC
D, DD	175	230	320	435	580	D, DD
E	270	355	490	670	890	E
F	405	540	745	1010	1350	F
G	260	340	470	640	855	G
H	320	430	590	805	1075	H
J	430	570	785	1070	1430	J
K	570	760	1045	1425	1900	K
L	770	1030	1415	1930	2570	L
$\frac{1}{8}$	260	340	470	640	855	$\frac{1}{8}$
$\frac{1}{12}$	380	505	695	950	1265	$\frac{1}{12}$
$\frac{1}{18}$	605	810	1110	1515	2020	$\frac{1}{18}$
	1	2	3	4	5	

On the choice and employment of the Objectives.

Working series. The medium Objectives from 18—4.3 Mm. focal length are issued in two different forms, with a greater or less aperture according to the purpose for which they are required. Those with a larger aperture (distinguished by double lettering) possess with equally perfect definition a considerably higher resolving power and permit of greater magnification being obtained by the use of the stronger eyepieces. Nevertheless the working distance in BB, CC, DD, although relatively large is perceptibly less than in the corresponding series of smaller aperture, and the former are more sensitive to differences in thickness of the cover and object than the latter. As a rule therefore B, C and D are recommended as the more suitable for working glasses in histological and anatomical research, particularly when the next stronger dry lens is available for higher magnification.

Thickness of Cover. All Objectives in fixed mounts are, unless otherwise ordered, corrected for a medium thickness of cover between 0.15 and 0.20 Mm. (0.006—0.008 in.). In the higher series from CC upwards the thickness of cover consistent with the most perfect correction is indicated on the side of the mount by small figures (Mm.). It is as a rule sufficient for ordinary work to use covers of an estimated medium thickness.

Objectives for *homogeneous* Immersion are within wide limits independent of the thickness of cover.

Adjustment for correction. For general purposes this arrangement is unnecessary in dry lenses and the weaker series of immersions. But if desired we also supply these objectives with correction

mounts and recommend it, particularly for F and J, when the glasses are intended to be frequently used for observing prepared specimens.

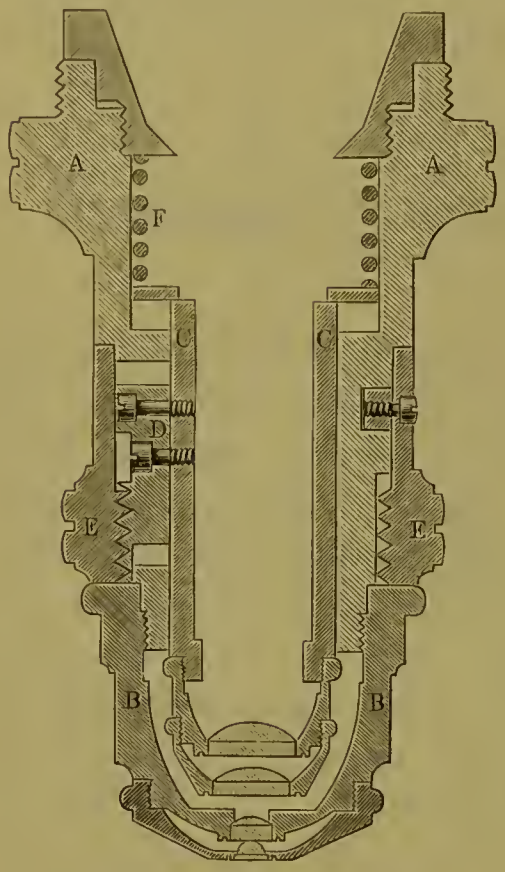


Fig. 14.
Section through a correction mount.
(twice actual size).

The correction mounts, always supplied with the two higher water-immersions K and L, and with the others if ordered, are so constructed that only the posterior combinations are moveable, the front lens remaining stationary. Thus if it be necessary to alter the correction during observation the image neither disappears nor is the specimen endangered. The graduation and numbering on the correction collar, read off on the fixed index, indicates directly at each position of the collar the corresponding thickness of cover in hundredths of a millimeter.

Body length. The whole of the objectives in this catalogue are adjusted to the customary body length of the continental stands, *i.e.* from 150 to 170 Mm. At the same time the objectives a, aa, A, B, C and D may be used on stands of English model with 10 inch bodies without appreciable loss. The same holds good for F and the higher immersion lenses from J upwards, inasmuch as in these the variation lies within the compass of the cover-correction, or in those with fixed mounts may be obviated by using slightly thinner covers. On the other hand the objectives AA, BB, CC, DD, E, G and H and also those for homogeneous immersion perform more or less deficiently when corrected for the short continental body on stands of English model, from the great derangement of the spherical correction caused by the alteration in the position of the image.

All objectives are also supplied adjusted for the 10 inch body and in the English form of mount, when expressly asked for.

The **objectives** marked **a** are simple achromatic lenses, so mounted that, notwithstanding their great focal length, the body of the microscope remains at its ordinary elevation during observation. In $\mathbf{a}_1$ the thread is so placed that when screwed up the lens is *inside the body.* They are only intended for use with the lower eye-pieces.

Objective a* consists of two achromatic lenses combined in a manner originated by us. By means of a ring rotating like a correction collar the two lenses can be approximated or withdrawn, whereby, using one of the lower eye-pieces, the magnification is changeable in the proportion from about 1 to 3. This graduation of the magnifying power is obviously useful for many purposes.

Objectives for homogeneous immersion. These new kind of objectives, which were *first* constructed in our factory at the instigation of Mr. J. W. Stephenson in the spring of 1878, have since been employed in nearly every branch of microscopical research and particularly in observations on the bacteria. Their introduction is now universally recognised as a substantial advance towards the perfection of the microscope and they are regarded as indispensable aids in all difficult investigation.

We make the three objectives of this series in essentially the same form as they were originally introduced. We have succeeded however in making a practical improvement in the $\frac{1}{18}$, *inasmuch as we have been enabled lately to give it so much greater working distance that it may be used with 0.20 Mm. covers or even thicker.*

The originally provisional designation of these objectives—focal length expressed in fractions of an inch—is retained because it has now become familiar.

By employing with these objectives an immersion fluid of the refractive index of crown glass any refraction of the rays of light before

their entrance into the front lens is done away with. In this way not only is the influence of varying thicknesses of cover-glass as good as abolished within wide limits, but at the same time more perfect definition is attained with a considerable increase of aperture. As a result therefore these lenses very considerably excel the dry series and also the water immersions in sharpness and luminosity of image and capacity of resolving fine details of structure. At the same time they bear much higher eye-pieces, so that they equal in available magnification considerably stronger lenses of the ordinary immersion series.

As immersion fluid for these objectives we recommend, after many trials, that which we have used from the beginning viz. cedar-wood oil (from *Juniperus virginiana*). Latterly we supply the same in a thickened condition which does away with its inconvenient fluidity, attaining at the same time almost perfect identity of refractive index with that of the cover-glass. A bottle of this oil is given with each objective and supplied subsequently when required. If desired a small test-bottle is also supplied, with parallel sides and a crown glass prism on the stopper for testing the refraction and dispersion of any other available immersion fluid. We expressly request therefore that no immersion fluids from other sources be used with our objectives, or at least until these have been previously carefully tested as to their exact refractive power, as considerable loss in the performance of the objective may be expected if unsuitable fluids are made use of.

In consequence of repeated demands we now quote in the list ***homogeneous immersion glasses with correction mounts.*** But for the regular requirements of scientific ***research we recommend*** as before ***ordinary mounts*** for these objectives inasmuch as we regard the fact of having a fixed *constant* of correction, even if limited to a small range of body-length, as a very considerable advantage of the homogenous over the dry lenses and water immersions, in which an adjustment for correction, though frequently necessary, is always a necessary evil. The endeavour to get the best correction with the object actually under observation affords room for greater errors (of correction) than arise from variable thickness of cover or from small differences in the normal length of body with a carefully worked out medium correction. So that the practical gain of a correctional adjustment in these glasses consists in the advantage, which for the most part is an indifferent one, of being able

to use the same objective on stands with varying lengths of body. The correction mounts of these objectives are marked by arbitrary divisions but the division corresponding to the proper correction for the normal immersion-fluid and normal length of body—155 Mm. for our stands, 250 Mm. for English models—is indicated by the number 155 or 250 as the case may be.

In accordance with the above remarks these objectives are kept in stock solely with fixed mounts and as we only make them with correction mounts if expressly ordered, a greater length of time must therefore be allowed for delivery.

The water immersion designated in our previous catalogues up to 1882 by the lotter M. is no longer regularly kept in stock, as experience has sufficiently shown that this short focus (0.75 Mm.) in water immersion possesses no advantage, which cannot be better attained by the use of the $\frac{1}{18}$ homogeneous. But if specially ordered this glass can still be supplied.

Eye-pieces.

We supply for our Microscopes the ordinary Huyghenian and also the so-called orthoscopic or achromatic eye-pieces on KELLNER's system. Their focal length and price is shown in the following table.

No.		Equivalent focus					*Mark*
	No.:	1	2	3	4	5	each
47	**Huyghenian eye-pieces . . .**	48mm	40mm	30mm	22,5mm	17,5mm	7
48	**Orthoscopic eye-pieces . . .**	45mm	36mm	27,7mm	21,2mm	16,4mm	15

Those marked with the same number in both series give equal magnifications when used with the stronger objectives on bodies about 155 Mm. long. With the weaker objectives, especially series a and a*, the orthoscopic eye-pieces give a somewhat *lower* magnification.

The focal lengths of the eye-pieces of both series are so adjusted that the *eye-piece magnification* of the 5 consecutive numbers equals

3.0 4.0 5.5 7.5 10.0

provided the body of the microscope is arranged to have a distance of 180 Mm. between the eye-lens of the eye-piece and the posterior focus of the objective, which is practically the case with our stronger objectives on bodies 155 Mm. long. The preceding figures indicate how many times, under these conditions, the real magnification of each objective, *i.e.*, used as a simple magnifier, is multiplied by the several eye-pieces, and thus they give a correct estimate of the degree to which each eye-piece can and does utilise the optical performance of the objective.

The Huyghenian eye-pieces are amply sufficient for ordinary purposes and the achromatic series is practically of little value especially with the higher objectives. But for micro-photography when an eye-piece is used the orthoscopic form is undoubtedly preferable.

The Huyghenian series will always be sent unless explicit directions to the contrary are given.

With regard to the choice of eye-pieces for a Microscope we would remark that all our stronger objectives are capable of giving effective magnifications even with No. 4, and in the series aa, AA, BB, CC, DD, G and the two weaker objectives for homogeneous immersion No. 4 at least is required to utilise the whole optical performance of the lenses, *i.e.* to render visible every detail the objective is capable of resolving.

When only two eye-pieces are taken Nos. 2 and 4 are therefore always recommended and when three, Nos. 2, 4 and 5.

Apparatus for Measuring and Drawing.

No.		*Mark*
49	**Stage Screw-Micrometer,** for the exact measurement of objects too large to be included in one visual field. A revolving disc divided on the edge, for fixing the position of the object, supported on struts extending from the frame of the micrometer screw. The divisions on the drum read off to 0.002 Mm.; whole turns of the screw are indicated on a	

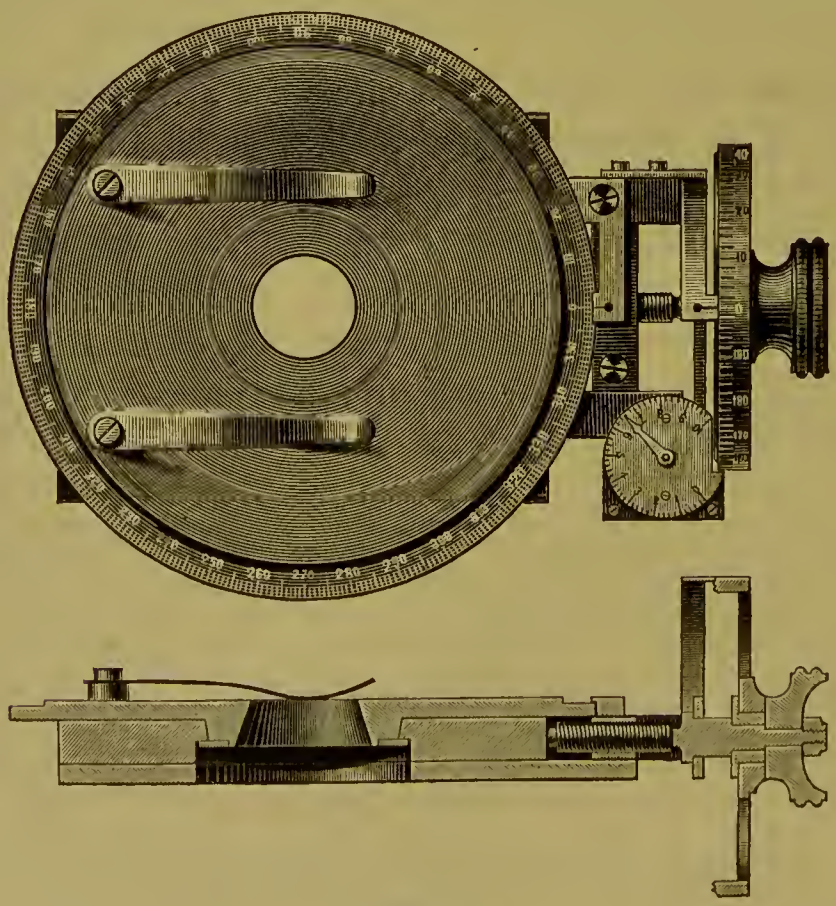


Fig. 14.
Stage Screw-Micrometer No. 49
($\frac{2}{3}$ actual size).

No.		Mark
	dial. The screw measures up to 10 Mm. Arranged to fix on the stage of the larger stands	120
50	**Ocular Screw-Micrometer,** with RAMSDEN eye-piece. Glass plate with crossed lines, which together with the eye-piece are carried across the image formed by the objective by the measuring screw, so that the adjustment always remains in the centre of the ocular field. Each division on the drum corresponds to 0.002 Mm. Whole turns are counted on a numbered scale seen in the visual field. Measures the image projected by the objective up to 8 Mm. (Fig. 15) . . .	60

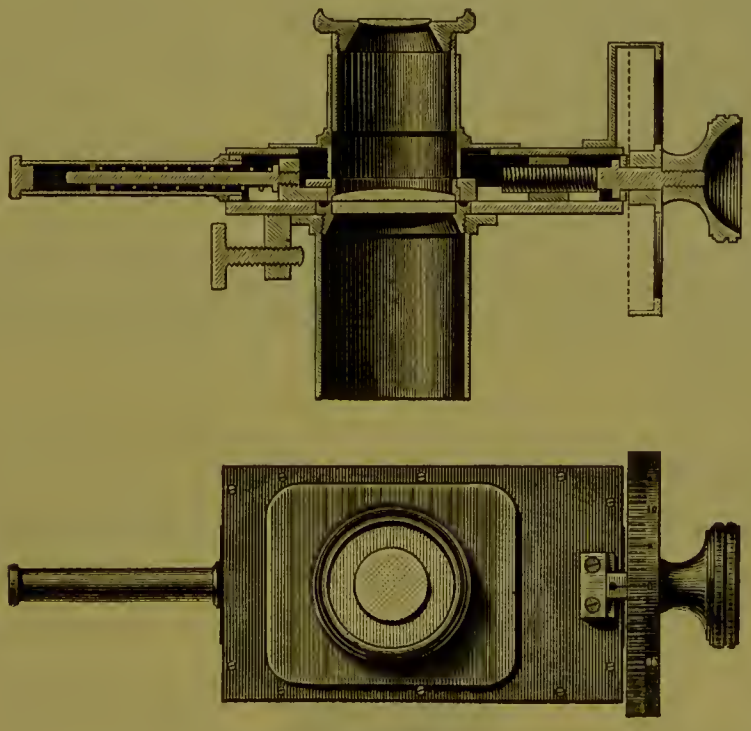


Fig. 15.
Ocular Screw-Micrometer No. 50
($\frac{3}{4}$ actual size).

51	**Stage Micrometer.** One Millim. divided into 100 parts; on a glass slip, in case	10
52	**Eye-piece Micrometer.** 5 Millim. divided into 50 parts with figures; to drop into either eye-piece . . .	5



Fig. 16.

If desired Eye-piece Micrometers can be supplied with 5 Mm. divided into 100, and 10 Mm. in 100 price 7.50 Mk. each.

No.		Mark
53	**Crossed-line Micrometer,** also for dropping into the eye-piece. A square of 5 Mm. divided either into whole or half Mm. according to order; for counting scattered particles in the visual field	5
54	**Glass slip** with excavation of equal and exactly measured depth (0.100 or 0.200 Mm.) for counting blood-corpuscles and the like by means of the crossed-line Micrometer, with 2 ground cover-glasses	8
55	**Apparatus** for counting blood-corpuscles as arranged by Prof. Thoma. Exactly calibrated mixer, chamber 0.100 Mm. in depth with crossed lines on the bottom (1 sq. Mm. in 400 parts). The whole in case	30
56	**The same,** with a small moveable stage, enabling the divided surface of the chamber to be moved across the visual field by a screw	40
57	**Micrometer Eye-piece.** No. 2 or No. 3 Eye-piece with an intermediate fitting for the reception of the micrometer, and sliding eye-lens for exact adjustment to the eye of the observer. With Micrometer No. 52	15

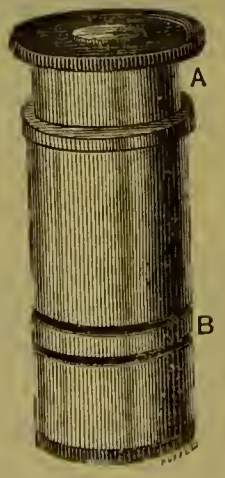


Fig. 17.
Micrometer Eye-piece No. 57.

No.		Mark
58	**Micrometer Eye-piece** with screw for moving the Micrometer, also for use in counting linear divisions instead of an indicator eye-piece	25
59	**Goniometer Eye-piece** (No. 2) with divided circle and glass plate marked with a series of parallel lines; sliding adjustment to eye-lens	30
60	**Cover-glass Tester,** for the exact measurement of cover-glasses, thin plates etc. The measurement is effected by a clip projecting from a box; the reading is given by an indicator moving over a divided circle on the lid of the box. The divisions show hundredths of a Millimeter. Measures to upwards of 5 Mm.	36
61	**Cover-glass Tester** of more simple construction; screw with divided disc and arrangement to regulate the pressure. Also gives measurements to 0.01 Mm.	12
62	100 Mm. brass measure with chamfered edge	1.50
	Measures on plate glass for drawings, in which the divisions lie on the surface of the paper without parallax, with fine, sharply engraved lines:	
63	300 Mm. glass rule, divided to single Mms.	9
64	200 Mm. do. do.	5
65	100 Mm. on glass slip 125 × 25 Mm.	1.50
66	50 Mm. divided to half Mms. on a 3 × 1 inch slip .	1.50
	The two latter with double divisions, English inches and lines, or half lines and Millims ; each	2.50
	Fully divided circles on plate glass discs, with contre marks, for use as transposers:	
67	Circle 80 Mm. in diamotor, entire degrees	5
68	Circle 120 Mm. in diameter, half degroes	9

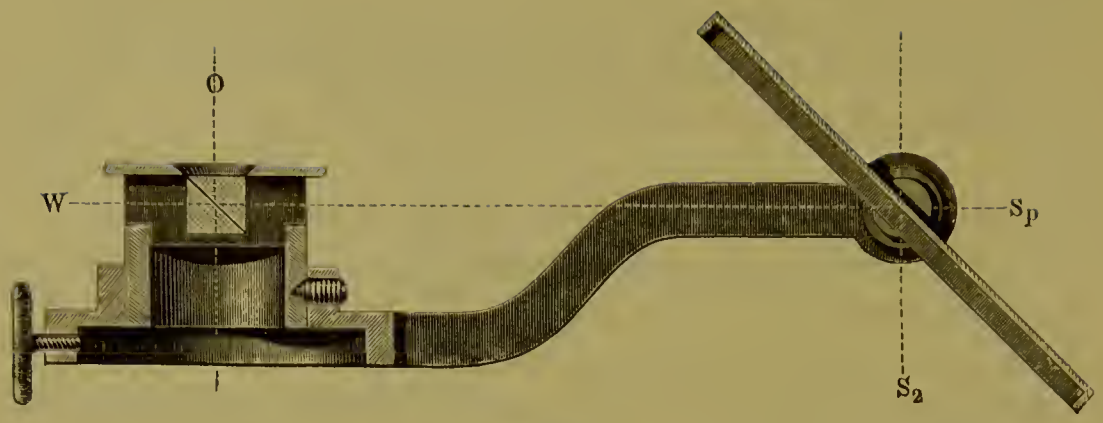


Fig. 18.

Camera lucida after Abbe No. 69

(actual size).

No.		*Mark*
*69	Camera lucida after Abbe. The drawing surface is made visible by a double reflection, from a large plane mirror and from the silvered surface of a small prism in the visual point of the eye-piece. The microscopic image is seen directly through an aperture in the silvering of the prism. By the concentricity thus obtained of the bundle of rays reaching the eye from both the microscope and the paper, the image and pencil are seen coincidently without any straining of the eyes. With this apparatus moreover drawings may be executed on a horizontal surface without perceptible distortion. The brightness of the paper is regulated by smoke-tinted glasses which fit into the prism mounting. The apparatus is specially adjusted for the No. 2 Huyghenian eye-piece; mounted on this and fixed by a clamping screw the mirror only requires turning in the proper position and it is then ready for use. (Fig. 18.) In case	30
*70	Whilst recommending the Camera described above as being more handy, we make to order another form with larger mirror and longer arm, which quite obviates any distortion of the drawing	36

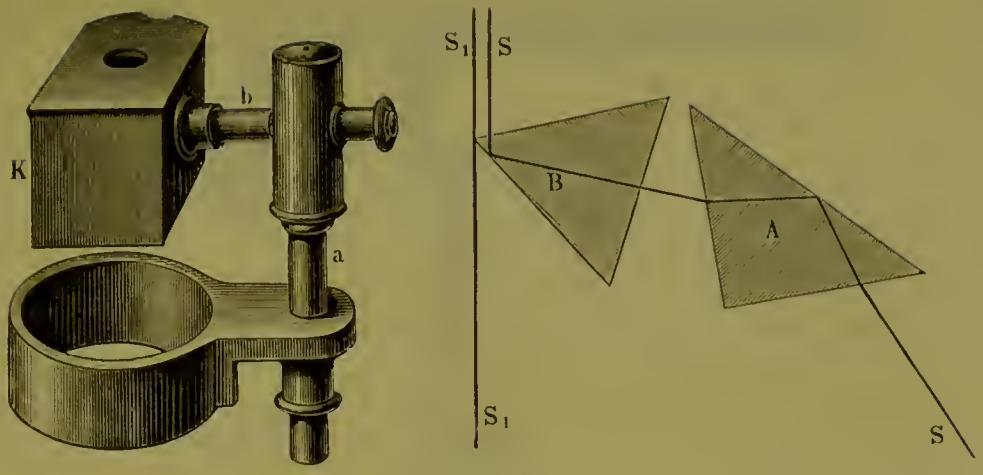


Fig. 19.

Camera lucida No. 71

(about actual size).

No.		*Mark*
71	Camera lucida with two prisms; for fixing over the eye-piece (Fig. 19)	21
72	Camera lucida after Milne Edwards and Doyère	36
73	Camera lucida after Oberhäuser, combined with No. 2 eye-pioce	40

In ordering either of these latter Nos. it will be sufficient to send a sharp sealing-wax impression of the end of the body on a piece of stiff cardboard.

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*74	Apparatus for measuring the growth of plants or parts of plants, aftor Reinke (Bot. Zeit. 1876). A circular disc of plate glass 57 Mm. in diameter, with a groovo on its circumferonco and a horizontal stool axis turning very oasily on hardened points. The surface of the disc is markod with diamond-cut divisions and microscopic figures, which on rotation aro brought in front of a horizontal reading microscopo. Each interval botwoen tho divisions oxactly corresponds to 1 Mm. of tho circumferenco of tho disc and is projected by tho objoctivo of tho microscopo upon an	

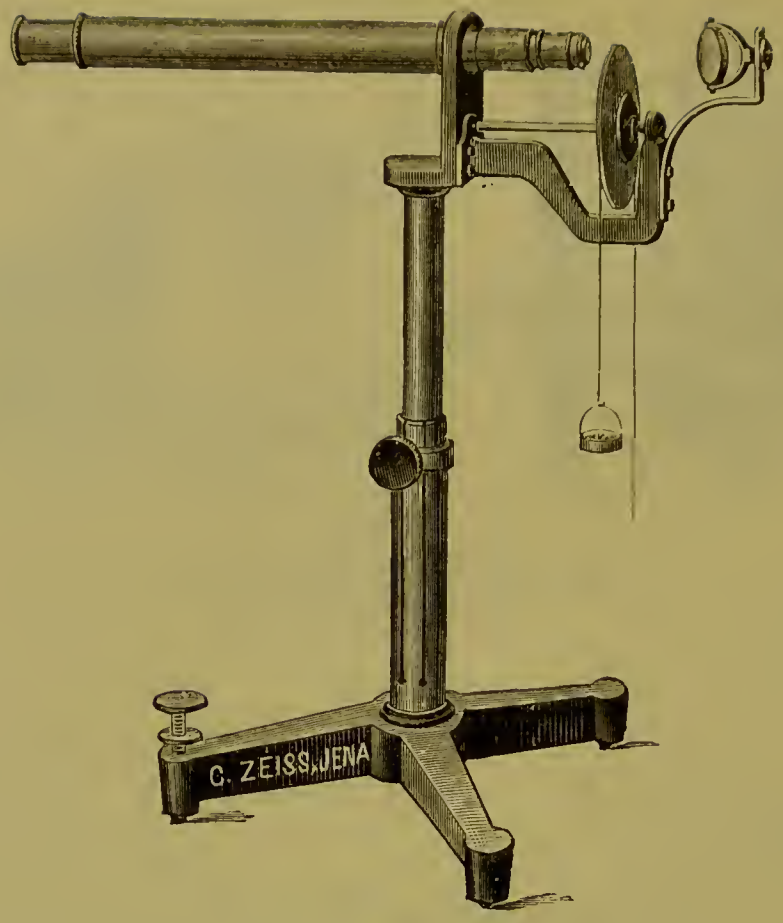

Fig. 20.
Apparatus for measuring the growth of plants No. 74.

No.		*Mark*
	eye-piece scale divided into 100 parts, so that movements of the disc equal to 100th Mm. can be read off directly and thousandths by estimation. A very fine metal wire is carried over the disc, one end of which is fixed to the object under observation and the other extended by small weights, thus transferring the vertical movement of the attached point to the periphery of the divided disc. The entire apparatus—disc, microscope and illuminating mirror—is mounted on a pillar with an iron tripod adjustable to various heights, this when in use is placed on a firm base near the object to be experimented upon	180

The following physico-chemical instruments are included in this place as they are occasionally employed in microscopical investigations.

No.		Mark
*75	**Large Refractometer** after Abbe, for estimating the refractive index and the medium dispersion of fluids and solid bodies by means of total reflexion (E. Abbe, Neue Apparate zur Bestimmung des Brechungs- und Zerstreuungsvermögens fester und flüssiger Körper, Jena 1872; and Sitzungsber. d. Jenaischen Gesellsch. f. Med. u. Nat. 1880). Double prism of highly refractile flint glass, rotating on a divided sector which also carries an observing telescope turning on a horizontal axis, the whole mounted on a heavy brass foot. In front of the object-glass of the telescope is a system of two revolving Amici prisms (Compensator), the revolutions of which are read off on a divided drum. The division of the sector gives directly the refractive index of the fluid or solid up to the third decimal place for the Fraunhofer line D, and allows of estimation up to about 2 units of the fourth place. The reading on the drum of the Compensator gives the data for calculating the dispersion with the assistance of an accompanying table. Observation is made by diffused day- or lamp-light. For the estimation of fluids one drop only is necessary, for solids, a fragment of any desirable shape on which is ground a plane surface about 1 Cm. square. Applicable for indices of refraction between 1.30 and 1.65. In case, with directions for use	230
*76	**Small Refractometer** on the same principle, designed exclusively for fluids and without the arrangement for estimating the dispersion. Divided sector with double prism and small telescope, the eye-piece of which contains an Amici prism. Observation is made by noting the successive extinction of a spectrum projected by this prism, the apparatus being held towards any source of light. The divisions on the sector give directly the refractive index for D to 5 units of the third decimal place and allows of the single units being accurately determined by estimation. Extent of	

No.		*Mark*
	the measurement from 1.30 to 1.65. In case, with directions for use	110
*77	**Percentage Refractometer,** for determining the concentration of solutions and fluid mixtures based on the measurement of the refractive index. Small hand telescope, with a double crown-glass prism in front of the objective and a revolving AMICI prism for compensating the colour dispersion. The reading is shown on an eye-piece scale divided and numbered according to the refractive index, which gives directly within the limits of 1.300 to 1.410 the units of the third decimal place and permits smaller differences being calculated by estimation. In use the apparatus is directed by hand towards either a cloudy sky or the opal-glass shade of a lamp. One drop of fluid suffices for measurement. In case, with directions for use	100
78	**The same,** with a second scale in the field of the eye-piece (alongside that for the refractive index) which gives a direct reading of the percentage value of a definite fluid (sugar solution, Glycerine etc.)	105
79	**Saccharimeter,** for estimating the rotatory property of fluids. Fluid holder 200 Mm. long, fitting into a brass tube which has a polarising NICOL and double quartz plate at one end and an analyser with divided circle at the other. The circle is divided to half degrees and tenths may be estimated with accuracy. Observation is made by adjusting the so-called transition colour on both halves of the quartz plate, the tube being directed towards a white surface. Only reliable for fluids of moderate rotatory power. With directions for use	65

Illuminating Apparatus.

No.		*Mark*
	Illuminating Apparatus after ABBE (Archiv für mikr. Anat. Bd. IX, p. 496). Immersion or dry condenser of large aperture with diaphragm holder and double mirror, the whole fitting in a groove below the stage of the microscope in place of the ordinary mirror.	

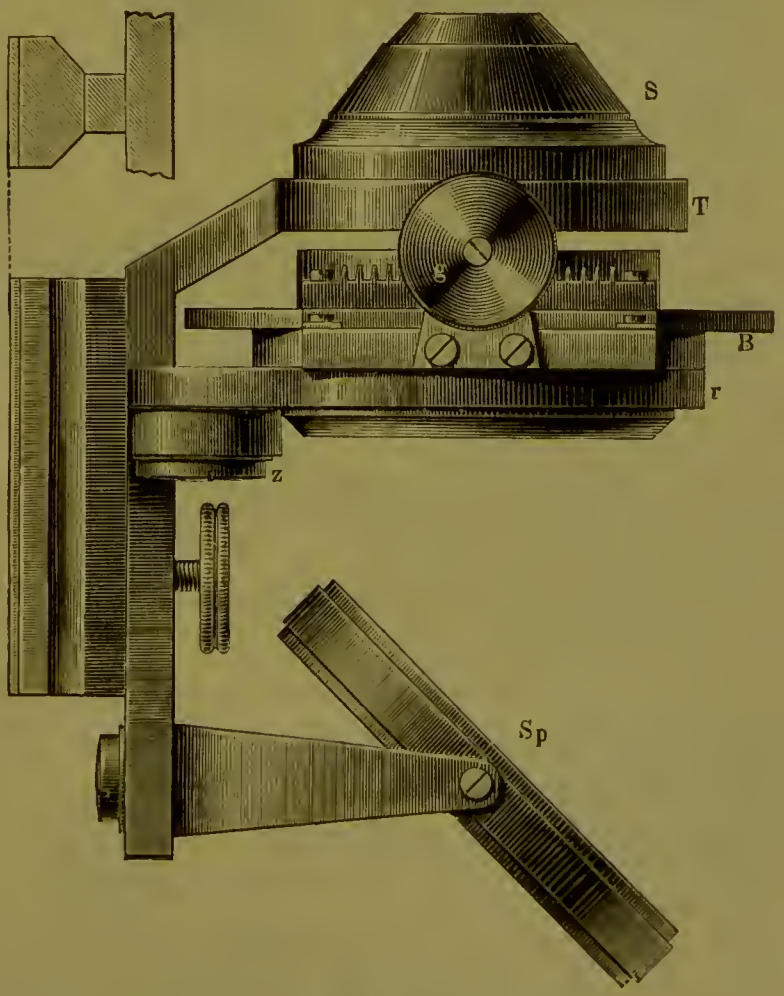

Fig. 21.
Illuminating Apparatus No. 80. Side view.
(actual size).

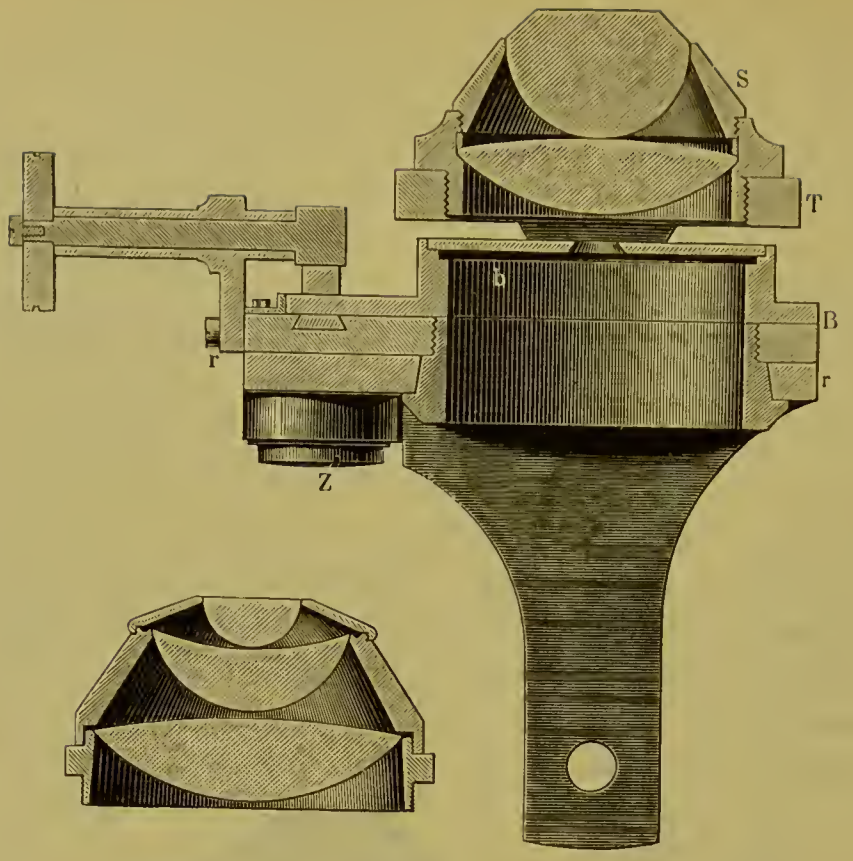

Fig. 21[a].
Illuminating Apparatus No. 80 and 81. Section.
(actual size).

No.		*Mark*
	This apparatus gives every modification of direct and oblique illumination with transmitted light by merely changing and moving the diaphragms; with it stained specimens may be observed by a cone of rays filling the whole aperture of the objective, according to the method used by R. Koch in his investigations on the Bacteria. It gives also dark-ground illumination with magnifications up to 600 and can be conveniently used with polarised light. Available either by day- or lamp-light, assisted in the latter case by a largo condensing lens or engravors water bottle. (Figs. 21 and 21[a].)	
	Special directions are given with it.	
*80	With single condenser of 1.20 num. apert.	55
*81	With two condonsers, interchangoable, of 1.20 and 1.40 num. apert., tho latter giving the most oblique illumination in working with objectivos of very largo aperture	80

No.		*Mark*
	The form in which this apparatus is constructed by us has particular reference to the arrangement of our larger stands, and consequently the fitting of the illum. appar. is specially considered in their construction. Adaptation to stands of other make therefore is nearly always impracticable and will not be undertaken. Subsequent fitting to one of our stands, which in any case must be returned for the purpose on account of the exact centering necessary, will be charged 10 Mk.	
*82	**The same apparatus,** constructed to fit the sub-stage in large stands of English model, with condenser of 1.40 numer. apert. (Fig. 22 and 22[a])	65

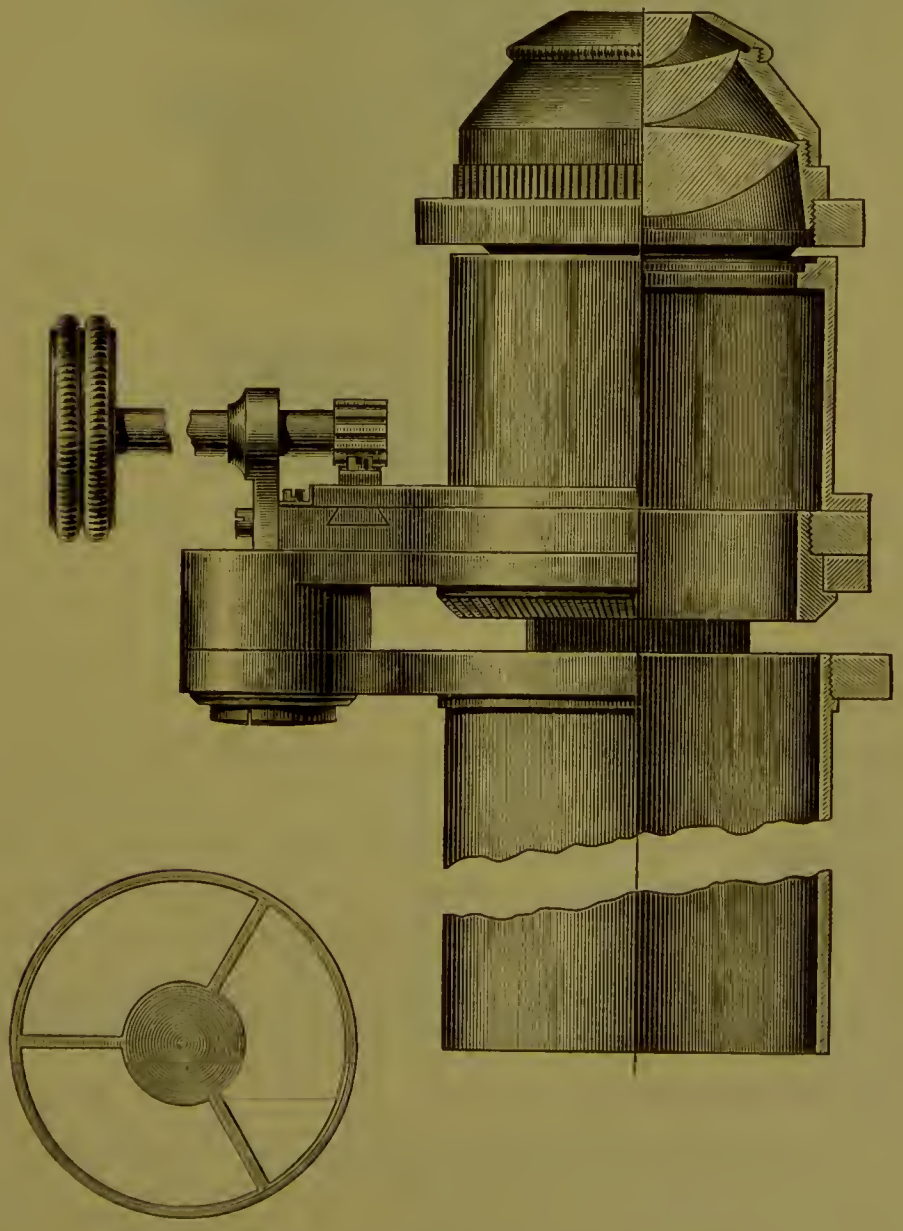

Fig. 22.
Illuminating Apparatus No. 82. Front view.
(actual size).

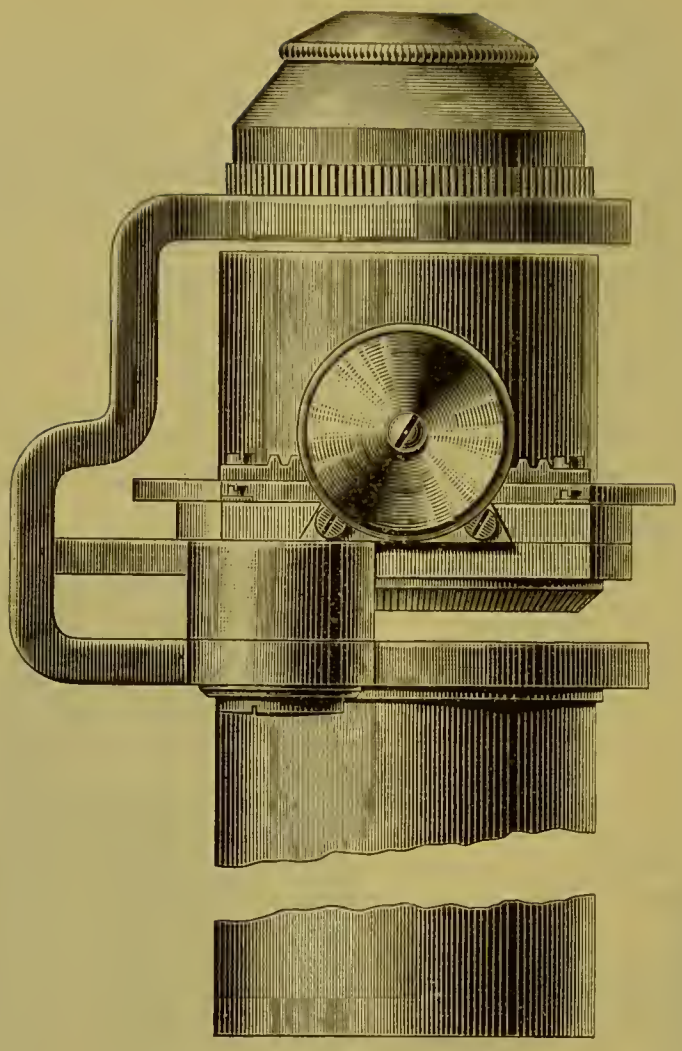

Fig. 22a.

Illuminating Apparatus No. 82. Side view.

(actual size).

No.		*Mark*
*83	**Condenser** for smaller Microscopes, up to Stand VII[a] inclusive. Lens of large aperture sliding in the jacket of the cylinder diaphragms. When brought up close to the level of the stage it gives a cone of rays filling nearly four-fifths of the free aperture of an homog. immersion objective; pushed lower down smaller cones of central light are obtained. This apparatus to a certain extent replaces the ABBE Condenser for ordinary purposes	10

For subsequent fitting the diaphragm slide, cylinder, and one of the diaphragms must be sent.

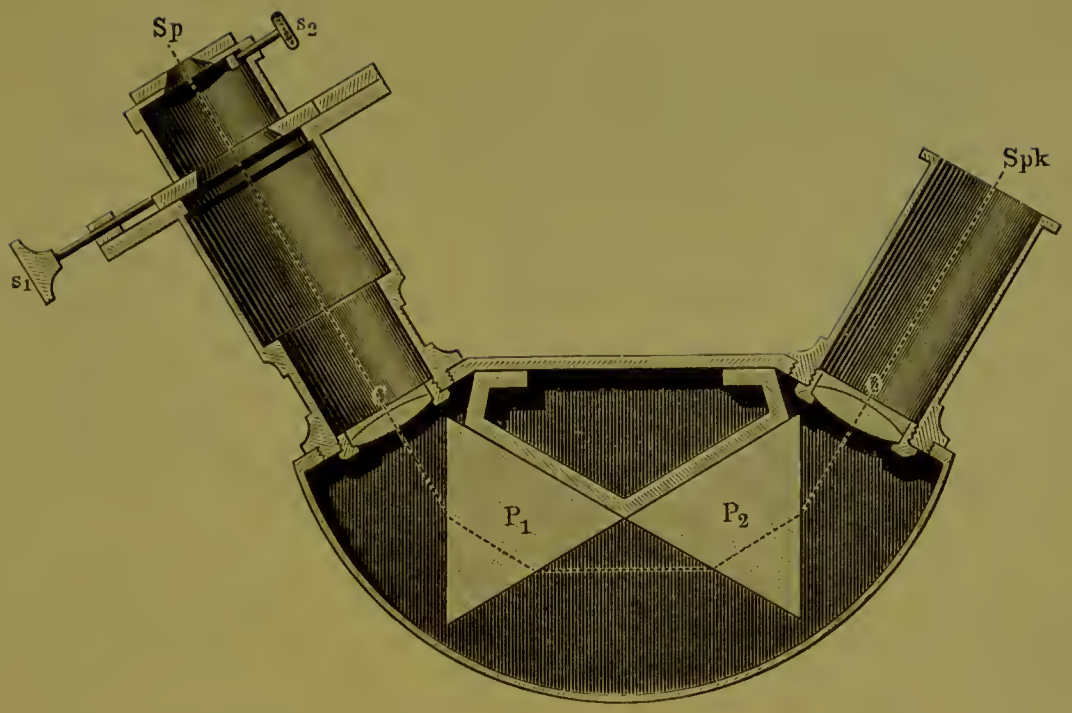

Fig. 23.
Illuminating Apparatus for Monochromatic Light No. 84
(actual size).

No.		*Mark*
84	Illuminating Apparatus for Monochromatic Light, after Hartnack. A spectrum of considerable length is projected on the specimen by means of a series of prisms of great dispersion, so that with rather high magnifications the whole visual field is illuminated by approximately monochromatic light. On shifting the slit by means of a screw the different colours are successively made to occupy the field of vision. To fit the substage of stand I or the diaphragm slide of other stands when not too small. (Fig. 23.) In case	80
85	Condensing lens 100 Mm. in diameter on stand; in case . .	50
86	Ditto, 80 Mm.	36
87	Ditto, 60 Mm.	27

No.		Mark
88	Microscope Lamp; SIEMENS Gas-burner on an adjustable brass stand, with a glass globe 150 Mm. in diameter filled with water or a solution of ammonio-sulphate of copper, as a condenser. To obtain a proper illumination the gas flame should be about 15 Cm. behind the globe and the mirror of the microscope the same distance in front of it with the most concentrated part of the cone of rays impinging on it. The lamp gives an excellent bright and white light which almost completely supplies the place of good daylight	35

Spectroscopes.

No.		*Mark*
*89	**Spectroscopic Eye-piece** (Micro-Spectroscope) after ABBE. Slit with symmetrical movement of both edges (after MERZ), opening widely to permit a view of the whole visual field; arrangement to regulate the length of the slit; comparison prism with lateral stage and mirror—all these parts in a drum combined with an achromatic eye-piece. Above the eye-piece is an AMICI prism of great dispersion, which turns aside on an excentric pin, leaving the eye-piece unobstructed for adjustment to an object. The mount of the prism carries a small scale-tube, with mirror for the scale and an achromatic lens, by which a virtual image of the scale reflected from the end surface of the prism is projected upon the spectrum. The scale gives the divisions and numbers of the wave-lengths at each position of the spectrum in fractions of a Micromillimeter, whereby the second decimal place may be read off directly and the third calculated by estimation. The position of the scale relative to the spectrum is adjusted by a screw on the jacket of the AMICI prism. The eye-lens of the eye-piece and the scale are adjustable to the vision of the observer. (See method of use.)	
	In case, including a number of lithographed scales for recording observations. (Fig. 24 and 25)	165

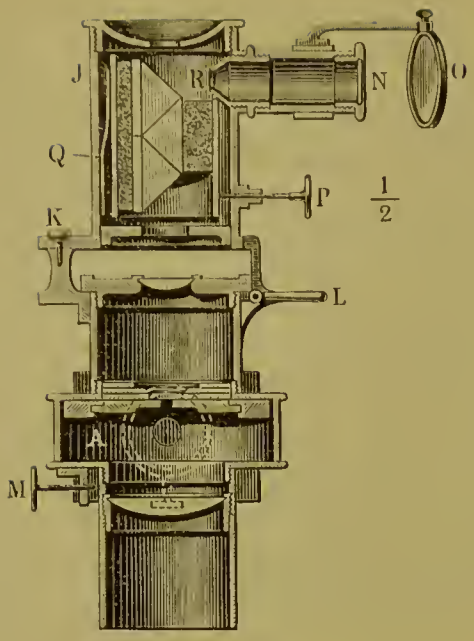

Fig. 24.

Spectroscopic Eye-piece No. 89

($\frac{1}{2}$ actual size).

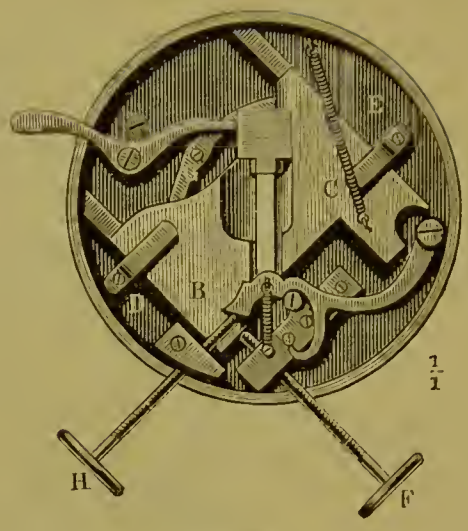

Fig. 25.

Drum with mechanism of the slit of No. 89

(actual size).

No.		*Mark*
90	Spectroscopic Eye-piece without scale; slit mechanism as in No. 89, but without comparison prism and without the arrangement to shorten the slit. AMICI prism to place over the eye-piece	72
	In ordering No. 89 or 90 for any given Microscope a sharp sealing-wax impression of the upper end of the body must be sent.	
	Hand Spectroscope (Pocket Spectroscope) after BROWNING, for observing the effect of absorption in larger objects—with adjustable slit and AMICI prism of high dispersion.	
91	Without Comparison prism	30
92	With Comparison prism	40
*93	Micro-Spectral Objective after ENGELMANN, for observing and measuring the effect of the colours of the spectrum on microscopical objects (Bot. Zeitung 1882 No. 26; PFLÜGER's Archiv Bd. XXVII p. 464, Bd. XXIX p. 415). Slit mechanism, collimator lens, AMICI prism and projection objective are com-	

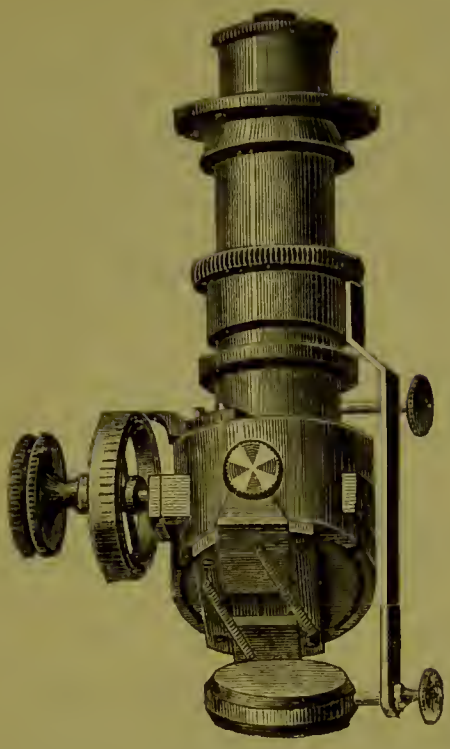

Fig. 26.
Micro-Spectral Objective No. 93.

No. | *Mark*

bined in a tube about 77 Mm. in length, which fits below the stage concentrically with the axis of the microscope so as to project a real spectrum upon the preparation under observation. The edges of the slit are moved symmetrically by a screw with two reversed threads, so that the middle of the slit remains unaltered in position; the divided head of the screw shows the width of the slit as adjusted in 100ths of a Mm.; the length of the slit may be shortened on both sides by two slides acted upon by screws.—Ordinary objectives are used for projecting the spectrum, either A, B, C or D according to the desired size of the spectrum, and which screw by the narrow gauge thread on the lens mounts over the Amici prism. Arranged for connecting with a substage, as in Stand I, which allows of vertical adjustment and centering, in case 124

Polarising Apparatus.

The Analysing Eye-piece after ABBE described in former Catalogues and the polarising arrangements in connection therewith cannot be made until further notice, in consequence of the difficulty lately experienced in procuring sufficiently good calc-spar for making the prisms.

No.		*Mark*
	Micro-Polariscope. NICOL prism with condensing lens as polariser, to fit in the slide of the cylinder diaphragms or in the diaphragm carrier of Stand I; Analyser after HARTNACK (PRAZMOWSKI prism mounted to fix above the eye-piece). Disc with revolving ring, to attach to the stage by means of an adapter fitting into the stage opening, for holding Selenite and Mica films and rotating them in the axis of the Microscope.	
94	With divided circle to the Analyser	59
95	Without ditto	44
	In ordering, the diaphragm holder and the smallest diaphragm must be sent.	
	Polarising arrangement for the ABBE Condenser. NICOL prism with disc on the mounting to fit the diaphragm carrier of the illuminating apparatus, so that the ordinary diaphragms	

No.		Mark
	and also Selenito and Mica films may bo placod ovor tho polarising prism. Analysor aftor HARTNACK.	
96	With divided circlo to tho Analysor	46
97	Without ditto	31
98	Series of 8 Selenite and Mica films after MOHL	10
	If a Microscope is already provided with the Goniometer eye-piece No. 59 the divided circle of this will serve for the analyser also, the price of the polarising arrangement in this case therefore must be reckoned minus this extra item.	
	It being impracticable to furnish the smaller stands with any useful arrangement for polarised light it will only be supplied for Stands I to V^{b} and for VII^{a}.	
99	Analyser aftor HARTNACK. PRAZMOWSKI prism in brass mount for placing above the eye-piece. Without divided circle .	16

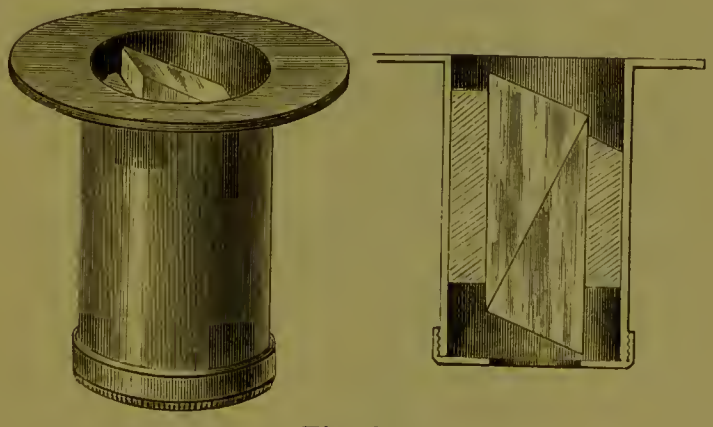

Fig. 27.
Polariser No. 100.

100	Polariser to fit the diaphragm carrier of tho ABBE Condenser	15
*101	Spectro-Polariscope aftor ROLLETT (Zeitschr. f. Instrumentenkunde, Jahrg. I, p. 366) as modifiod by DIPPEL, for determining tho character of doublo refraction in microscopical spo-	

No. | *Mark*

cimons. Combination of two flint-glass prisms, giving a deviation of 90°, having on one side a moveable slit and collimator and on the other a microscope objective, which projects from below a real spectrum on the specimen under observation. Scale tube on the box containing the prisms, with mirror, collimator-lens, and a scale divided and numbered according to the wave lengths (as in the spectroscopic eye-piece No. 89); by reflexion from one surface of the prism a real image of this scale is projected with the spectrum in the plane of adjustment. The edges of the slit are moved symmetrically by a double threaded screw so that the middle of the slit always occupies the same position. A PRAZMOWSKI prism mounted on a revolving arm in front of the slit serves as a polariser, and between it and the slit is a revolving ring to receive selenite films for producing interference lines in the spectrum. An A, B, C or D objective is used to project a spectrum of the desired dimensions and is screwed to the box containing the prisms by the narrow gauge thread on the lens mount.

The apparatus is designed to fit in a substage as in Stand I, wherein the vertical adjustment is made by rack and pinion, but the shifting of the spectrum along the transverse plane is effected by two milled-head screws acting on double slides. (Fig. 28.)

In case, including two selenite films for red of the second and third order 240

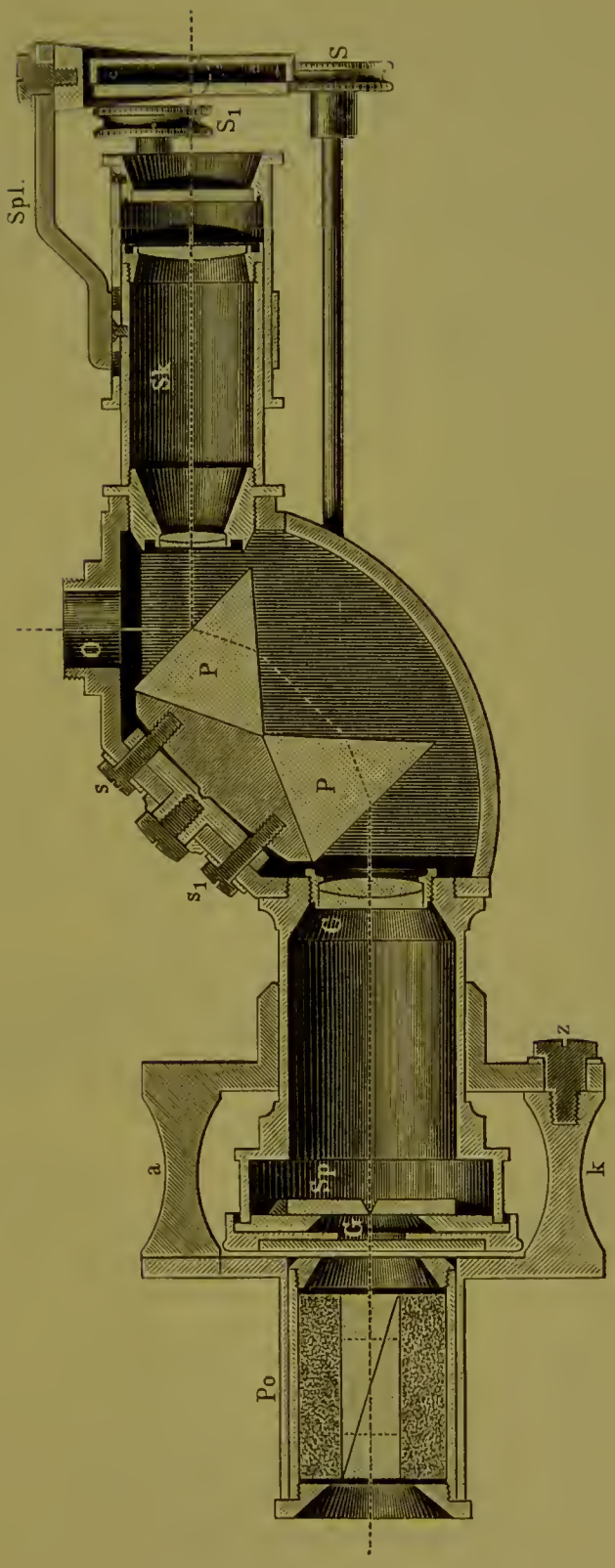

Fig. 28.

Spectro-Polariscope No. 101

(Section, actual size).

Various Optical and Mechanical Accessories.

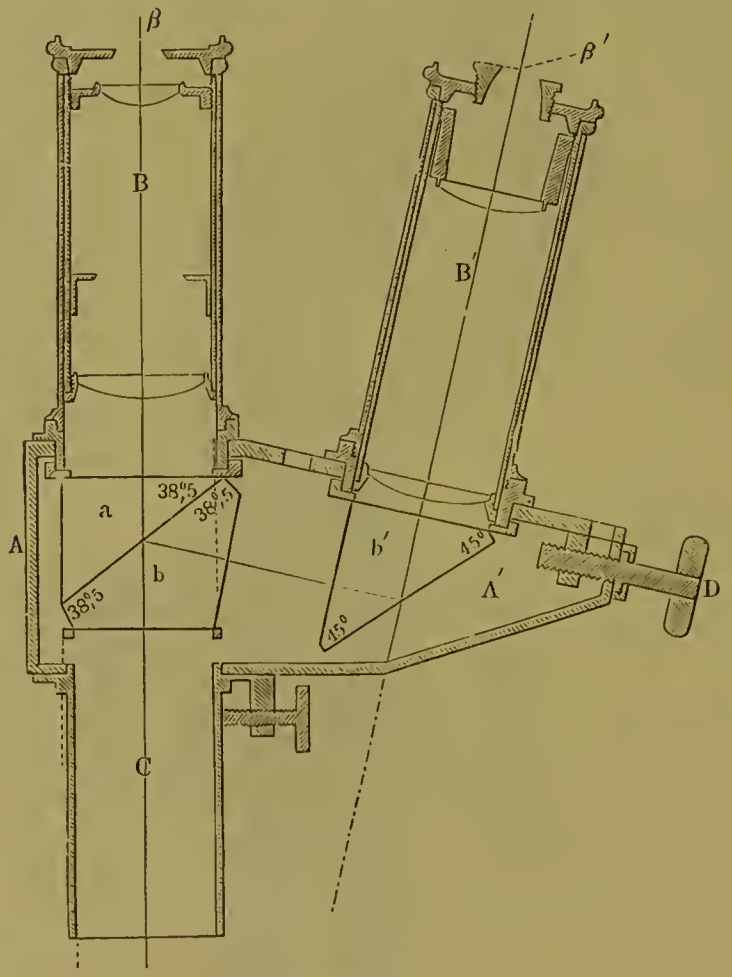

Fig. 29.
Stereoscopic Eye-piece No. 102
(Section, $\frac{2}{3}$ actual size).

No.		*Mark*
*102	Stereoscopic Eye-piece after Abbe, for stereoscopic and binocular observation of microscopical objects with any degree	

No.		Mark
	of high magnification. (Zeitschrift für Mikroskopie, Jahrg. 1880, p. 207; Carl's Repertorium d. Experimentalphysik, Jahrg. 1881, p. 298; Journ. of the R. Micr. Soc. 1881, p. 203.)—The division of the bundle of rays proceeding from the objective to produce two separated images, takes place at the upper end of the body by partial reflexion from a thin stratum of air between two juxtaposed glass prisms. The direct rays proceed to an eye-piece in the axis of the body, the divergent undergo another reflexion through a prism in a second eye-piece placed excentrically, so that its axis forms an angle of 14^0 with that of the body. Both eye-pieces give images of equal magnification. The excentric eye-piece is adjustable by a screw to the inter-ocular width of the observer. Bisection of the ray bundles for producing stereoscopic effects is made by adjustable semi-diaphragms above the eye-pieces; without these the apparatus gives binocular non-stereoscopic vision. Available with low or high powers on any of the larger stands provided with rackwork coarse adjustment and which permit of the body being shortened to at least 160 Mm. (Fig. 29.) In case . . .	150
	In ordering this binocular apparatus for any microscope it will be sufficient to send a sharp sealing-wax impression of the upper end of the body.	
103	Reversing Prism after Nachet (prisme redresseur), for obtaining erect images in dissecting with the compound microscope. With plate mount to fix above No. 2 eye-piece	18

No.		*Mark*
104	Revolving nose-piece for rapidly changing the objectivos—for three objectives. Tappod to the standard thread. (Fig. 30)	27



Fig. 30.

105	Nose-piece for two objectives. As above. (Fig. 31) . . .	20

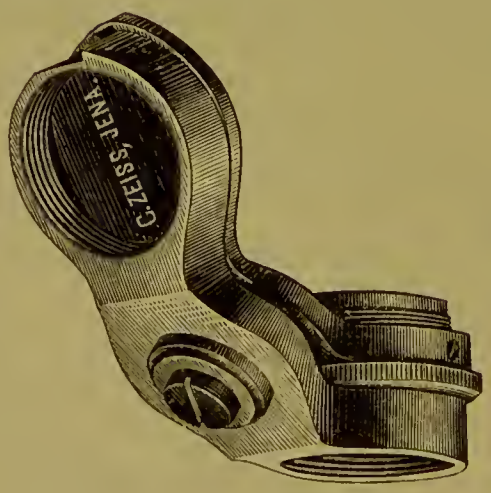

Fig. 31.

106	Revolving nose-piece for four objectivos, provided with the narrow gaugo thread of our lens mounts; applicablo to stands with sliding bodies but only for tho objoctives A, B, C, D,	

No. | Mark

DD, E, F, where the lens mount unscrews from the adapter. (Fig. 32) 20

If when ordering this nose-piece the objectives are stated for which it is intended, it will be fitted with mounts so graduated as to give the lenses as nearly as possible their proper focal distances.

If desired for use with stands V—VII this nose-piece can be supplied with a clamping ring to fix the body in its jacket. Price 5 Mk.



Fig. 32.

In all these nose-pieces the objectives not actually in use are protected from dust by a cover.

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*107 **Apertometer** after Abbe, for estimating the numerical and angular aperture of objectives (Journ. of the R. Micr. Soc. Jany. 1878, p. 19). Semi-circular disc of thick plate glass 90 Mm. in diameter, with reflecting prism for throwing horizontally-incident light in the axis of the microscope; to lie on the stage of the microscope. The objective to be tested is adjusted to a central spot on the surface of the disc. The limits of the aperture are indicated by moveable verniers on the periphery of the disc; a special auxiliary objective is used for observation, which screws into the draw tube and is adjusted by it to the image of the indices. The reading is given by two series of divisions on the glass disc, one of which shows the angle of aperture in air and the other the numerical aperture. For use on either

No.		*Mark*
	of the larger stands with draw-tubes. Including the auxiliary objective, in case	60
*108	The same apparatus, the glass disc being provided with a metal foot, on which the indices move in a groove . . .	80
*109	Test-plate after ABBE—for testing the spherical and chromatic aberration of objectives, and for estimating the thickness of cover compatible with the most perfect correction. Six cover-glasses, having the exact thickness	



Fig. 33.
Test-plate No. 109.

	marked on each (0.09 to 0.24 Mm.), cemented in order on a slip, their lower surface silvered and engraved with parallel lines, the contours of which form the test. For use with the ABBE Condenser. (See Method of use.) In case .	7
*110	Diffraction-plate after ABBE, for demonstrating the influence of reflexion on the formation of microscopical images (Monthly Micr. Journ. Febr. 1877; Zeitschr. f. Mikroskopie, II. Jahrg. Heft 2). Three cover glasses, silvered on their lower surfaces and engraved with a series of parallel and crossed lines, cemented on a glass slip	6
*111	The same, with a diaphragm and an arrangement for fixing and rotating the same above the objective, designed for objective aa	11

Apparatus for Microphotography.

No.		Mark
112	**Large Micro-photographic Camera.** For use with the Micro-photographic Stand No. 23, or with stands of other construction, made for a corresponding purpose. Ordinary mahogany photographic Camera of medium size, with extending arrangement lengthening to about 1 Meter, the length of withdrawal being registered on a measure fixed to the lower border of the Camera. Two slides for plates 23 Cm. square, with wooden frames for the reception of plates of any smaller dimensions, are included. The arrangements corresponding to the special purpose of the Camera are: 1. The connection with the Microscope. For this purpose the Camera is fastened to a strong wooden support, which also carries the Microscope, its fine adjustment being worked from in front of the support by a long Hooke's joint. In order that the axis of the microscope may be brought into line with that of the Camera, the former stands on a heavy metal plate, adjustable by three screws, which again can easily be moved by hand laterally on the wooden support. This support runs in wooden slides, which permit of the microscope being freely moved in the long axis of the apparatus, that is, approach or recede from the Camera.	

No. *Mark*

The end of tho Camera directed towards the Microscope terminates in a long funnel-shaped brass nozzlo, blackened inside, which carries a brass jacket worked by rack and pinion; this is easily removed, should it be desired to view the interior of the Camera. The connection of this nozzle with the body of the Microscope, so as to be impervious to light, is very easily made by inserting the above described rack-work jacket into a double capsule fitting the end of the body tube, as shown in the accompanying sketch.

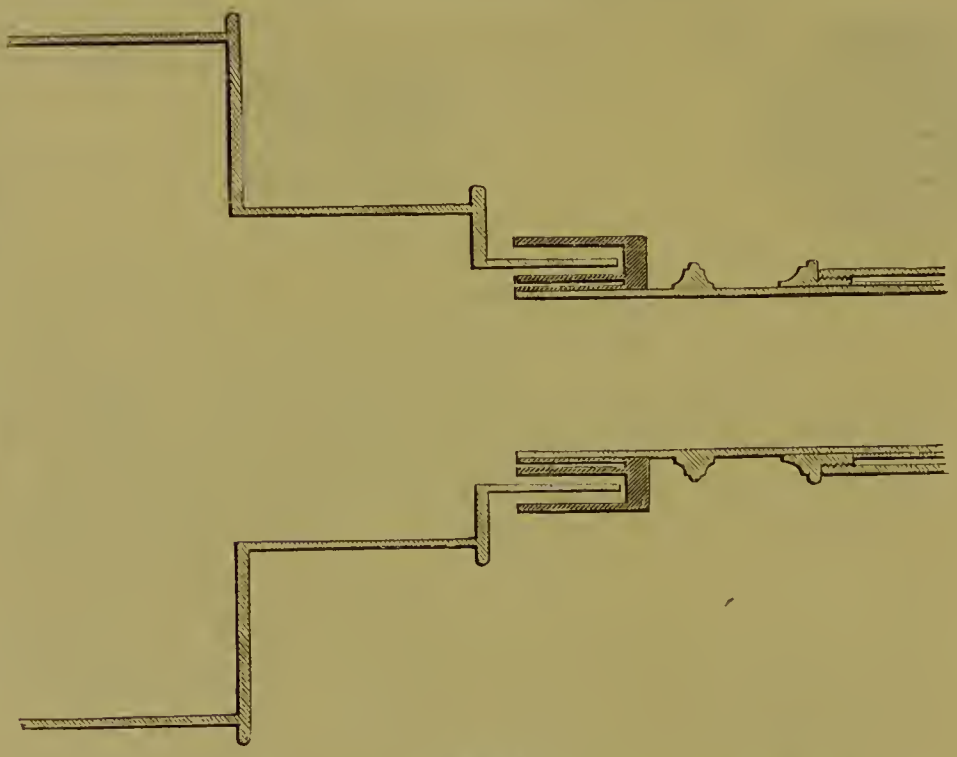


Fig. 34.

Light excluding connection between Camera and Microscope.

The Microscope may be fitted to or withdrawn from the apparatus without the slightest loss of time.

2. The arrangements for regulating the adjustment of the picture. A rough focus and adjustment of the size and position of the picture is made on tho ordinary ground-glass slide; for the fine adjustment this is replaced by a frame containing a disc of transparent plato glass having in its contre a diamond-cut cross. A low power magnifying lons is focussed on this mark and moved ovor

No.		*Mark*

the glass plate by means of a carrier, at the same focal distance. The roughly adjusted picture is now accurately focussed by means of the HOOKE's Joint attached to the micrometer screw of the microscope, the observation being accurately controlled by the above lens. The interchange of the ground-glass plate with the diamond marked plate, and the latter with the sensitive plate holder, is effected in the simplest manner and without the smallest loss of time. (Fig. 35).

Price of the Camera with the Microscope stand . . .	580
Price of the Camera without Microscope stand	280
Extra Plate holders each	18

Fitting the above apparatus to other stands will be charged extra. The stand must also be sent for the purpose.

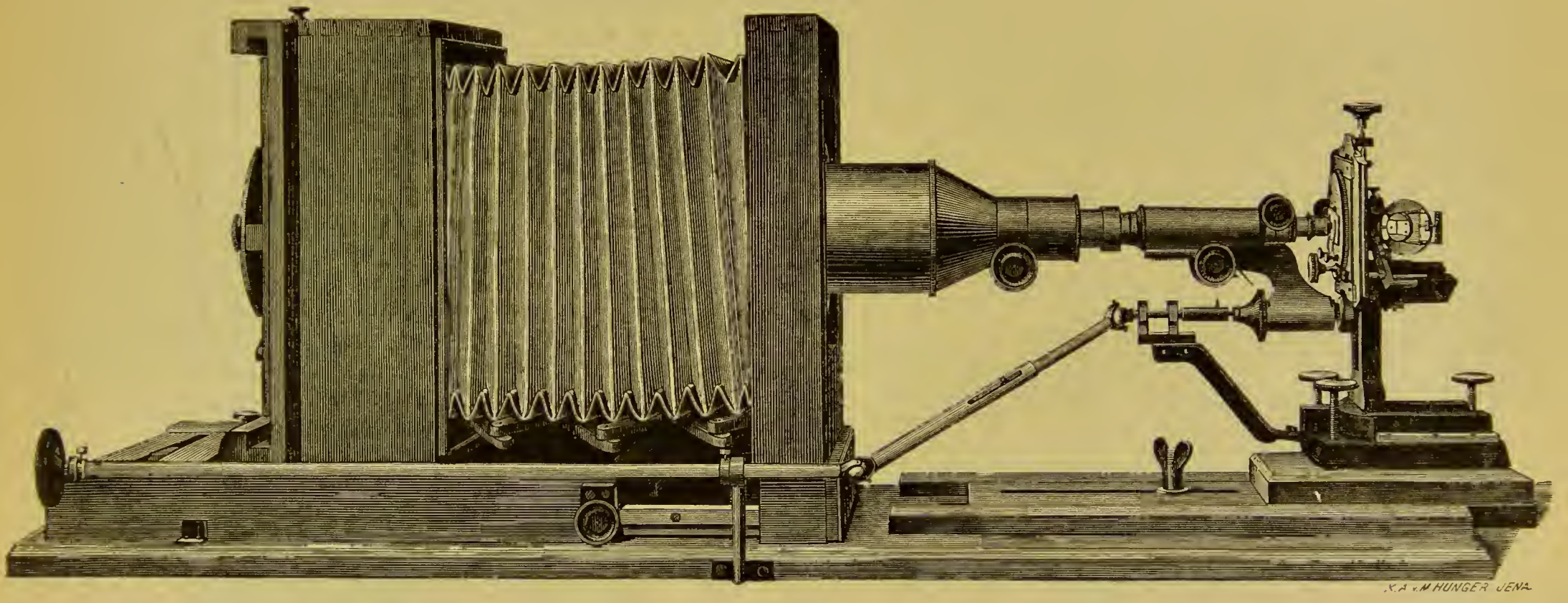


Fig. 35.
Large micro-photographic apparatus No. 112.

No.		Mark
113	**Small micro-photographic Camera.** For use, in combination with an eye-piece, on all microscopes made to incline; without an eye-piece only small sized pictures are obtained such as are used for book illustrations. (Wood-engravers copies.) Funnel-shaped non-extending Camera, with two plate holders 18 Cm. square and wood frames for taking any smaller sized plates. Moveable in grooves on a strong wood support to prevent shifting; the support bears a heavy metal foot for the Microscope adjustable by three screws, the instrument being connected with the Camera as described in the foregoing number. (Fig. 34) Position and size of picture obtained by coarse adjustment of ground-glass plate, a plate with diamond cut cross and lens as in No. 112 for fine focussing. (Fig. 36.)	
	Price of the Camera	70
	Extra plate-holders each	12

The Microscope lamp No. 88 is recommended as the source of light for low magnifications, especially when the smaller Camera is employed, the glass globe being filled with a rather dark-blue solution of Ammonio-sulphate of Copper to cut off the chemically inactive rays. For high magnifications, the electric light or direct sun-light with a heliostat.

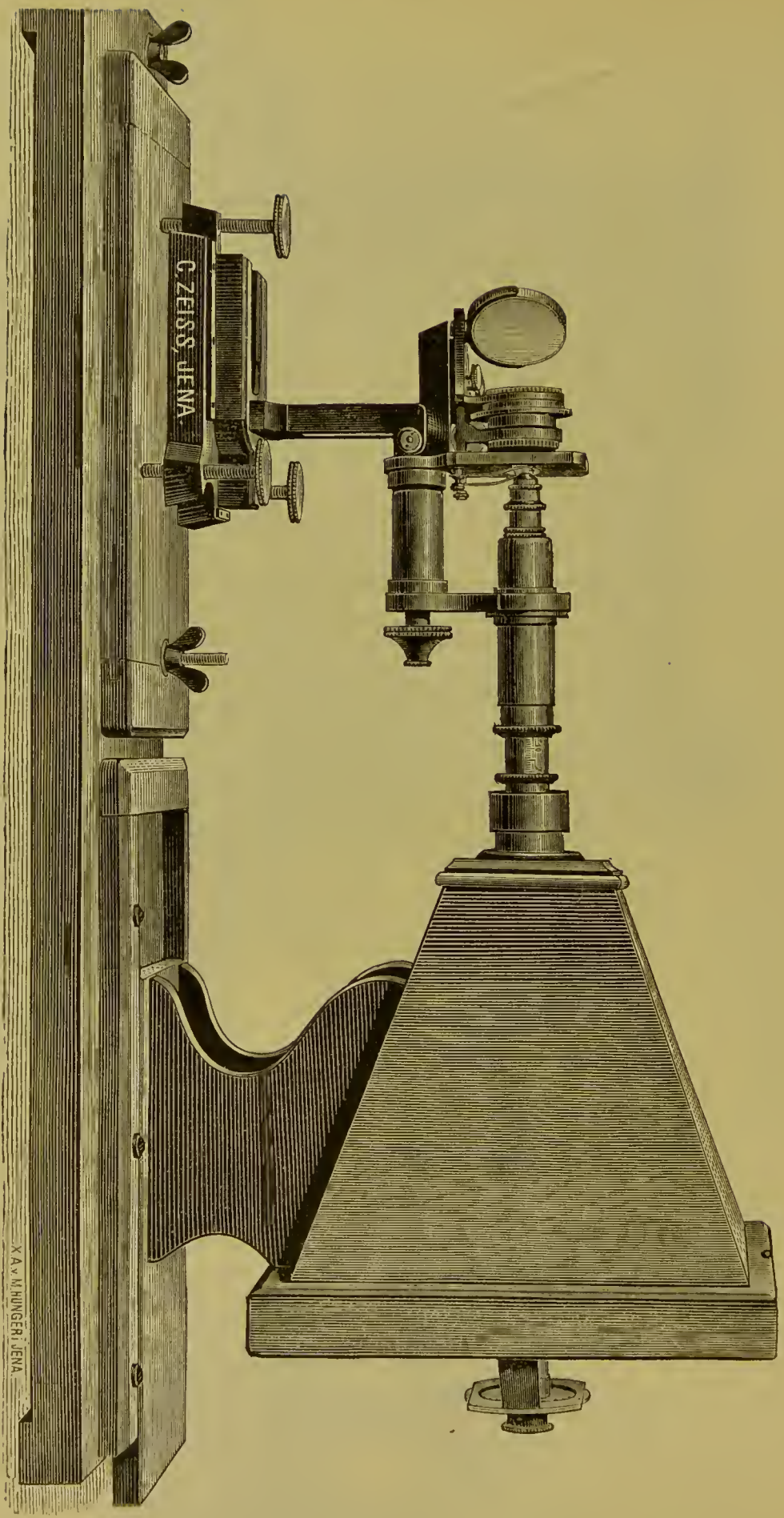


Fig. 36.

Smaller Micro-photographic Apparatus No. 113.

Dissecting Microscopes and Magnifiers.

No.	Dissecting Stands.	*Mark*
*114	Dissecting Stand I after Paul Mayer. Heavy horse-shoe foot; the stage consists of a large metal frame (10 Cm. square) to which is attached conveniently folding wooden struts to support the hands; adjustment by rack and pinion, plane and concave mirrors with universal motions. For teasing out small objects on a slip or in a watch glass the double dissecting series No. 125 or the triple ditto No. 124 is made use of, carried in the ordinary lens holder, and in the above frame is placed a metal plate with stage opening of the usual size, which can be closed below by either a black or white disc as may be desired. For the observation of larger objects, particularly living aquatic animals, the aplanatic lenses No. 127 (× 6 and × 10) are employed, fitting into a special arm inserted in the ordinary lens holder which can be moved about all over the stage. In this case the metal stage is replaced by a glass plate, the easily changed discs described above giving a white or black ground as required. Included is a reserve glass plate and a ring to fix on the mirror for holding a circular piece of white cardboard to serve as the source of light with low magnifications; also a brass plate to fit the frame, on which small dissecting saucers are fixed by paraffin and an extra holder to permit the dissecting lenses Nos. 124	

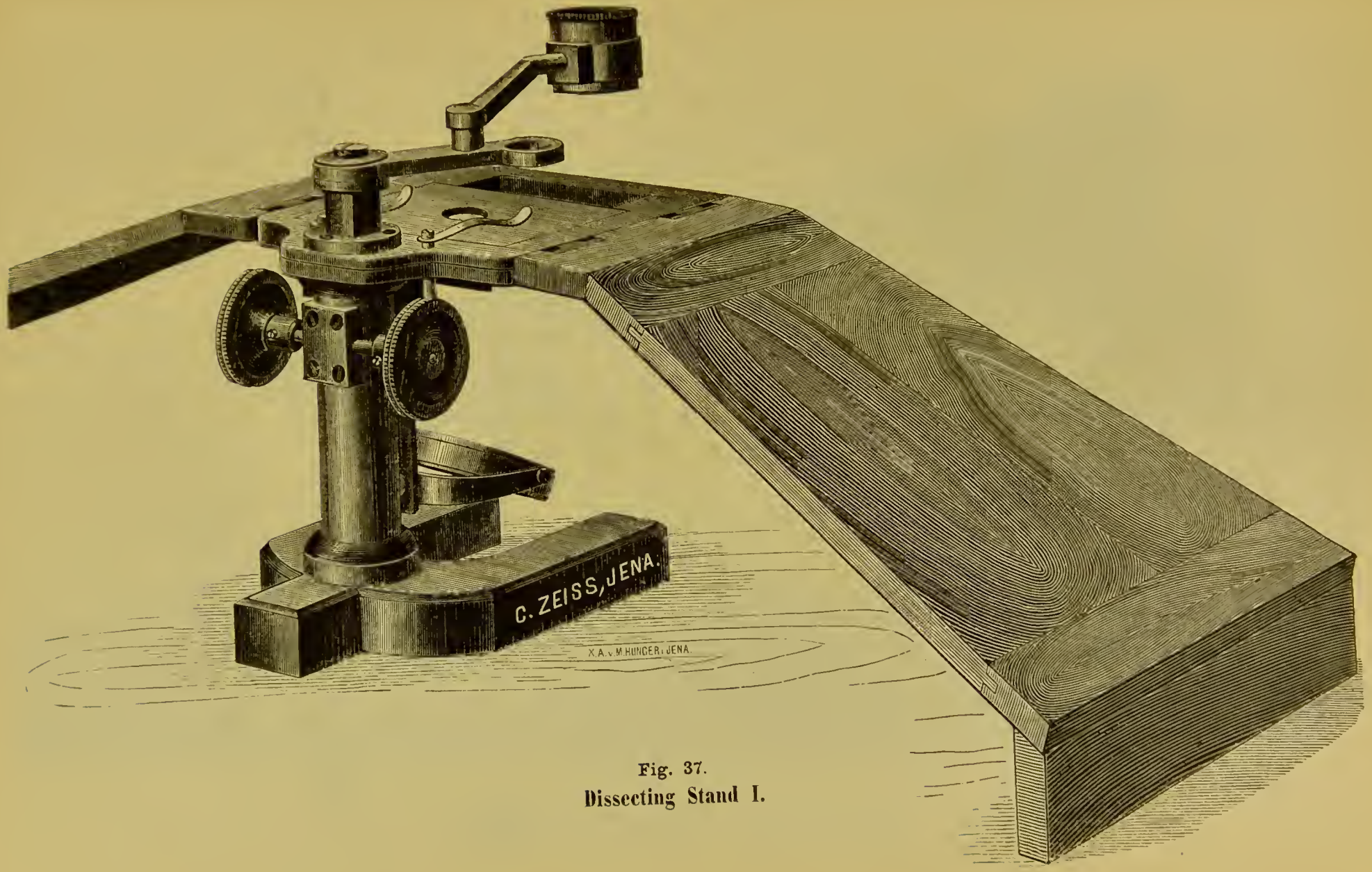


Fig. 37.
Dissecting Stand I.

No.		Mark
	and 125 being moved over the entire stage. The whole in locked mahogany case with handle. (Fig. 37.)	
	Without lenses	100
115	**Dissecting Stand II.** The same as above, but instead of the arrangements on the stage as described there is a thick glass plate in the metal frame interchangeable with a similar shaped blackened brass plate; in place of the double mirror with universal motion a large plane mirror only, fixed in the axis.	
	Otherwise arranged for Nos. 124, 125, 126, 127.	
	Without lenses	75
116	**Dissecting Stand III.** (Described in former Catalogues as Large Dissecting Microscope.) Heavy square stand,	

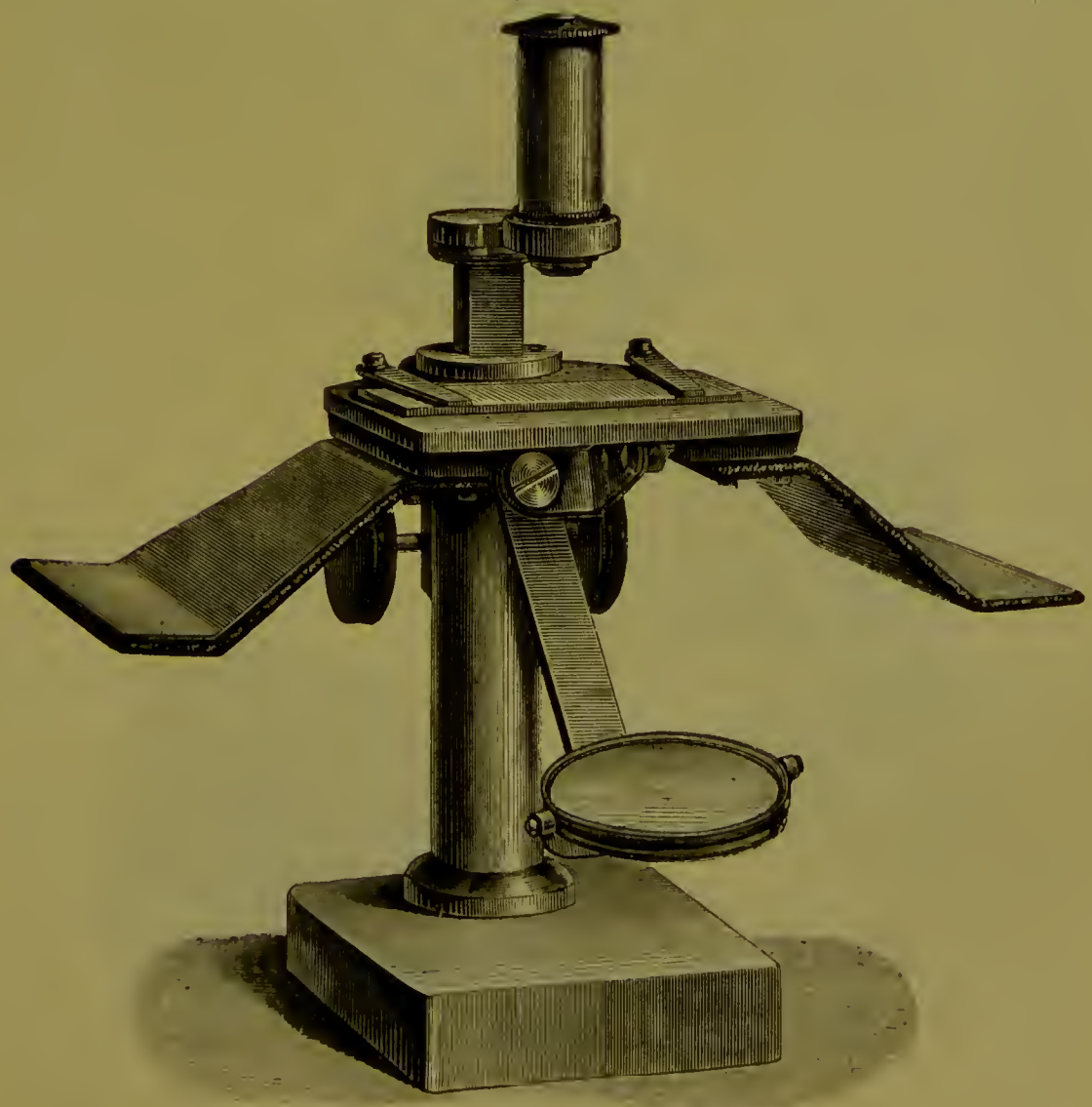


Fig. 38.
Dissecting Stand III ($\frac{2}{3}$ actual size).

No.		*Mark*
	large stage to which is attached leather covered hand-rests. Adjustment by rack and pinion, large concave mirror. In locked case with handle. (Fig. 38.)	
	Arranged for Nos. 124, 125, 126, 127.	
	Without lenses	50
	Dissecting Stand IV. (Described in former Catalogues as Small Dissecting Stand.) Constructed on our well known former model; coarse adjustment by sliding the lens holder, fine adjustment by micrometer screw acting on the stage. Concave mirror. (Fig. 39.)	
117	a) In locked Case on which it screws when in use . .	18
118	b) With Case and separate foot, with rests for the hands	21
119	c) Without Case, screwed to the foot	18

The lenses described under the numbers from 128 to 130 are recommended as particularly suitable for this stand whilst Nos. 124 to 127 are unsuited to it.

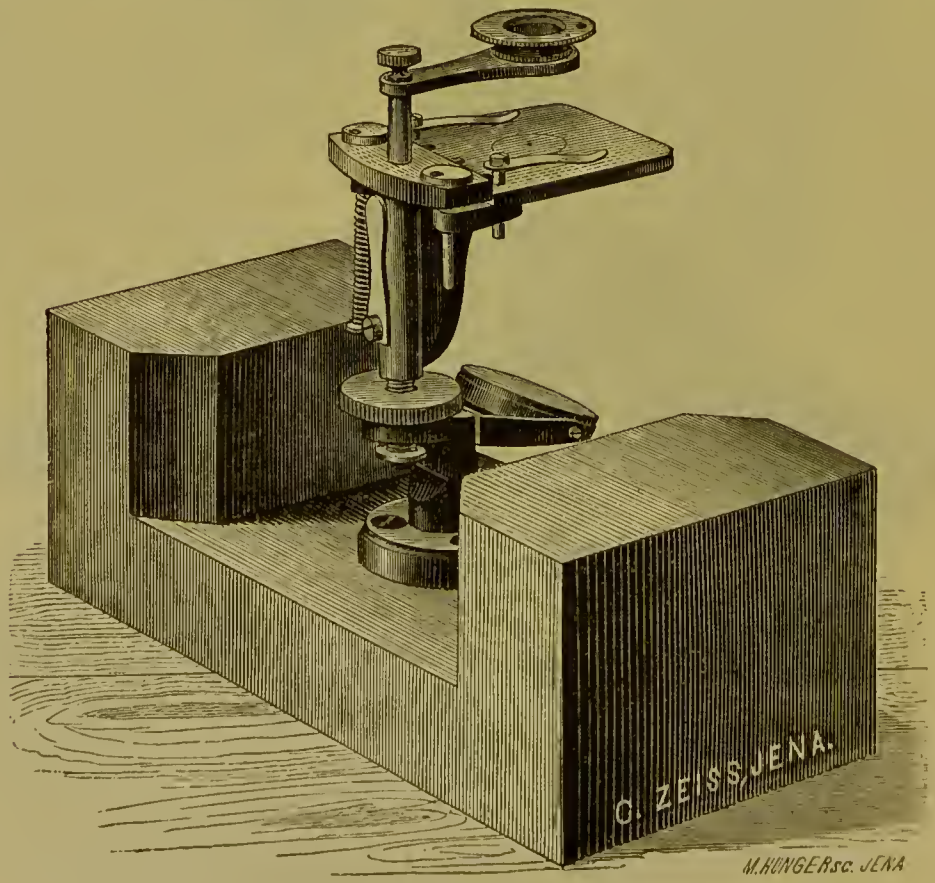


Fig. 39.
Dissecting Stand IV (⅔ actual size).

No.		Mark
	Dissecting Stand V. Small brass stand with stage, above which a lens slides up and down in a holder. (Fig. 40.)	
120	a) With blocks for supporting the hands	7
121	b) Without ditto	6
	only suitable for use with lens No. 130 and Doublet No. 128 (Mag. 15 and 30)	



Fig. 40.
Dissecting Stand V (½ actual size).

Lens Holders.

122	Lens holder I. Heavy metal foot, lens holder with hinge joints, rack and pinion for focussing	25
123	Lens holder II. Heavy metal foot with vertical brass rod and sliding lens holder	12

The lens holders are specially constructed for use with the Brücke's Lenses Nos. 131 and 132, but can also be employed with other weak lenses (Nos. 126 and 127).

No.		Mark

Dissecting Lenses.

*124 Dissecting series, consisting of three achromatic lenses (objective) and an achromatic concave eye-piece; magnifying 100 diameters with a focal distance (9 Mm.) permitting convenient manipulation with knife and needle during observation . . 30

By unscrewing the third and second lens of the objective and using the latter without the eye-piece a useful series of graduated magnifications may be obtained as shown in the following table:

3	lenses	with	eye-piece	100 diameters
2	„	„	„	60 „
1	„	„	„	40 „
3	„	without	„	30 „
2	„	„	„	20 „
1	„	„	„	15 „

125 Dissecting series, consisting of two achromatic lenses (objective) and an achromatic concave eye-piece. Magnifying 30 diameters with great focal distance. On unscrewing the inferior objective lens a magnification of 15 is given. In wood capsule 21

Both series are designed for use with the Dissecting stands I, II and III and cannot be employed with advantage on the smaller ones.

126 Aplanatic Lenses,—after Steinheil's construction—composed of three cemented lenses, giving a relatively long focal distance with large flat field; the higher for use with the Dissecting Microscopes, the weaker as hand lenses or with a lens holder. Magnifying 6, 10, 20, each in wood capsule . 12

127 Aplanatic Lenses, of same construction, with particularly large visual field. Magnifying 6, 10, each in wood capsule . . 15

No.		Mark
128	**Doublets,** after our former construction.	
	a) × 15 in Caso	6
	b) × 30 „ „	6
	c) × 60 „ „	9
	designed for the Dissecting stands IV and V.	
129	**Magnifier,** two lenses in brass mounting, magnifying 10, lower lens alone 5, in capsule	6
	Designed for Dissecting stands IV and V and also as a hand magnifier.	
130	**Magnifier,** same construction simplified for Dissecting stand V, in wood capsule	4
131	**Dissecting lens** after Brücke, with long focal distance, magnifying 4 to 5 times	11
132	**Dissecting lens** after Brücke, double objective with achromatic lenses of 33^{mm} aperture and sliding eye-piece, magnifying 10 and 12 times	30
	The above two numbers are specially designed for the Lens holders Nos. 122 and 123.	

Hand Magnifiers.

133	**Diatom Finder.** Lens magnifying 120 times, with glass plate for the object and adjusting screw	5
134	Two achromatic **lenses** of large aperture in brass mounts, magnifying 4 and 6 timos	11
135	Two non-achromatic **lenses** in brass mounts, magnifying 6 times	6
136	**Simple magnifier,** mounted in buffalo horn, for excursions × 7 times	2

No.		*Mark*
137	Two lenses ⨯ 6- and 12, to fold	3
138	Three lenses ⨯ 6-, 12- and 18, to fold, for excursions . .	4
139	Achromatic magnifier, in ivory mount to fold, as above, with two achromatic lenses; magnifying 3, 5 and 8	12
140	Magnifier for medical purposes, two lenses of greater diameter than the above, folding for the pocket; ⨯ 4 and 8	4
141	Magnifier, in horn mount, two plano-convex lenses of large aperture, to unscrew; ⨯ 5	4
142	Magnifier with two lenses 40 Mm. in diameter, in black brass mount; ⨯ 5	5
143	A single biconvex lens mounted in horn, of large aperture and magnifying 4 times	2

Microtomes and Mounting Instruments.

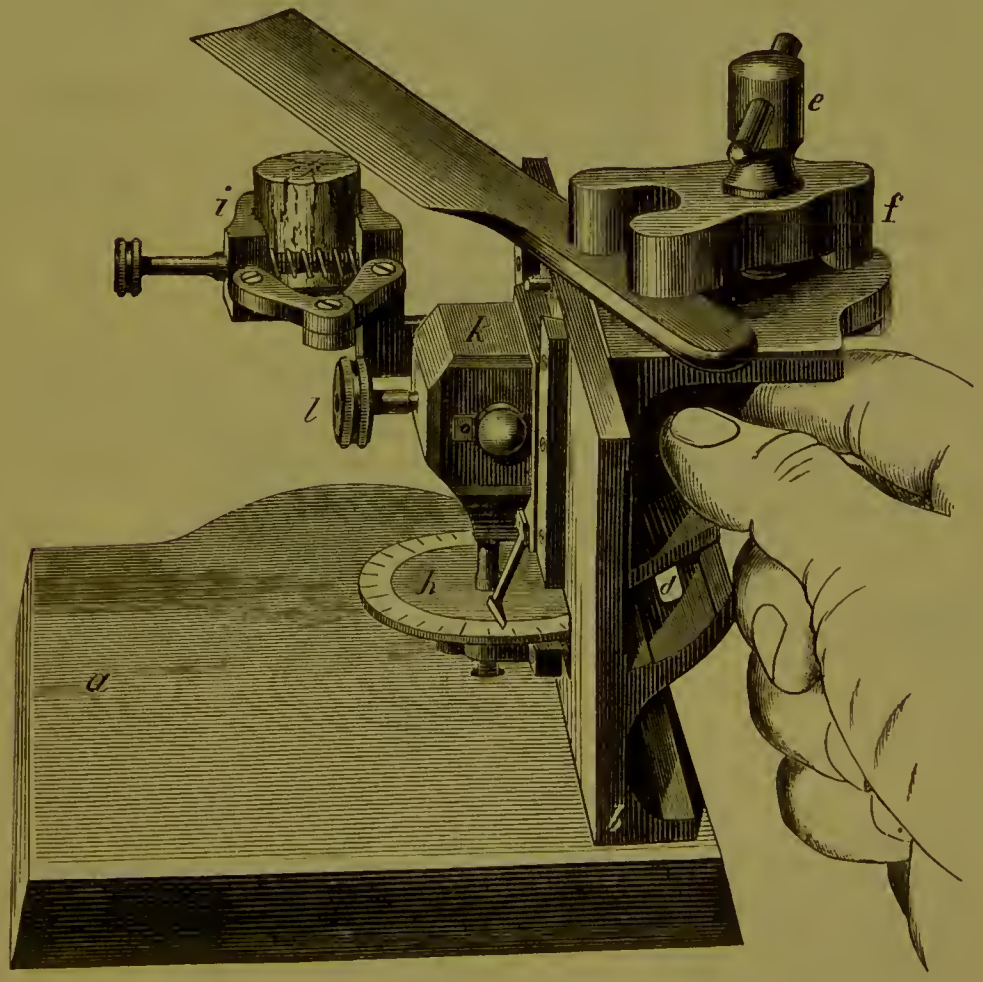


Fig. 41.
Microtome No. 144
($\frac{2}{3}$ actual size).

No.		Mark
*144	**Microtome** after KÖRTING (Jenaische Zeitschr. Bd. XIV) with recently added improvements. The knife is fastened by a	

No.		*Mark*
	clamp to a slide which travels backwards and forwards in a straight bed. Length of cutting movement 160 Mm. The edge of the blade is adjustable vertically by set screws on the knife rest. The knife may be raised during the backward movement so as not to touch the specimen and together with the slide may easily be lifted from the bed without altering the adjustment. The specimen is held in a clip, which turns on two axes at right angles to each other in order to vary the inclination of the object in any required direction. The clip is attached to a second slide moving stiffly in grooves and worked vertically against the cutting edge by a micrometer screw. The divided head of the screw indicates the thickness of the section in hundredths of a millimeter. Separate parts all nickel-plated; the whole standing on a broad cast-iron base. (Fig. 41.) With knife; in case	110
145	Freezing arrangement for the above. Thin metal box (nickel-plated) to fix in place of the clip, and spray apparatus with india-rubber bellows for rapidly vaporising ether in the box and so freezing any specimen placed upon it	15
146	Knife for the above Microtome, with straight welded haft . .	7.50

No.		Mark
*147	**Microtome** after our former pattern. Round polished glass plate 80 Mm. in diameter, borne by two pillars on a heavy brass foot, on which the knife is worked by hand. The specimen to be cut is imbedded in a brass tube and pushed up through an opening in the plate by a screw with divided head. The divisions on the head indicate the thickness in hundredths of a Mm. (Fig. 42.) With knife, in small case	40

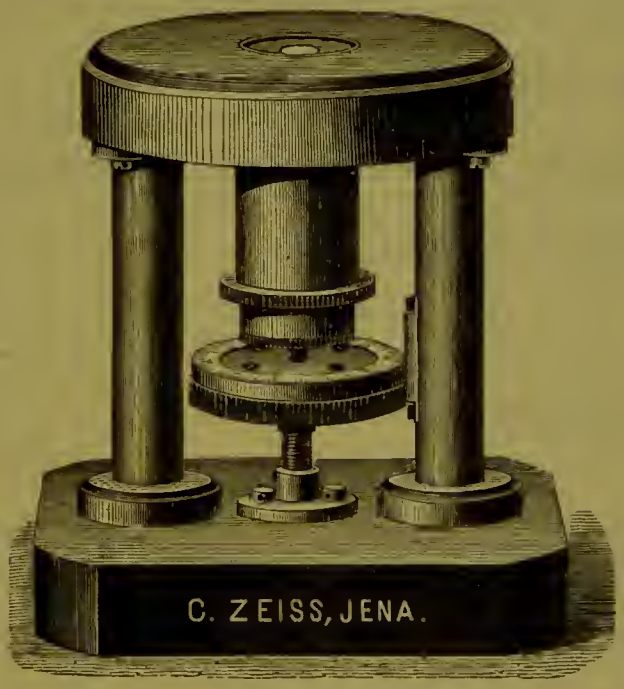
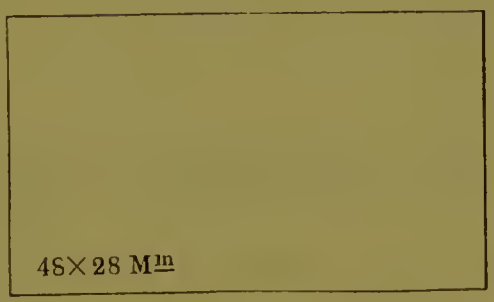
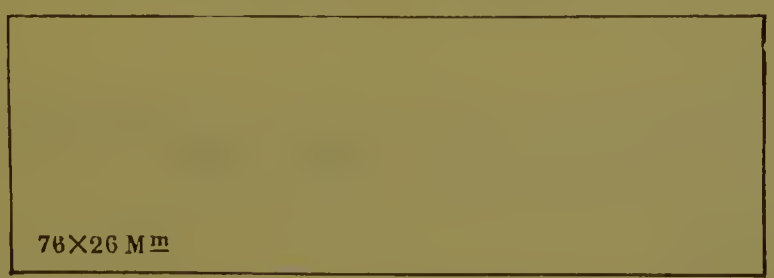


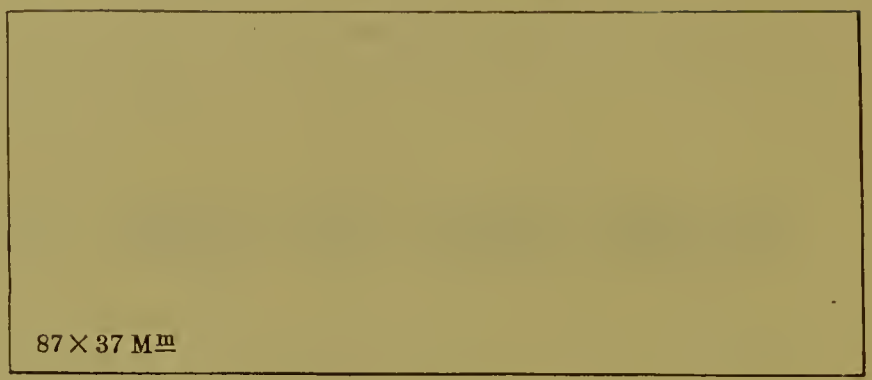
Fig. 42.
Microtome No. 147.
($\frac{2}{3}$ actual size.)

148	**Hand Microtome.** Round flat brass plate 80 Mm. in diameter, with a cylindrical jacket to hold in the hand through which the specimen is advanced by a screw. The thickness is indicated on a divided disc. For use with an ordinary razor. Without knife	18
149	**Section cutter** for Nos. 147 and 148. Large razor with straight edge and handle	5

No.		*Mark*
150	Compressorium after Schacht; in case	18
151	Compressorium of more simple construction. Pressure regulated by means of a sliding jacket containing the cover-glass (English Live-box)	5
152	Anatomical Case, in leather, containing scalpel, steel forceps with sliding grip, curved scissors and needle holder . . .	9.50
153	The same, with two extra holders to take two round and two lancet-shaped needles, and also a finer pair of forceps . .	13.50
154	Steel forceps with fine smooth points	1.20
155	Steel forceps with roughed points and sliding grip	2.50
156	Brass forceps, according to size	0.60 –1.20
157	Scalpel	1.20
158	Anatomical Scissors; a) straight	2
	b) curved	2.50
159	Holder with two round needles	1.50
160	Holder with two lancet-shaped needles	1.50
161	Needle fixed in handle; a) straight	0.60
	b) curved	1
	c) lancet-shaped	1
162	Turn-table, on wood base, for making varnish rings on slides	9

Slips and Covers.

No.		Mark
	Slips of the Giessen pattern 28 × 48 Mm.:	
		
163	a) white crown-glass with ground edges, per 100	4
	b) „ „ with unground edges, per 100	2.50
	c) best white plate-glass with ground edges, per 100 . . .	6
	Slips of the English pattern 76 × 26 Mm.:	
		
164	a) white crown-glass with ground edges, per 100	5
	b) „ „ with unground edges	3
	c) best white plate-glass with ground edges, per 100 . . .	7.50

No.		Mark
	Slips of extra large size 87 × 37 Mm.:	
		
165	a) white crown-glass with ground edges, per 100	6
	b) „ „ with unground edges, per 100	3.50
	c) best white plate-glass with ground edges, per 100 . . .	9
166	Hollow Slips:	
	a) small pattern, 55 × 32 Mm., of best make and finish, ground edges . . . . . each	1
	b) extra large, 87 × 37 Mm., of best make and finish, edges ground and polished, 5 Mm. thick . . . . . each	2
167	Slips with cemented glass rings, for moist chambers 1 or 2 Mm. deep . . . . . each	0.80
168	Covers, square:	

size:	24	21	18	15	12 Mm. □
per 100 Mk.	4.70	3.60	2.70	1.80	1.—

169 Covers, round:

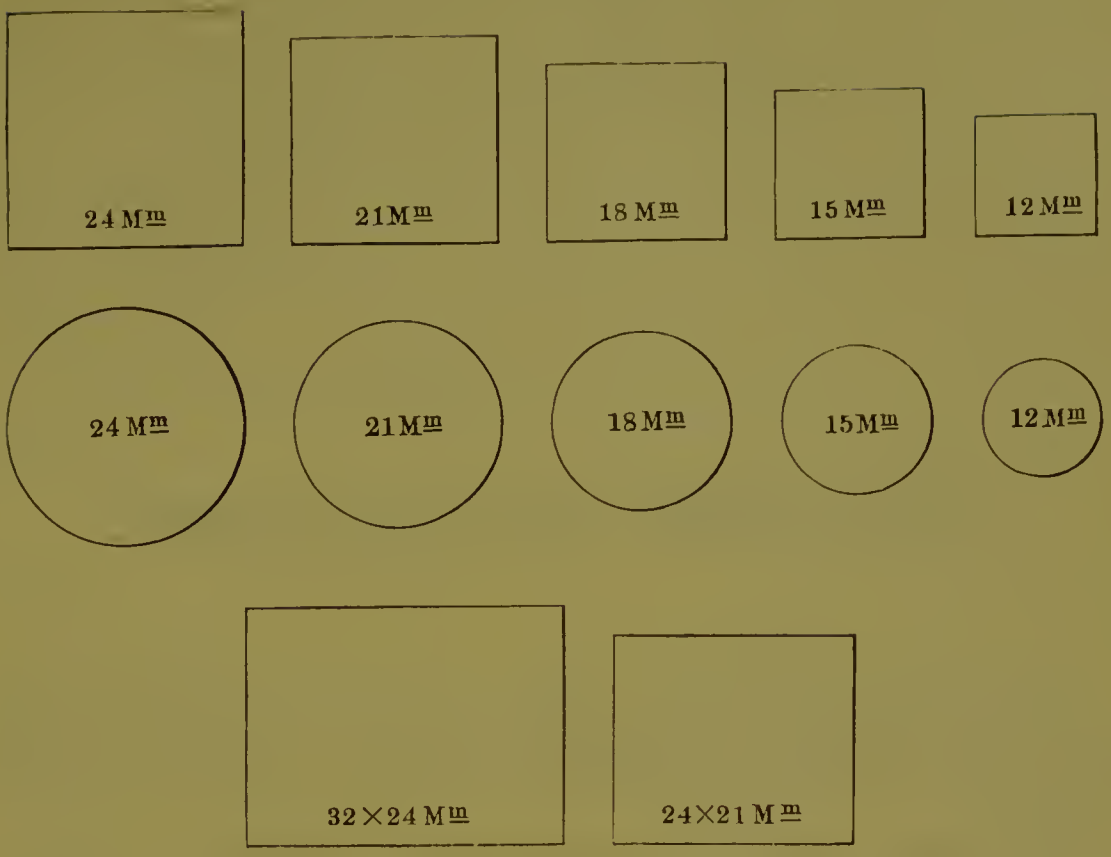
size:	24	21	18	15	12 Mm. diameter
per 100 Mk.	6.90	5.50	4,20	3.00	1.50

170 Covers, oblong:

size:	32 × 24 Mm.	and	24 × 21 Mm.
per 100 Mk.	6.00		4.50

The thickness of the above covers varies between 0.15 and 0.22 Mm.; one third more must be added to the above prices for covers of given thickness.

The annexed figures show the sizes of the covers.



Complete Microscopes.

For the convenience of the purchaser we have put together the following series of suitable and practical combinations with the total price appended.

In ordering either of these sets it will be sufficient to quote the number and price.

A. Optical Outfit of a complete Microscopical Laboratory.

1) Microscope:

Stand I with double and triple Condenser . . . . . Mk. 325.—

Mahogany Case veneered in Walnut with two handles, polished nickel-plated corners and name-plate with engraving, extra . . . . . Mk. 60.—

Portable Leather Case for the above „ 20.—

Glass shade for the work-table . . „ 10.— „ 90.—

Objectives:

a*, aa, AA, BB, DD, F with corr.
40.— 27.— 30.— 42.— 54.— 104.— „ 297.—

H with corr. **K, L** (Water immers.)
130.— 200.— 270.— . . . . „ 600.—

$\frac{1}{12}$, $\frac{1}{18}$ (Homog. immersion)
320.— 400.— . . . . . „ 720.— „ 1617.—

Carried forward Mk. 2032.—

	Brought forward Mk. 2032.—		
Eye-pieces 1—5	à 7.— Mk. 35.—		
Orthoscopic Eye-piece 3, 4, 5 .	à 15.— „ 45.—		
Micrometer Eye-piece No. 57 (3) . . .	„ 15.—		
Goniometer Eye-piece No. 59	„ 30.—	Mk. 125.—	
Stage Screw-Micrometer No. 49 . . .		„ 120.—	
Eye-piece Screw-Micrometer No. 50 .		„ 60.—	
Stage Micrometer No. 51		„ 10.—	
Eye-piece Micrometer No. 52		„ 5.—	
Cross-line Micrometer No. 53		„ 5.—	
Camera No. 69		„ 30.—	
Polarising Apparatus No. 94 (Divided circle of the Goniometer Eye-piece) .		„ 44.—	
Series of Selenite and Mica films No. 98		„ 10.—	
Nose-piece No. 104		„ 27.—	Mk. 2468.—
In separate Cases:			
Apparatus for counting blood-corpuscles No. 55		„ 30.—	
Cover-glass Tester No. 60		„ 36.—	
Rules on Plate-glass Nos. 63 and 65 . .		„ 10.50	
Divided Circle on Plate-glass No. 67 . .		„ 5.—	
Condensing Lens No. 85		„ 50.—	
Microscope Lamp No. 88		„ 35.—	
Spectroscopic Eye-piece No. 89		„ 165.—	
Stereoscopic Eye-piece No. 102		„ 150.—	
Apertometer No. 107		„ 60.—	
Test Plate after ABBE No. 109		„ 7.—	„ 548.50

Apparatus for Mounting.

Dissecting Microscope:			
Dissecting stand I		„ 100.—	
Dissecting series No. 124		„ 30.—	
Aplanatic Lenses Nos. 127, × 6 and 10 . . . . . à 15.—		„ 30.—	
Arrangement for using the Camera lucida No. 69 with No. 127 for low magnification		„ 8.—	„ 168.—
Lens Holder I		„ 25.—	
with BRÜCKE's Lenses Nos. 131 and 132		„ 41.—	„ 66.—
Microtome No. 144 with Apparatus for Freezing No. 145		„ 125.—	
Extra knife for ditto		„ 7.50	„ 132.50
Hand Microtome No. 148 with knife No. 149			„ 23.—
Anatomical Case No. 153			„ 13.50
Turn-table No. 162			„ 9.— Mk. 3428 50

2) Microscope:

Stand I^a with mechanical stage . . .		Mk. 340.—	
Best make mahogany case,			
Engraved name plate	Mk. 5.—		
Metal corners	„ 10.—		
Leather case for travelling . . .	„ 15.—		
Glass shade	„ 10.—		
		„ 40.—	
Objectives:			
a_1, a_3, AA, DD, F			
12.— 12.— 30.— 54.— 84.—	„ 192.—		
J with corr., **K** (Water immersion)			
164.— 200.—	„ 364.—		
$\frac{1}{12}$, $\frac{1}{18}$ (homog. immersion)			
320.— 400.—	„ 720.—		
		„ 1276.—	
Eye-pieces 1, 2, 4, 5 . . . . à 7 —	„ 28 —		
Micrometer Eye-piece No. 57 (3). . . .	„ 15.—		
		„ 43.—	
Stage Micrometer No. 51		„ 10.—	
Camera lucida No. 69		„ 30.—	
Spectroscopic Eye-piece No. 89		„ 165.—	
Polarising Apparatus No. 96		„ 46.—	
Series of Selenite and Mica films No. 98		„ 10.—	
Nose-piece No. 105		„ 20.—	
Apertometer No. 107		„ 60.—	
Test Plate No. 109		„ 7.—	
			Mk. 2047.—

Apparatus for Mounting.

Dissecting Microscope:			
Dissecting stand II		Mk. 75.—	
Dissecting series No. 124		„ 30.—	
Aplanatic Lens No. 127, $\times$ 6 . .		„ 15.—	
Arrangement for using the Camera No. 69 for low magnification		„ 8.—	
			„ 128.—
Lens Holder I		„ 25.—	
with Brücke's Lens No. 131 . . .		„ 11.—	
			„ 36.—
Microtome No. 147		„ 40.—	
Extra knife No. 149		„ 5.—	
			„ 45.—
Compressorium No. 150			„ 18.—
Turn-table No. 162			„ 9.—
Cover-glass Tester No. 61			„ 12.—
			Mk. 2295.—

3) Microscope:

Stand IV, I		Mk. 205.—	
Objectives:			
a_2, A, C, E			
12.— 24.— 36.— 66.— . .	„ 138.—		
J with corr. (Water immersion)	„ 164.—		
$1/12$, $1/18$ (homog. immersion)			
320.— 400.—	„ 720.—	„ 1022.—	
Eye-pieces 2, 4, 5 . . . . . à 7.—	Mk. 21.—		
Micrometer Eye-piece No. 57 (3) . . .	„ 15.—	„ 36.—	
Camera lucida No. 71		„ 21.—	
Spectroscopic Eye-piece No. 90 . . .		„ 72.—	
Polarising Apparatus No. 97		„ 31.—	
Reversing Prism No. 103		„ 18.—	
Nose-piece No. 105		„ 20.—	
Apertometer No. 107		„ 60.—	
Test Plate No. 109		„ 7.—	Mk. 1492.—

Apparatus for Mounting.

Dissecting Microscope:			
Dissecting stand IV, b		„ 21.—	
Doublets No. 128 b and c			
6.— 9.— . . .		„ 15.—	
Lens No. 129		„ 6.—	„ 42.—
Lens Holder II		„ 12.—	
Brücke's Dissecting Lens No. 131 .		„ 11.—	„ 23.—
Hand Microtome No. 148		„ 18.—	
with knife No. 149		„ 5.—	„ 23.— Mk. 1580.—

B. Larger Microscopes

with sufficient outfit for most scientific purposes and especially for the investigation of Bacteria.

1) Microscope:

Stand I[a] with mechanical stage		Mk. 340.—	
Objectives a*, AA, DD, F			
40.— 30.— 54.— 84.—	Mk. 208.—		
J with corr. (Water immersion)	,, 164.—		
1/12, 1/18 (homog. immersion)			
320.— 400.—	,, 720.—	,, 1092.—	
Eye-pieces 2, 4, 5 . . . . . à 7.—	,, 21.—		
Micrometer Eye-piece No. 57 (3) . . .	,, 15.—	,, 36.—	
Nose-piece No. 104		,, 27.—	
Camera lucida No. 69		,, 30.—	
Stage Micrometer No. 51		,, 10.—	Mk. 1535.—

2) Microscope:

Stand I[a]		Mk. 250.—	
Objectives a*, AA, DD			
40.— 30.— 54.—	Mk. 124.—		
J with corr., K (Water immersion)			
164.— 200.—	,, 364.—		
1/18 (homog. immersion)	,, 400.—	,, 888.—	
Eye-pieces 2, 4, 5 . . . . . à 7.—	,, 21.—		
Micrometer Eye-piece No. 57 (3)	,, 15.—	,, 36.—	
Camera lucida No. 69		,, 30.—	
Nose-piece No. 104		,, 27.—	Mk. 1231.—

3) Microscope:

Stand I		Mk. 300.—	
Objectives A, D, F			
24.— 42.— 84.—	Mk. 150.—		
1/12 1/18 (homog. immersion)			
320.— 400.—	,, 720.—	,, 870.—	
Eye-pieces 1, 2, 4, 5 . . . . . à 7.—	,, 28.—		
Micrometer Eye-piece No. 57 (3)	,, 15.—	,, 43.—	
Camera lucida No. 69		,, 30.—	
Nose-piece No. 105		,, 20.—	Mk. 1263.—

4) Microscope:

Stand I[a]		Mk. 250.—	
Objectives A, C, E			
24.— 36.— 66.—	Mk. 126.—		
J (Water immersion)	„ 144.—		
1/12 (homog. immersion)	„ 320.—	„ 590.—	
Eye-pieces 1, 2, 4 à 7.—	„ 21.—		
Micrometer Eye-piece No. 57 (3)	„ 15.—	„ 36.—	
Camera lucida No. 69		„ 30.—	
Nose-piece No. 105		„ 20.—	Mk. 926.—

5) Microscope:

Stand I[a]		Mk. 250.—	
Objectives AA, DD			
30.— 54.—	Mk. 84.—		
1/12 (homog. immersion)	„ 320.—	„ 404.—	
Eye-pieces 2, 4, 5 à 7.—		„ 21.—	
Eye-piece Micrometer No. 52		„ 5.—	
Camera lucida No. 71		„ 21.—	
Nose-piece No. 105		„ 20.—	Mk. 721.—

6) Microscope:

Stand IV, 1		Mk 205.—	
Objectives a_2, A, D, F			
12.— 24.— 42.— 84.—	Mk. 162.—		
J with corr. (Water immersion)	„ 164.—		
1/12, 1/18 (homog. immersion)			
320.— 400.—	„ 720.—	„ 1046.—	
Eye-pieces 2, 4 à 7.—	„ 14.—		
Micrometer Eye-piece No. 57 (3)	„ 15.—	„ 29.—	
Camera lucida No. 69		„ 30.—	
Nose-piece No. 104		„ 27.—	Mk. 1337.—

7) Microscope:

Stand IV, 1		Mk. 205.—	
Objectives A, D, F			
24.— 42.— 84.—	Mk. 150.—		
1/12, 1/18 (homog. immersion)			
320.— 400.—	„ 720.—	„ 870.—	
Eye-pieces 2, 4 à 7.—	„ 14.—		
Micrometer Eye-piece No. 57 (3)	„ 15.—	„ 29.—	
Camera lucida No. 71		„ 21.—	
Nose-piece No. 105		„ 20.—	Mk. 1145.—

8) Microscope:

Stand IV, 3		Mk. 175.—	
Objectives A, C, E			
24.— 36.— 66.—	Mk. 126.—		
1/12 (homog. immersion) . .	„ 320.—	„ 446.—	
Eye-pieces 2, 4 . . . . . à 7.—		„ 14.—	
Eye-piece Micrometer No. 52		„ 5.—	
Nose-piece No. 105		„ 20.—	Mk. 660.—

9) Microscope:

Stand IV, 3		Mk. 175.—	
Objectives AA, DD			
30.— 54.—	Mk. 84.—		
1/12 (homog. immersion) . .	„ 320.—	„ 404.—	
Eye-pieces 2, 4, 5 . . . . . à 7.—		„ 21.—	
Nose-piece No. 105		„ 20.—	Mk. 620.—

10) Microscope:

Stand IV, 3		Mk. 175.—	
Objectives A, D			
24.— 42.—	Mk. 66.—		
1/12 (homog. immersion) . .	„ 320.—	„ 386.—	
Eye-pieces 2, 4 . . . . . à 7.—		„ 14.—	
Nose-piece No. 105		„ 20.—	Mk. 595.—

11) Microscope:

Stand Va, 3		Mk. 120.—	
Objectives A, D, F			
24.— 42.— 84.—	Mk. 150.—		
1/12 (homog. immersion) . .	„ 320.—	„ 470.—	
Eye-pieces 2, 4 . . . . . à 7.—		„ 14.—	
Nose-piece No. 105		„ 20.—	Mk. 624.—

12) Microscope:

Stand Va, 3		Mk. 120.—	
Objectives A, DD			
24.— 54.—	Mk. 78.—		
1/12 (homog. immersion) . .	„ 320.—	„ 398.—	
Eye-pieces 2, 4, 5 . . . . . à 7.—		„ 21.—	
Nose-piece No. 105		„ 20.—	Mk. 559.—

13) Microscope:

Stand Va, 3		Mk. 120.—	
Objectives A, D			
24.— 42.—	Mk. 66.—		
1/12 (homog. immersion) . .	„ 320.—	„ 386.—	
Eye-piece 3		„ 7.—	Mk. 513.—

14) Microscope:

Stand VII[a] with Condenser No. 83 . . .		Mk. 70.—	
Objectives A, D			
24.— 42.—	Mk. 66.—		
J (Water immersion)	„ 144.—	„ 210.—	
Eye-pieces 2, 4 . . . . . à 7.—		„ 14.—	Mk. 294.—

C. Medium Microscopes
for Laboratory and other purposes.

15) Microscope:

Stand V[a], 2		Mk. 95.—	
Objectives A, D, F			
24.— 42.— 84.—		„ 150.—	
Eye-pieces 2, 4 . . . . . à 7.—		„ 14.—	
Eye-piece Micrometer No. 52		„ 5.—	
Camera lucida No. 69		„ 30.—	Mk. 294.—

16) Microscope:

Stand V[a], 2		Mk. 95.—	
Objectives AA, DD			
30.— 54.—		„ 84.—	
Eye-pieces 2, 4, 5 . . . . . à 7.—		„ 21.—	Mk. 200.—

17) Microscope:

Stand VII[a]		Mk. 60.—	
Objectives A, D, F			
24.— 42.— 84.—		„ 150.—	
Eye-pieces 2, 4 . . . . . à 7.—		„ 14.—	Mk. 224.—

18) Microscope:

Stand VII[a]		Mk. 60.—	
Objectives AA, DD			
30.— 54.—		„ 84.—	
Eye-pieces 2, 4, 5 . . . . . à 7.—		„ 21.—	Mk. 165.—

19) Microscope:

Stand VII[b]		Mk. 55.—	
Objectives A, D			
24.— 42.—		„ 66.—	
Eye-pieces 2, 4 . . . . . à 7.—		„ 14.—	Mk. 135.—

20) Microscope:

Stand VIII	Mk. 48.—	
Objectives A, D		
24.— 42.—	„ 66.—	
Eye-piece 3	„ 7.—	Mk. 121.—

21) Microscope:

Stand IX	Mk. 40.—	
Objectives A, C		
24.— 36.—	„ 60.—	
Eye-pieces 2, 4 . . . . . à 7.—	„ 14.—	Mk. 114.—

D. Small Microscopes

for Schools and Technical purposes.

22) Microscope:

Stand IX	Mk. 40.—	
Objectives a_2, A, D		
12.— 24.— 42.—	„ 78.—	
Eye-pieces 2, 4 . . . . . à 7.—	„ 14.—	Mk. 132.—

23) Microscope:

Stand IX	Mk. 40.—	
Objectives A, C		
24.— 36.—	„ 60.—	
Eye-piece 3	„ 7.—	Mk. 107.—

24) Microscope:

Stand IX	Mk. 40.—	
Objective C	„ 36.—	
Eye-pieces 1, 3	„ 14.—	Mk. 90.—

25) Microscope:

Stand X	Mk. 30.—	
Objectives A, C		
24.— 36.—	„ 60.—	
Eye-pieces 2, 4 . . . . . à 7.—	„ 14.—	Mk. 104.—

26) Microscope:

Stand X	Mk. 30.—	
Objective AA	„ 30.—	
Eye-pieces 2, 4 . . . . . à 7.—	„ 14.—	Mk. 74.—

27) Microscope:

Stand X		Mk. 30.—	
Objective A		„ 24.—	
Eye-piece 3		„ 7.—	Mk. 61.—

28) Hand Microscope:

Stand No 22		Mk. 15.—	
Objectives A, C			
24.— 36.—		„ 60.—	
Eye-piece 3		„ 7.—	Mk. 82.—

E. Microscopes for special purposes.

I. Travelling Microscopes.

29) Travelling Microscope:

Stand No. 21 (including Dissecting series No. 125, Nose-piece No. 106, Camera lucida No. 71, Scissors, Forceps, Knife, Glass rod, Glass tube)		Mk. 180.—	
Objectives A, D, F			
24.— 42.— 84.—	Mk. 150.—		
J (Water immersion)	„ 144.—	„ 294.—	
Eye-pieces 2, 4	à 7.—	„ 14.—	
Eye-piece Micrometer No. 52		„ 5.—	
Leather cover to protect the case		„ 10.—	Mk. 503.—

30) Travelling Microscope:

(Objectives, Eye-pieces and Camera are packed in a separate case, which also has room for mounting materials, slips and covers.)

Stand VI^a in very compact, light case		Mk. 65.—	
Objectives a_3, A, DD			
12.— 24.— 54.—	Mk. 90.—		
J (Water immersion)	„ 144.—	„ 234.—	
Eye-pieces 2, „ 5	à 7.—	„ 21.—	
Micrometer Eye-piece No. 57 (3)	„ 15	„ 36.—	
Camera lucida No. 71		„ 21.—	Mk. 356.—

II. Microscopes for mineralogical and petrographical study.

31) Mineralogical Microscope:

Stand No. 19		Mk. 320.—
Objectives a*, aa, C, DD, F with corr.		
40.— 27.— 36.— 54.— 104.— .	Mk. 261.—	
$\frac{1}{12}$ (homog. immersion) . .	„ 320.—	„ 581.—
Eye-pieces 1, 2, 4, 5 . . . . à 7.—	„ 28.—	
Micrometer Eye-piece No. 57 (3) . . .	„ 15.—	„ 43.—
Camera lucida No. 69		„ 30.— Mk. 974.—

32) Mineralogical Microscope:

Stand No. 19		Mk. 320.—
Objectives a*, aa, DD		
40.— 27.— 54.—	Mk. 121.—	
$\frac{1}{12}$ (homog. immersion) . .	„ 320.—	„ 441.—
Eye-piece 2, 4, 5 . . . . . à 7.—		„ 21.—
Eye-piece Micrometer No. 52		„ 5.— Mk. 787.—



JENA: PRINTED BY H. POHLE.

