CARL ZEISS

OPTISCHE WERKSTAETTE

JENA.

CATALOGUE

OF

PHOTO-MICROGRAPHIC APPARATUS.

5th Edition.

1903.

M. 79. VII. 03. 2500 a.

Besides this catalogue the following publications (in English, French, or German) may be had gratis on application:

Catalogue of ***Microscopes and Microscopic Accessories.***

Price List relating to our ***large Projection Apparatus.***

Prospectus relating to the ***Epidiascope.***

Prospectus relating to the ***Projection Microscope for the Epidiascope.***

Catalogue of ***Photographic Objectives and Photo-optical Auxiliary Appliances.***

Special List relating to ***Spectrometers and Refractometers,*** *as also*

Prospectus relating to ***Comparison Spectroscopes, Butter Refractometers and Immersion Refractometers.***

Catalogue of ***Zeiss Field-Glasses and portable Stereo-Telescopes.***

Catalogue of ***Binocular and Monocular Stand Telescopes.***

Prospectus relating to our ***Inter-ocular Distance Gauge.***

Prospectus relating to our ***Stereoscopic Telemeter.***

Catalogue of ***Astronomical Objectives and Astronomical Instruments.***

Catalogue of ***Astronomical Telescopes and Astronomical Auxiliary Appliances.***

Catalogue of ***Palmos Hand Cameras and Enlarging Apparatus.***

Any of the items specified in this catalogue will be supplied, either singly or in any desired combination, at the prices quoted. — The price of a complete set is in all cases obtained by adding together the prices of the several components.

Our **quotations** are strictly net cash, without any deduction whatever, and do not include cost of packing and carriage from Jena. Payment may be made by Cash, Cheques, or short negotiable English, French or German Bills of Exchange. **On receipt of payment, as stipulated, the consignment of goods in Jena is held to constitute delivery and our liability ceases.**

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Goods are forwarded, value declared, at the risk and cost of the consignee. In the absence of special instructions, orders received from abroad are despatched by the most convenient route, with every precaution as to safety and prompt delivery.

We request that the name and address may be plainly written on all orders and, to avoid misunderstanding, that the number, or year of publication, of this edition of our catalogue be quoted.

In telegraphic orders it is sufficient to quote the code-words; if several specimens of the same apparatus are required, it is advisable to indicate the quantity desired in words, instead of in figures.

Jena, 1903.

Carl Zeiss,
Optische Werkstaette.

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No.	Description	Price Marks	Code-word
	Projection Tables and Optical Benches.		
601	**Projection Table.** Table top 135 × 50 cm (54 × 20 in.), with optical bench 1 m long, on massive cast-iron stand	100.—	Diabao
602	**Table top** separately, incl. optical bench, without the cast-iron stand (Fig. 2)	40.—	Diabelha
603	**Optical Bench.** Triangular prismatic rail 1 m long, to screw upon any ordinary table	20.—	Diabeticos
604	**Optical Bench,** similar to the preceding, 1 m long, to connect with the sole-plate of the horizontal and vertical camera	20.—	Diableando
605	**The same,** but only ¾ m long, to connect with the sole-plate of the horizontal and vertical camera (Fig. 15)	20.—	Diables
606	**Sole-plate** for the microscope, with levelling screws and slides	26.—	Diablillos
	This facilitates the rapid withdrawal of the microscope from the optical axis and its immediate restoration. The elevation is calculated so that the optical axis of our larger stands, when horizontal, lies about 225 mm above the level of the projection table (Fig. 1).		
607	**Elevating Gear** for the sole-plate	15.—	Diablon
	This is requisite whenever stands of low construction are to be used in the horizontal position, or stands of any given height standing vertical. In the latter case there is required in addition an		
608	**Illuminating Mirror** in mount, to attach to the sole-plate by means of a ball and socket joint . . .	6.—	Diaboli
609	**Light-excluding Appliance,** recommended, whenever lime-light or arc-light is used, to prevent the disturbance caused by extraneous light penetrating into the working area	30.—	Diabolique

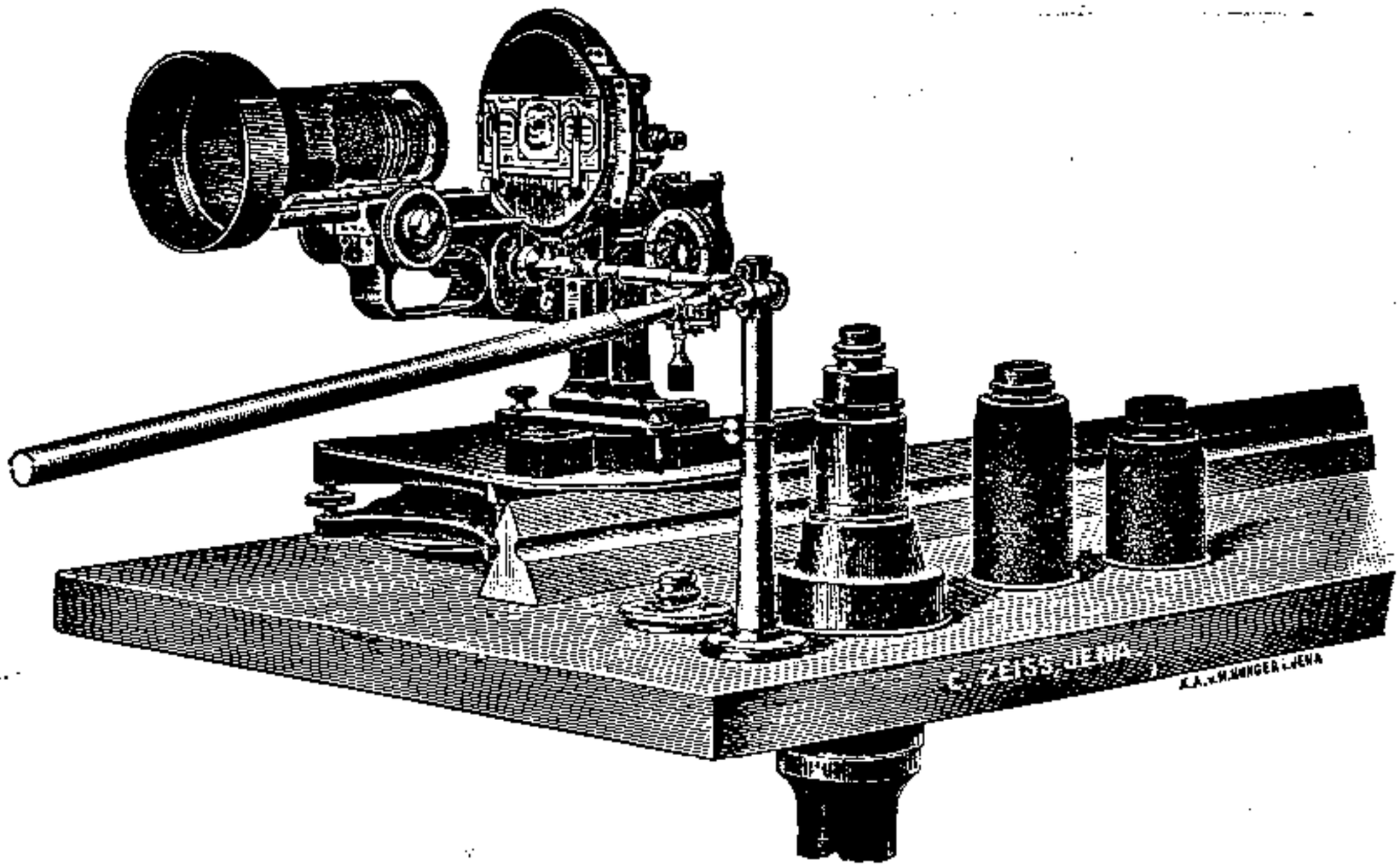


Fig. 1.
Front of Projection Table with optical bench.
Stand Ic on sole-plate, with appliance for focusing from a distance.
($^1/_6$ full size.)

The **stand** is horizontal; the lower plate, with the thread for the objective screw, is removed from the tube and appears lying on the projection table, bearing the **20 mm** Planar. The upper plate with the draw-tube is also removed, its place being occupied by the **light excluding conical adapter** which is supplied with each Stand **Ic**. This adapter serves to screw in the low-power objectives with long focal distances which are employed without eye-pieces. The **100 mm** Planar **is seen** attached to the adapter through the break in the tube as shown in the drawing. A second adapter, fitted with an intermediate collar by which the **35 mm** Planar is screwed in, stands on the table.

The **appliance for focusing from a distance** is connected with the milled head of the micrometer screw by means of a bell-shaped cap. It is supported by a pin attached to a column, the latter screwed fast to the projection table. The focusing is effected from the ground-glass screen by means of a removable light wooden rod.

The stand is secured to the **sole-plate** by a crosspiece, which is fastened down by screws. A projecting cleat, not seen in the illustration, ensures the correct position of the microscope. The sole-plate rests upon a rigid support with two levelling screws, one of which is visible on the left. The entire upper platform bearing the microscope can be moved by slides at right angles to the optical axis, so that the microscope can be removed from the optical axis and restored without loss of time.

No.	Description	Price Marks	Code-word

Sources of Light.

Electrical Arc-Light.

The lamps are enclosed in well ventilated casings and are fitted with set-screws for the exact adjustment of the crater within the optical axis. The screw heads being outside the body, they are conveniently accessible. The medium elevation of the crater above the level of the table is 225 mm. The lamps are fitted with connecting terminals for the cable, but not with switches; the latter are supplied separately as ordered (see Nos. 613—616).

Projection Lamps for Continuous Current.

610	**Automatic-regulator Lamp,** made by the Elektrizitäts-Aktiengesellschaft, formerly SCHUCKERT & Co., Nürnberg; adjusted for a current of **20** amperes	185.—	Diabolos
611	**Automatic-regulator Lamp,** made by the Elektrizitäts-Aktiengesellschaft, formerly SCHUCKERT & Co., Nürnberg; adjusted for a current of **30** amperes	275.—	Diabrinha
	Hand-feed Lamp see No. 612.		

Projection Lamp for Alternating Current.

To prevent the vibration — so frequently occurring with lamps of this description — being communicated to the microscope, to the possible prejudice of its adjustment, it is best to place the lamp on a separate table, clear of the projection table, which would require shortening accordingly.

612	**Hand-feed Lamp,** made by KÖRTING and MATHIESEN, Leutzsch-Leipzig; adjusted for a current of from **20** to **50** amperes; also adapted for continuous current	215.—	Diabrura

Box Switches.

All the contacts of these switches by which current is transmitted are enclosed. They may be

No.	Description	Price Marks	Code-word
	attached to the projection table, or fastened to the wall within easy reach of the apparatus.		
	Box Switches adjusted for a maximum output		
613	of 20 amperes and 125 volts	6.—	Diacalpe
614	of 20 amperes and 250 volts, or of 40 amperes and 125 volts	7.50	Diacasse
615	of 40 amperes and 250 volts, or of 60 amperes and 125 volts	12.50	Diacetine
616	of 60 amperes and 250 volts	22.50	Diachilone
	Regulating Resistances for a main circuit of 65 volts. The current can also be cut off by the regulating lever.		
617	**Resistance Coil** for a current of 20 amperes . . .	45.—	Diachrista
618	„ „ „ „ „ „ 30 „ . . .	78.—	Diachyme
	for a main circuit of 110 volts. The current can also be cut off by the regulating lever.		
619	**Resistance Coil** for a current of 20 amperes . . .	78.—	Diacidonio
620	„ „ „ „ „ „ 30 „ . . .	88.—	Diacimino
	for a main circuit of 220 volts. The current cannot be cut off by the lever, and therefore a special switch is indispensable.		
621	**Resistance Coil** for a current of 20 amperes . . .	168.—	Diacodion
622	„ „ „ „ „ „ 30 „ . . .	168.—	Diaconato
	Cables, Lugs, Gauges (Voltmeters and Amperemeters), also **Transformers** (recommended for alternating currents of 110 Volts and upwards), adapted to the available electrical supply, are obtained from the best sources and supplied to our customers at makers' prices.		
	Limelight.		
623	**Limelight-Lamp** in casing, to place on projection table	52.—	Diaconie

No.	Description	*Price Marks*	*Code-word*
624	**Lime Cylinders,** each fused into a glass tube, per dozen	6.—	**Diacono**
625	**Steel Cylinders** for 1200 litres of gas, empty . .	36.—	**Diacopos**
626	**Pressure-reducing Valve,** to decrease the pressure of the outflowing gas and thus prevent the forcing off of the rubber tubes, which might otherwise easily occur	35.—	**Diacrea**
627	**Pressure-reducing Valve with gauge,** to determine approximately the quantity of gas remaining in the cylinder	45.—	**Diacrisis**
	Charging a cylinder with **1200 litres of Oxygen** . .	9.60	**Diadeem**
	„ „ „ „ **1200 litres of Hydrogen** .	9.60	**Diadele**
	WELSBACH Incandescent Gas Light.		
628	**Incandescent Gas Lamp,** burner adjustable in elevation and laterally, secured by a clamp, with 2 spare mantles, on round **foot**	15.—	**Diadelfo**
629	**Incandescent Gas Lamp,** same as preceding, but mounted on saddle-stand to fit on optical bench (Fig. 15)	18.—	**Diademas**
630	**Two-fold Metal-plate Screen,** to protect the microscope and camera, when in the vertical position, from the heat of the lamp	8.—	**Diadoco**
	Petroleum Light.		
631	**Lamp** with flat duplex burner, HINKS' patent . . .	9.50	**Diadrom**
	Illuminating Appliances.		
	For Sunlight.		
632	**Heliostat** by R. FUESS, adjusted for the polar altitude of the locality where it is to be used (which should be stated when ordering), at maker's catalogue price	280.—	**Diaet**
633	**Plane Mirror,** with coarse and fine adjustment, mounted on saddle-stand, designed to direct the light coming from the heliostat upon the axis of the microscope and to compensate slight irregularities in the movement of the mechanism of the heliostat	60.—	**Diaeteta**

No.	Description	*Price Marks*	*Code-word*
634	**Collective Lens** of 70 cm focus and 8 cm diameter, mounted on saddle-stand, to project an image of the sun upon the plane of the diaphragm of the condenser	20.—	**Diactis**

For electrical Arc-Light and Lime-Light.

With sources of light possessing but a small lighting surface the use of a condenser combination of fairly large aperture is recommended. This is in two parts, one composed of two lenses, the other of a single plano-convex lens.

The **double-lens** should be placed at a certain distance from the lamp, the exact point being denoted by a small screw on the projection table. It will there convert the rays of light reflected by the elementary planes of the source of light into practically parallel pencils. These continue their course as if they originated from a very distant source of light whose apparent size is approximately determined by the focal length of the double lens and the extent of the illuminating surface (i. e., of the crater of the arc-light or the incandescent surface of the lime cylinders).

The **single lens,** no matter what its position on the optical bench may be, always combines these rays in the vicinity of its focal point, i. e., where it would form an image of distant objects.

With due regard to the **requirements** for the projection of diapositives, we supply these lenses in three different sizes. The smallest (intended for diapositives **8,5 cm : 10 cm**) is best adapted for photo-micrographic purposes, for which the second is equally serviceable, but it is only essential when the apparatus is also intended for the projection of diapositives **9 cm : 12 cm.** (Fig. 2.) The third size is less suitable for photo-micrography. (See No. 426 in the "Price List relating to the large Projection Apparatus".

No.	Description	*Price Marks*	*Code-word*
635	**Condenser Combination, size I,** diameter 14 cm	**95.—**	**Diafanlta**
	This is composed of:		
635a	the **double-lens,** on saddle-stand	**55.—**	**Diagalves**
635b	the **single-lens,** on saddle-stand	**40.—**	**Diaglyph**
636	**Condenser combination, size II,** diameter 17 cm	**125.—**	**Diagnose**
	This is composed of		
636a	the **double-lens,** on saddle-stand	**75.—**	**Diagnostic**
636b	the **single-lens,** on saddle-stand	**50.—**	**Diagonaal**
637	**Concave Lens** of 30 mm diameter, on saddle-stand	**15.—**	**Diagondas**
	This lens serves in conjunction with the condensing lenses to produce an image of the crater, sufficiently large to cover the full aperture of our microscope condensers.		
	For centring the light with perfect ease and for shutting off superfluous light — with either sunlight, or arc-light or lime-light — we recommend our		
638	**Iris-Diaphragm,** having a total aperture of 10 cm, mounted on saddle-stand, fitted with spring-clips, and provided with ground-glass plate for "indirect illumination". (See also No. 705)	**30.—**	**Diagrafia**
	For Lamp-Light.		
	For use with broader sources of light we recommend our collective lens (with iris-diaphragm) of about 6 cm diameter. Its object is to produce an image of the source of light near the diaphragm of the condenser and to prevent thereby the inequalities of the illuminating surface being reproduced in the objective plane and on the photographic plate. The iris-diaphragm serves to define the limits of the illuminated field of view. The lens is supplied mounted on a saddle stand or on a round foot.		
639	**Collective Lens with iris-diaphragm, on saddle stand**	**30.—**	**Diagram**
640	**Collective Lens with iris-diaphragm, on round foot**	**30.—**	**Diagraph**

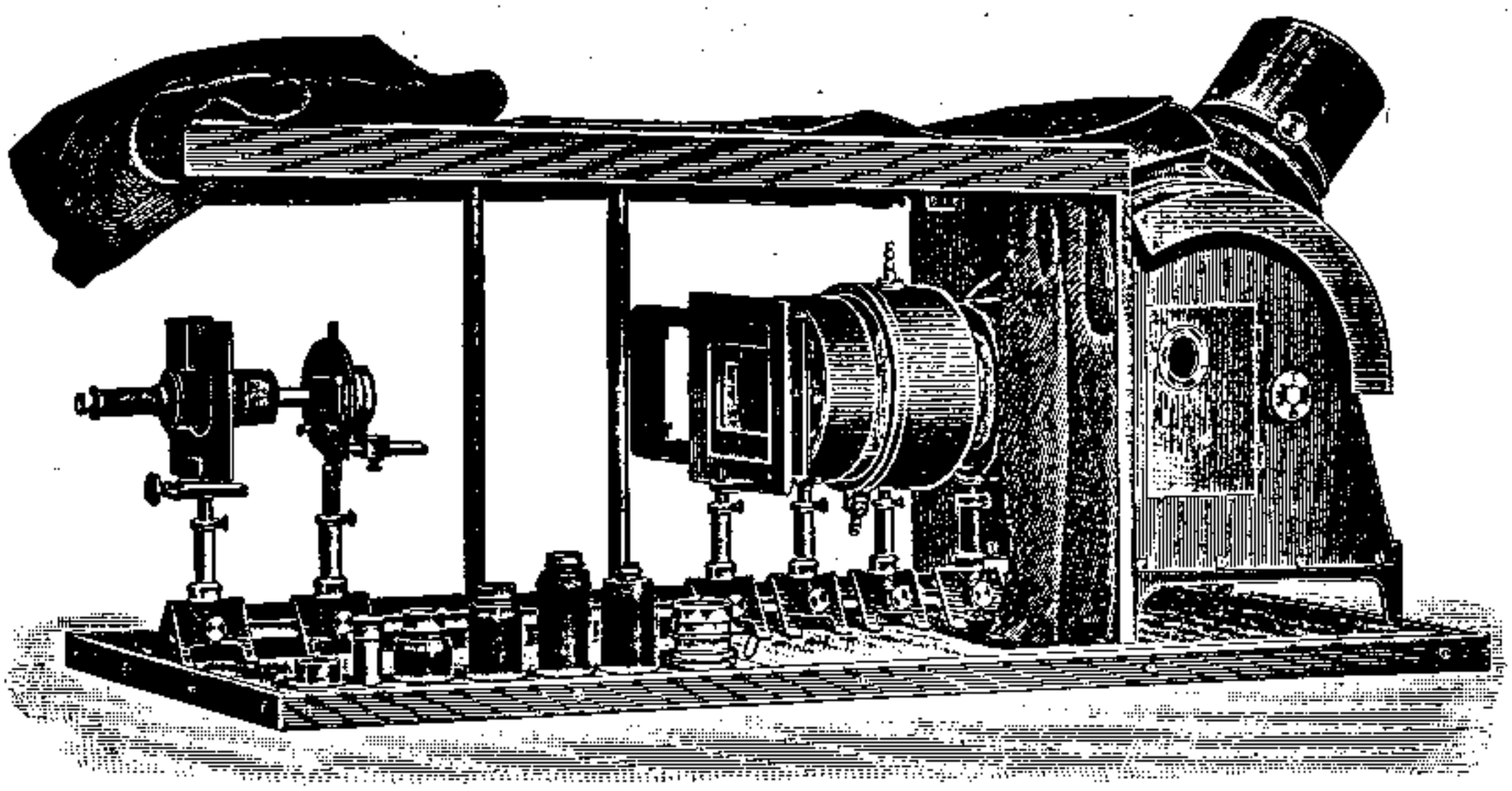


Fig. 2.

Table Top with Optical Bench, Dark Curtains, and Arc-lamp in casing.

($^1/_{10}$ full size.)

The **optical bench,** 1 m long, is screwed down upon the **table top.** Very accurately ground feet **(saddles)**, resembling the rafters of a roof, rest upon the bench; **these** are **movable** and can be **clamped down** by means of screws acting on **a groove** in the optical bench. The bottoms of the saddles are formed into **four small** feet, so **that** they may also stand securely on the top of an **ordinary** table. The **saddles** support hollow pillars which serve to receive the **stems bearing** the various appliances. The stems are maintained at the correct **elevation by means** of clamping screws. Latterly we have devised sets of **tubes of graduated** lengths, to slip over the stems, as an additional means of ensuring **the** correct position. Of the auxiliary appliances shown **in** the illustration only the **double-lens condenser,** the **water chamber** and the **single-lens condenser** are in question as regards photo-micrography, all the other appliances being **required** solely for projection purposes.

The **light-excluding appliance** consists of a wooden top, **fitted on three** sides with **black** cloth **curtains** and resting at the side nearest the **lamp on** a stiffened **metal plate, the** other end being supported by iron **rods.** The curtains **are seen in the figure,** partly turned up on the top, partly **drawn** back.

The **body of the lamp** shows the **door** with a **dark-glass window** and on its **right the** set-screw for the lateral adjustment of the crater; the screw for the vertical adjustment of the carbons is situated at the back and is therefore not visible.

No.	Description	*Price Marks*	*Code-word*

Absorption Vessels.

For absorbing the long waves of the so-called "heat rays", with sunlight, arc or lime-light, water chambers are required, which are best placed in the direct path of the rays between the double and single components of the condenser combination. These chambers consist of short cylindrical metal cells closed at both ends by plate-glass disks. A tube, with tap, is fitted near the bottom to facilitate connection with the domestic water supply. At the suggestion of Professor BLOCHMANN we have lately adopted an additional rectangular fitting transversely across the top of the chamber which has a large opening covered, when not required, by a lid. The opening is sufficiently large to admit of a convenient removal of air bubbles from the plate-glass disks during use; it also facilitates the cleaning of the interior of the chamber without the necessity, formerly existing, of unscrewing the mounts of the glass disks. A tube, by which the heated water flows off as the cold from the house pipes enters from below, is attached to the side of the same fitting. We make the water chamber in three sizes, corresponding to the three sizes of the condenser lenses, of which only **sizes I** and **II** now come in question (the older form is still represented in Fig. 2).

641	**Water Chamber, size I,** diameter of clear opening 14 cm, on saddle-stand	50.—	Diakon
642	**Water Chamber, size II,** diameter of clear opening 17 cm, on saddle-stand	60.—	Diakris

When working with highly sensitive preparations, it may be advisable to use liquids possessing greater absorbing power for rays productive of long waves than water. Such a liquid is supplied by a 5 % solution, in water, of chloride of iron, this solution being slightly tinged green-yellow. For this purpose we recommend the

No.	Description	*Price Marks*	*Code-word*
643	**Glass Trough,** cemented by LEYBOLD's process, on saddle-stand	24.—	**Dialecte**
643a	**Glass Trough** only	9.—	**Dialectra**
	When it is desirable to employ rays of light from a certain area only of the spectrum, rendering the use of coloured absorption fluids (light-filters) necessary for their separation, a filter-carrier and two of the smaller troughs will be required.		
644	**Light-filter Carrier on saddle-stand,** with 2 troughs made by LEYBOLD's process (Fig. 15 and 16)	24.—	**Dialepidos**
645	**Light-filter Carrier,** similar to preceding, **on round foot**	24.—	**Dialibanon**
645a	Each **Trough** separately	5.—	**Dialima**
	Plates of coloured glass may also be used instead of liquids. These plates fit into the diaphragm-carrier of the illuminating apparatus (see Nos. 633—637).		

The Microscope and its Accessoires.

Objectives and Eye-pieces.

With regard to details of construction of microscope objectives and eye-pieces, see our Microscope Catalogue, 32nd edition, 1902, pp. 1—21.

Hints on the selection of objectives will be found on pp. 18 and 19 of this list.

Apochromatic Objectives *(see pp. 19 and 21).*

	Description		Price Marks	Code-word
	Equivalent Focus mm	Numerical Aperture		
Dry Series	16	0,30	80.—	**Dialisis**
	12	0,65	140.—	**Diallage**
	8	0,65	100.—	**Dialist**
	6	0,95	180.—	**Diallaggio**
	4	0,95	140.—	**Dialitica**
	3	0,95	160.—	**Dialiticos**
Water Immersion	2,5	1,25	250.—	**Dializaba**
Homog. Immersion	3	1,30	300.—	**Dializador**
	3	1,40	400.—	**Dializamos**
	2	1,30	300.—	**Dializando**
	2	1,40	400.—	**Dializaron**
	1,5	1,30	350.—	**Dializas**

The **4 mm** and **3 mm** objectives of the dry series, as also the **2,5 mm water** immersion objective, are supplied with correction collars.

The two objectives, **12 mm** and **6 mm** of the dry series are constructed exclusively for the 10-inch tube (tube-lenght 250 mm) and are only supplied to special order.

With each of our homogeneous immersion objectives we supply gratis one of the bottles designed by MACH, with a separate flask containing about 15 gr. Cedar-wood Oil.

Subsequent supplies as follows:

	Price:	Code-word
Bottle for Immersion Oil with glass cap and rod .	Mk. 1.—	**Dialling**
„ „ „ „ with metal cap and rod .	„ **1.50**	**Diallus**
Cedar-wood Oil, 15 gr. in plain flask	„ **0.75**	**Diallyle**

Achromatic Objectives *(see pp. 20, 22 and 23).*

	Designation	Equivalent Focus mm	Num. Aperture	Price in Marks without | with correction-collar	Code-word
Dry Series	a_1	39	—	12.—	**Dialogammo**
	a_2	37	—	12.—	**Dialogaron**
	a_3	28	—	12.—	**Dialogassi**
	aa	26	—	27.—	**Dialogato**
	A	15	—	24.—	**Dialogava**
	AA	17	0,30	30.—	**Dialoght**
	B	12	0,35	30.—	**Dialogical**
	C	7	0,40	36.—	**Dialogico**
	D	4,2	0,65	42.—	**Dialogismo**
	DD	4,3	0,85	54.—	**Dialogista**
				74.—	**Dialogos**
	E	2,8	0,90	66.—	**Dialogue**
				86.—	**Dialose**
	F	1,8	0,90	84.—	**Dialysant**
				104.—	**Dialytic**
Water Immersion	Pl Plankton-Searcher	25	0,11	20.—	**Diamant**
	D*	4,4	0,75	75.—	**Diamela**
	H	2,4	1,18	110.—	**Diametric**
				130.—	**Diamirton**
	J	1,8	1,18	144.—	**Diamond**
				164.—	**Diamoron**
Homog. Immersion	$\frac{1''}{12}$	1,8	1,30	160.—	**Diamyle**

With each of our homogeneous immersion objectives we supply gratis one of the bottles of MACH's design, with a separate flask containing about 15 gr. Cedar-wood Oil. (See also p. 11.)

Glass Cell for Objective Pl (Plankton-Searcher), Price: Marks **3.50.**

Code-word: **Diamylene.**

Objectives a_0 *and* a*, *not being well adapted for photo-micrographic purposes, are omitted from above list.*

All achromatic objectives are also supplied, if so desired, adjusted for the English 10-inch body (tube-length = 250 mm).

Projection Eye-pieces.

Projection eye-pieces are projection systems with a collective lens in the same mount. In external appearance they do not greatly differ from other eye-pieces and are fitted in the tube in the same way. They are primarily designed for use with apochromatic objectives and like the compensating eye-pieces are so adjusted as to possess a certain amount of chromatic difference of magnification (see Microscope Catalogue, p. 10). With regard to their use with achromatic objectives refer to p. 18 and 23.

As is the case with compensating eye-pieces, here also the designation indicates at the same time the eye-piece magnification.

The distance of the focusing screen from the upper edge of the tube may, with Projection Eye-piece **2**, be shortened to about 24 cm, or with Projection Eye-piece **4** to about 15 cm, but in other cases any desired distance may be adopted. The diameter of the image corresponding to a screen distance of 1 metre from the eye-piece cap is

with Projection Eye-piece **2** about 20 cm
" " " **4** " 30 "

Eye-piece No. and Magnification	**2**	**4**
Price Marks:	40.—	40.—
Code-word	**Dianaeasmo**	**Dianarios**

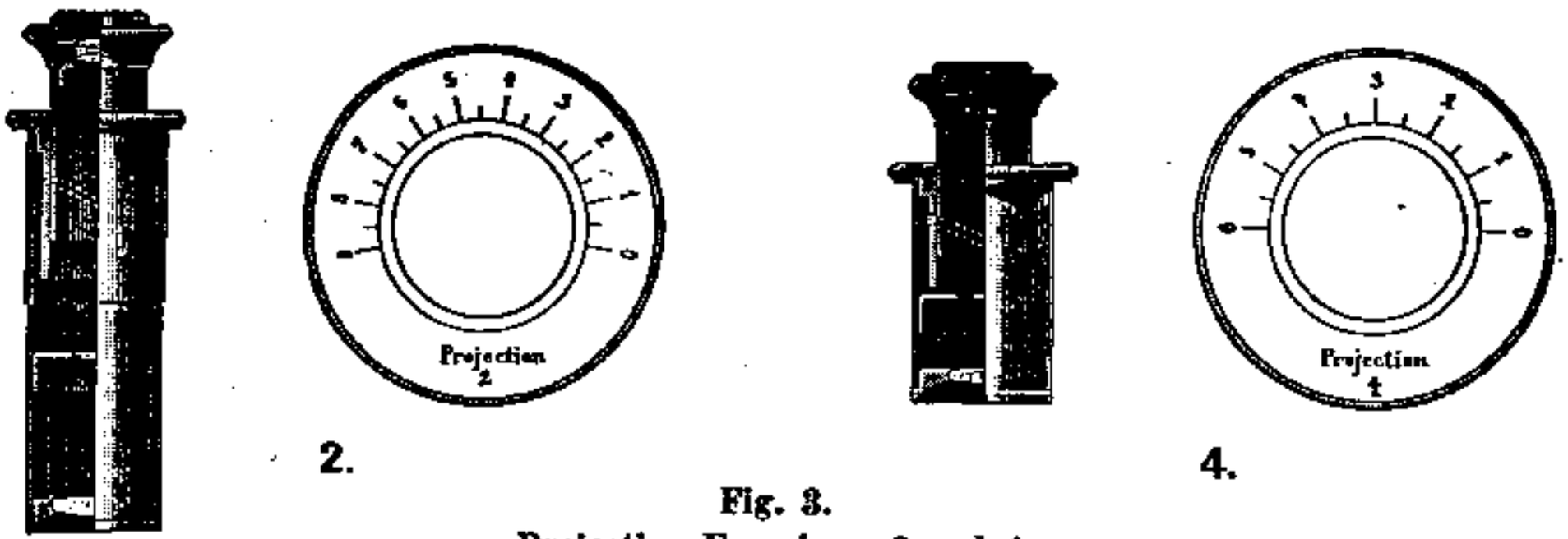
Tape Measure for focusing Projection Eye-pieces. Price: Marks **1.50.**
Code-word: **Dianarium.**

In conjunction with the divided scale on the projection eye-pieces the tape measure facilitates the correct adjustment of the projection systems for varying camera lengths. (Fig. 15.) (See „Zeitschr. für wiss. Mikrosk.", vol. XVIII, 1901, pp. 273—279.)

The tape measure is given gratis with complete sets, but should subsequently be ordered only for eye-pieces having the new form of divided scale, as shown in Fig. 3, and which are marked with a factory number.

Regarding PLAGGE's Micrometer-Projection-Eye-piece see under heading of Measuring Appliances, p. 42.

Projection Eye-pieces **2** and **4** are also supplied for the 10-inch tube; their descriptive numbers in this case will become **3** and **6** in accordance with their increased eye-piece magnification when used with a tube length of 250 mm. The prices remain the same.



2. 4.

Fig. 3.
Projection Eye-pieces 2 and 4.
($^1/_2$ full size.)

The illustrations show the eye-pieces in half-section. The lower is the collective lens; this, when the preparation is correctly focused, produces in combination with the objective an image of the object in the plane of the eye-piece diaphragm. The image is magnified by the triple projection combination in the head of the eye-piece and projected upon the ground-glass screen. A focusing appliance is fitted to the head of the eye-piece to facilitate correct adjustment of the projection system; the adjustment is read by the divided scale, the divisions of which indicate 0.5 mm.

An eye-piece cap is screwed in above the projection system to cut off any reflections that may originate in the interior of the tube. **Analyzer** No. 698 may be screwed in instead of the cap.

Compensating Eye-pieces. *(See pp. 18, 21 and 23.)*

	Searcher Eye-piece	Working Eye-pieces				
Eye-piece No. and Magnification:	2	4	6	8	12	18
Price Marks:	20.—	20.—	20.—	30.—	30.—	25.—
Code-word:	**Dianatic**	**Diander**	**Dianelle**	**Dianios**	**Dianous**	**Dianuco**

The compensating eye-pieces for the continental tube may also be used on the 10-inch tube, but in order to obtain correct eye-piece magnification for a tube-length of 250 mm it is necessary to multiply the figures engraved on the eye-pieces by 1,5.

In addition we supply the following **Eye-pieces for the 10-inch tube**

2e	Price Marks:	25.—	Code-word:	**Diapalme**
4e	„ „	25.—	„	**Diapasma**
8e	„ „	35.—	„	**Diapasones**

Huygenian Eye-Pieces. *(See pp. 18 and 22.)*

Eye-piece No.:	1	2	3	4	5
Price Marks:	7.—	7.—	7.—	7.—	7.—
Code-word:	**Diapering**	**Diaphano**	**Diapia**	**Diaplasi**	**Diapnoe**

When ordering eye-pieces for stands by other makers, it is necessary to send us an exact impression in sealing wax of the tube edge or, better still, to forward the tube in question to our works.

The eye-pieces with enlarged field of view are not specified here, because for photo-micrographic purposes only the central portion of the field is utilized.

Reversing Prisms

used in photographing horizontal objects with the microscope vertical while the camera is horizontal.

Small Reversing Prism in mount, to attach to eye-pieces and adapted for that purpose only; with fitting to establish light-tight connection with the camera.

Price: Mks. 20.—

Code-word: **Diaprassio**

Correction Lenses for large image distances.

These correction lenses are primarily designed for projection, but may, under certain conditions, be applied to photo-micrographic purposes also (see p. 18). They are plain concave lenses, so computed as to project to a

greater relative distance the actual image which the objective by itself would form in the neighbourhood of the upper edge of the tube. The sole object of the lens consists in correcting for the intermediate colours the deterioration of the spherical correction which invariably ensues upon the use of high-power objectives for long-distance projection without eye-pieces. The lenses are mounted in blackened funnel-shaped tubes; the widest end is fitted with the English screw thread for screwing into the body tube, the other end carries a narrower thread into which the objectives are screwed after removal from their own tube. These lenses are therefore adapted only for objectives whose mount proper can be unscrewed from the tubular portion.

While in the black tube, an objective must never be used in conjunction with an eye-piece.

We supply above-described correction lenses for the achromatic objectives **B**, **C**, **D**, and for **DD—J** when not corrected for cover-glass thickness, also for the homogeneous immersion objective $^1/_{12}$".

Price: Mks. 7.—

Code-word: **Diapruno**

When ordering, please state description of objective for which the correction lens is required.

Projection Lenses and Micro-Planars.

(See pp. 18, 20 and 24.)

These lenses are used without eye-pieces for taking photographs with low powers. Our projection lenses, as also the Micro-planars Nos. 1—3, have the English screw and may — with the exception of the **70 mm** objective, whose objective distance is too great — be used on ordinary stands, though in that case the narrowness of the tube would not admit of the full field being utilized. Micro-planars 4 and 5 can only be fitted to Stands **I**^{c} and **I**^{d} by means of the light-excluding Adapter No. 711 as supplied with those stands.

Designation	Focus mm	Ratio of Aperture	Price Marks	Code-word
Projection Lens	**35**	1 : 7	**35.—**	**Diaptose**
„ „	**70**	1 : 7	**40.—**	**Diaptosis**
Micro-Planar Ser. I[a], No. 1	**20**	1 : 4.5	**100.—**	**Diarchy**
„ Ser. I[a], No. 2	**35**	1 : 4.5	**100.—**	**Diarial**
„ Ser. I[a], No. 3	**50**	1 : 4.5	**100.—**	**Diarrena**
„ Ser. I[a], No. 4	**75**	1 : 4.5	**120.—**	**Diarthron**
„ Ser. I[a], No. 5	**100**	1 : 4.5	**120.—**	**Diary**

For further particulars regarding the Planars specified above under the designation of Micro-planars, see our Catalogue of Photographic Objectives, edition of 1901, pp. 34—41.

Pairs of Objectives for DRÜNER's Stereoscopic Camera.

(See also pp. 20, 24, 50 and 52.)

These pairs of objectives are the same as those used on Stands **X[a]** and **X[b]**. With each pair of objectives ordered for use with a stereoscopic camera, or purchased together with a camera, we supply two pairs of diaphragms of different apertures to slip on the lens mounts. The diaphragms are slipped on from above in the case of objective pair (55), in all other cases from below.

Designation	(55)	(a_0)	(a_2)	(a_3)	(PI)
Price Marks	**45.—**	**45.—**	**45.—**	**45.—**	**55.—**
Code-word	**Diascane**	**Diaseere**	**Diascnie**	**Diascna**	**Diasies**

Hints on the selection of Objectives and Eye-pieces.

For the solution of the more difficult problems in photo-micrography the apochromatic lenses merit first consideration. Here, perhaps even more than in ordinary visual observation, they surpass the achromatic objectives in optical capacity by virtue of their more perfect correction. The lenses are most effective when used in conjunction with projection eye-pieces. The higher powers of compensating eye-pieces must be substituted for the latter whenever it is requisite to obtain high magnification with short camera extension. Under certain conditions the compensating eye-pieces, more particularly the eye-piece **4**, may be employed with advantage when it is desired, with low magnifications, to obtain the greatest possible uniformity of sharpness of definition over a large field.

If only moderate magnification is demanded (in no case exceeding the values given on page 22 under the heading "useful magnification") and when the preparations are of such nature that the objects can be photographed on orthochromatic plates by yellowish-green light (rays of other colours being excluded), achromatic objectives may also be employed. With the higher powers of achromatic objectives the employment of projection eye-pieces is advisable. If it is an object to obtain comparatively high magnifications with short camera extensions, HUYGENIAN eye-pieces of the higher magnifying powers, or corresponding powers of compensating eye-pieces, should be substituted for projection eye-pieces. By illumination with the almost **monochromatic** light referred to the use of the lower powers of achromatic objectives in conjunction with projection or compensating eye-pieces is likewise admissible, the chromatic correction of the eye-pieces being of no great importance in that particular case. Without eye-pieces none but low-power objectives can be used with moderate camera extension without considerable impairment of sharpness of definition, but with the intermediate and high powers it is always advisable to use at least a correction lens for long screen distances if it should be absolutely necessary to dispense with an eye-piece.

Photographs by low magnifications in which general clearness is the first consideration are best produced by the use of micro-planars or the cheaper projection lenses of **35** and **70 mm** focus. These objectives are used exclusively without eye-pieces.

Although, of course, the same magnification can be obtained by variation of camera-extension or by different eye-pieces with two objectives of different focus which are of the same construction and have the same numerical aperture (the same ratio of aperture), still, the lens with the longer focus is generally preferable whenever it is desirable that the available field should have as large an area as possible. This point should be borne in mind when, for instance, the choice lies between the **3 mm** apochromatic objective of 1,30 num. aperture and the **2 mm** objective of the same type and having the same aperture, or between the various micro-planars.

In order to still further facilitate the selection of objectives suitable for various investigations, we add a few tables of magnifications. The values specified in the tables represent mean values, given in round figures. With regard to the different tables we offer the following notes:

Table I contains the magnifications of the apochromatic objectives with projection and compensating eye-pieces. The data hold good under the supposition of the screen being 1 m from the posterior focal point of the microscope, which lies close to the back lens of the eye-piece. This distance is selected in preference to the 25 cm limit of clear vision which, in ordinary visual observation, is usually adopted as the basis for data of magnification, because in this way the magnification at varying screen distances may be computed from the tabular data by a simple process of multiplication.

For instance, in order to compute the magnification for a screen distance of 63 cm (0,63 m) it is only necessary to multiply the tabular data by 0,63. The accuracy of the result is sufficient for preliminary purposes, but where the requirements in individual cases are more exacting, nothing will suffice but direct measurement by means of a stage micrometer.

The figures in the last column (under the heading, "Highest limit of useful magnification") specify the magnifications at which the power of the objective to produce satisfactory images reaches its limit, i. e., at which a normal eye can readily discern from a distance of 25 cm, in a photogram taken at such magnification, everything that the objective is able to depict with light of medium wave lengths. The visual angle required for observation **without strain** is assumed as one of 4′. (See ABBE, the Relation of Aperture and Power in the Microscope, J. R. Micr. Soc. Ser. II, Vol. II, London 1882, p. 460; DIPPEL. "Handbuch der allgemeinen Mikroskopie", 2nd edition, Brunswick 1882, p. 325; also see CZAPSKI "Theorie der optischen Instrumente", Breslau 1893, p. 231.) If the objects are exceptionally thick, the magnification applied would generally fall considerably below this effective limit, in order to maintain sufficient depth of focus, but would, as a rule, be exceeded only in the case of a photogram, on a large scale, being required for simultaneous inspection by a number of persons. It might be advantageous to produce a picture of this kind by enlarging a smaller original.

Table II in a similar manner supplies data as to the magnification of the achromatic objectives with, as well as without, HUYGENIAN eye-pieces. In the latter case the distance of 1 m is calculated from the posterior focal plane of the objective. If a correction lens is being used for large image distances, the objectives yield approximately the same magnification as without eye-pieces. The low-power objectives omitted from the table, and those for which no magnification data are supplied, are better replaced by corresponding projection lenses or by micro-planars. The values given under the heading "Highest limit of useful magnification" have the same significance as the corresponding data relating to apochromatic objectives; in view, however, of the less perfect union of rays, this limit will be even less readily exceeded with the achromatic than with the apochromatic lenses.

Table III specifies the magnifications obtained by the combination of high-power achromatic objectives and projection eye-pieces. The remarks above, referring to Table II, apply equally here.

Table IV contains a group of the magnifications obtained with micro-planars and projection lenses for three different screen distances. Data for only one distance would not suffice here, because the magnifications — especially with long-focus objectives — are no longer in approximate proportion to the distance of the screen from the objective.

Table V, finally, gives the magnification and the visible area of the object for DRÜNER's stereoscopic camera. The data of magnification apply only to the two planes situated in the object area, each of them parallel to one of the screens of the double camera and passing through the point of intersection of the two camera axes. The pair of objectives is so adjusted that an image of any small object, whose position coincides with the latter point, is produced centrally on each of the two screens.

Table I.

Magnifications of the Apochromatic Objectives with Projection and Compensating Eye-pieces.

Calculated for 160 mm tube-length and 1 m distance from the screen to the eye-piece. (See p. 19.)

Objective		Descriptive No. (magnification) of Eye-pieces						Highest limit of useful magnification
Focus mm	num. Ap.	2	4	6	8	12	18	
16	0,30	125	250	372	500	750	1125	320
8	0,65	250	500	750	1000	1500	2250	690
4	0,95	500	1000	1500	2000	3000	4500	1000
3	0,95	667	1333	2000	2667	4000	6000	1000
2,5	1,25	800	1600	2400	3200	4800	7200	1320
3	1,30	667	1333	2000	2667	4000	6000	1380
3	1,40	667	1333	2000	2667	4000	6000	1480
2	1,30	1000	2000	3000	4000	6000	9000	1380
2	1,40	1000	2000	3000	4000	6000	9000	1480
1,5	1,30	1000	2667	4000	5333	8000	12000	1380

The diameter of the image circle on the screen at 1 m from the eye-piece is

with Projection Eye-piece **2** . . about 20 cm
with Projection Eye-piece **4** . . about 30 cm

Table II.

Magnifications of the Achromatic Objectives without Eye-pieces

calculated for 1 m distance of the screen from the objective

and with HUYGENIAN Eye-pieces

calculated for 160 mm tube-length and 1 m distance of the screen from the eye-piece. (See p. 20.)

Objectives	Without Eye-pieces or with Correction Lens	HUYGENIAN Eye-pieces					Highest limit of useful magnification
		1	2	3	4	5	
a_1	24	—	—	—	—	—	—
a_2	26	—	—	—	—	—	—
a_3	35	—	—	—	—	—	—
aa	40	95	125	180	220	310	180
A	65	175	225	310	390	575	210
AA	60	170	215	295	365	535	320
B	85	250	320	460	560	800	360
C	150	400	500	720	880	1260	420
D	240	700	880	1280	1560	2200	690
DD	240	700	880	1280	1560	2200	900
E	370	1080	1360	1980	2400	3440	950
F	570	1660	2080	3040	3720	5200	950
Pl	40	100	130	190	230	335	120
D*	240	700	880	1280	1560	2200	790
H	410	1220	1540	2220	2720	3840	1250
J	570	1660	2080	3040	3720	5200	1250
$\frac{1''}{12}$	570	1660	2080	3040	3720	5200	1380

Table III.

Magnifications of the higher-power Achromatic Objectives with Projection and Compensating Eye-pieces

calculated for 160 mm tube-length and 1 m distance of the screen from the eye-piece. (See p. 20.)

Designation of Objective	Descriptive No. (magnification) of Eye-piece						Highest limit of useful magnification
	2	4	6	8	12	18	
DD	440	880	1320	1760	2640	3960	900
E	720	1440	2160	2880	4320	6480	950
F	1040	2080	3120	4160	6240	9360	950
D*	440	880	1320	1760	2640	3960	790
H	740	1480	2220	2960	4440	6660	1250
J	1040	2080	3120	4160	6240	9360	1250
$\frac{1''}{12}$	1040	2080	3120	4160	6240	9360	1380

The diameter of the image circle on the screen at 1 m from the eye-piece is

with Projection Eye-piece 2 . . about 20 cm
" " " " 4 . . " 30 "

Carl Zeiss, Optische Werkstaette, Jena.

Table IV.

Magnifications of Projection Lenses and Micro-Planars

calculated for 50, 100, and 150 cm distance of the screen from the objective.

Distance of screen from objective cm	Focus of Objective in mm					
	100	75	70	50	35	20
50	4	5,7	6	9	13	24
100	9	12	13	19	28	49
150	14	19	20	29	42	74

Table V.

Magnifications of Pairs of Objectives for Drüner's Stereoscopic Camera and diameters of visible areas of objects.

	Designation of Objectives				
	(55)	(a_0)	(a_2)	(a_3)	(Pl)
Magnifications	1,6	2,8	4	6,2	7
Visible areas of objects in mm	30	18	13	8	7

The Choice of Stands.

The stand designated in our list as **I^c** is specially designed for the purposes with which we are here concerned. It is distinguished from our other stands by its more delicate micrometer movement (after BERGER) and also by its exceptionally wide body-tube. The finer micrometer movement facilitates most exact adjustment with lenses of the highest power, while the width of the tube minimises internal reflection and admits of the use of objectives of long focus and large field. (See Fig. 1, p. 2.) We particularly recommend Stand **I^c**, fitted with our photo-micrographic stage, as this form of stage facilitates a particularly precise and slow movement of the object within a margin of about 10 mm. If, on the other hand, a greater range of movement is desirable, the same stand with our large mechanical stage is preferable; by means of the latter the object can be moved 50 mm in one direction and 30 mm in the other. In cases where at first a less elaborate outfit is required, to be supplemented by subsequent additions, we recommend Stand **I^c** with centring vulcanite stage, as in that case the large mechanical stage can afterwards be added without hindrance.

The photo-micrographic stage is rigidly connected with its stand and cannot therefore be ordered subsequently, nor is it interchangeable with any other form of stage.

Stand **I^d** is recommended only where the extent of the preparations really demands a stage of extraordinary size. A movable stage cannot be fitted to this stand.

Stands **I^a** and **I^b** are also applicable to photo-micrographic work, providing the use of the **100 mm** and **75 mm** Planars and of the **70 mm** Projection Lens is not insisted upon. The **50 mm, 35 mm** and **20 mm** Planars, as also the **35 mm** Projection Lens, can certainly be used on those stands, but owing to the narrowness of the tube the field will be more or less restricted. Stands **II^a** and **IV^a** may be used subject to the same limitations.

With other stands, which are not fitted with a complete ABBE illuminating apparatus, perfect adjustment of the illumination is difficult to obtain, more particularly when working with high magnifications.

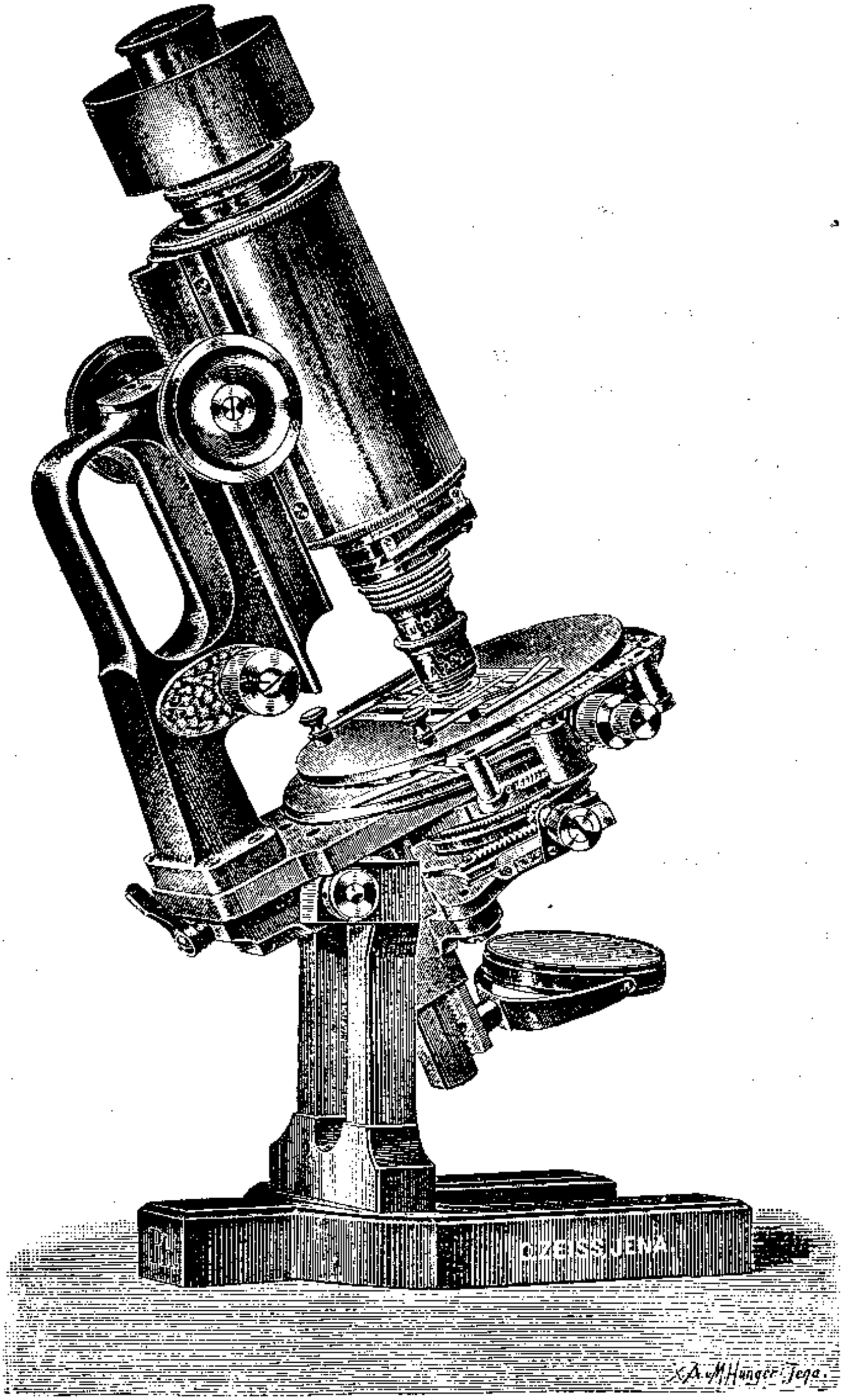


Fig. 4.
Stand Ic with photo-micrographic stage.
($^1/_2$ full size.)

The stand is shown from the right. The shape of the foot and the

nature of the illuminating appliance correspond to those of our other large stands.

The **stage** revolves and may be moved in two directions at right angles to each other by means of the conaxial milled heads seen in the illustration. The range of movement in either direction is slightly over 10 mm.

The **body-tube** is attached to a long arm and is unusually short and wide. Both ends are fitted with plates which can readily be screwed off. The lower plate bears the English screw thread for the objectives, and is shown in the illustration with the sliding objective-changer attached. The upper plate carries inside the tube the sliding sleeve for the wide draw-tube (provided with the usual graduation) into which the narrower eye-piece tube is screwed. The cylinder which ensures the light-tight connection of microscope and camera is shown inserted over the eye-piece tube.

The **fine adjustment** (BERGER's design) is effected by two cylindrical milled heads, of which the one on the right is visible.

Coarse adjustment by rack and pinion movement as with our other large stands.

No.	Description	*Price Marks*	*Code-word*
	Stands. (See Catalogue of Microscopes, 32nd edition, 1902, pp. 50 to 71.)		
646	**Stand I^{c}** (Photo-micrographic and Projection Stand) with photo-micrographic stage and ordinary condenser, num. ap. 1,40 (Fig. 1 and 4)	400.—	Diaspasme
647	**Stand I^{c}** with large mechanical stage and ordinary condenser, num. ap. 1,40	400.—	Diaspinel
648	**Stand I^{c}** with revolving and centring vulcanite stage and ordinary condenser, num. ap. 1,40	325.—	Diaspore
649	**Stand I^{d}** (Stand for examining Brain-sections) with ordinary condenser, num. ap. 1,20 (Fig. 5) . . .	355.—	Diaspros

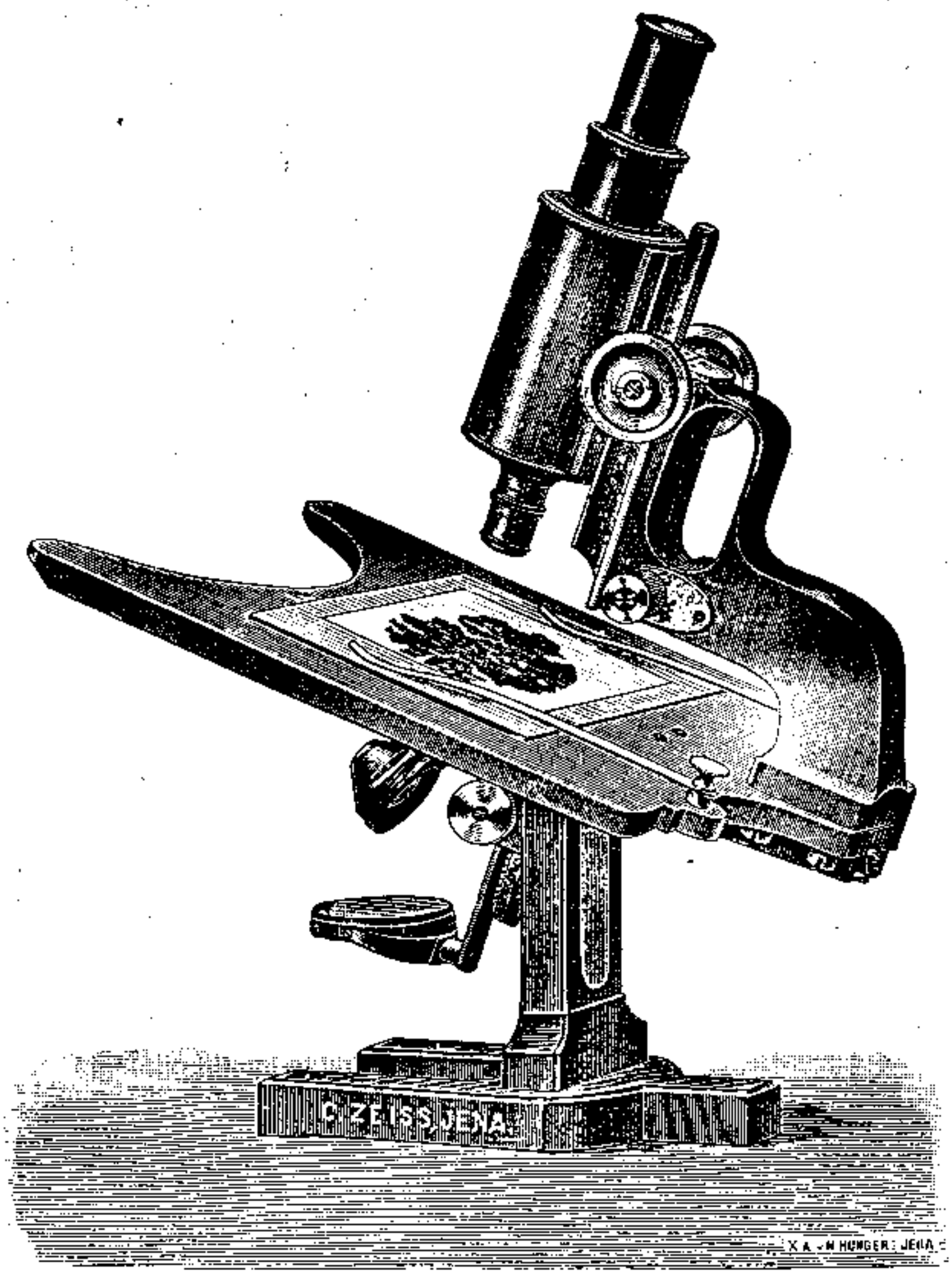


Fig. 5.
Staud I^{d} (for examining Brain-sections).
($^{1}/_{3}$ full size.)

This stand differs from Stand I^{c} mainly by the exceptional size (250 × 250 mm) of its fixed stage and the consequent abnormal projection of the tube carrier.

No.	Description	*Price Marks*	*Code-word*
	Focusing Gear for adjusting the micrometer screw from a distance.		
	A.		
	for stands fitted with BERGER's micrometer movement.		
650	**Focusing Gear,** to fasten to the projection table of the large photo-micrographic apparatus (Fig. 1) .	**45.—**	**Diastase**
	If this focusing gear is to be used also in the vertical position of the microscope, in conjunction with the large (horizontal) camera, an additional pillar of greater length is required.		
650a	**Longer Pillar,** as above mentioned	**6.—**	**Diastema**
651	**Focusing Gear,** same as preceding, but **on round** foot to place on table, for the horizontal and vertical camera	**45.—**	**Diastiete**
652	**Simplified Focusing Gear**	**4.—**	**Diastoleum**
	This small appliance consists of a two-armed lever which is fitted to the head of the micrometer screw and is driven by a string. The rotation of the screw head is limited to about 180°.		
	B.		
	for stands with the older form of micrometer movement.		
653	**Focusing Gear,** to fasten to the projection table of the large photo-micrographic apparatus	**35.—**	**Diastolico**
654	**Simplified Focusing Gear,** for the horizontal and vertical cameras	**9.—**	**Diastylo**
	This appliance consists of a bell to clamp to the head of the micrometer screw. A rod, which is easily accessible from the extremity of the camera, is attached to the bell by means of a universally movable joint.		

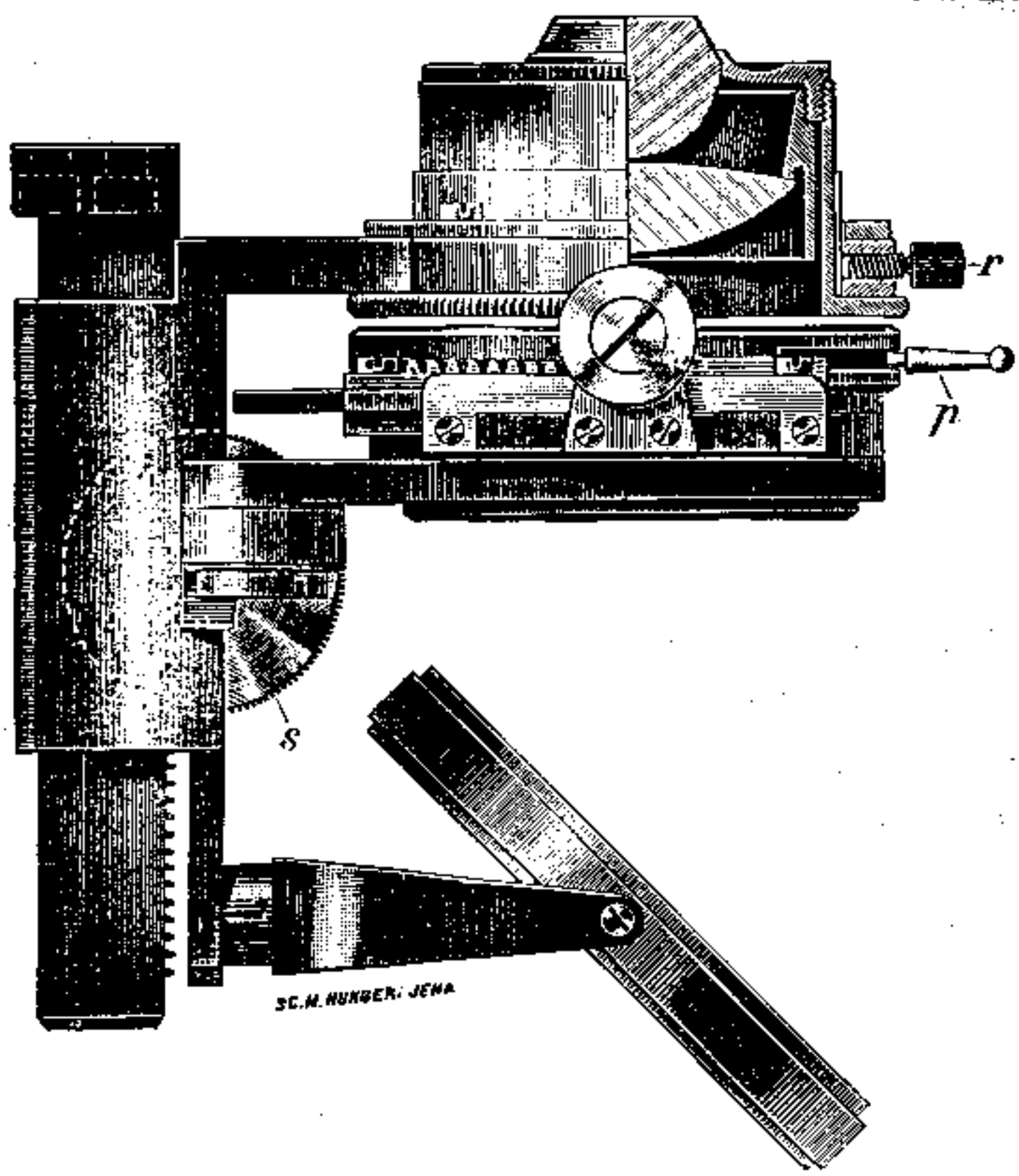


Fig. 6.
Abbe's Illuminating Apparatus.
(Full size.)

The apparatus, with its supporting rack which is screwed on to the lower side of the stage, is shown above as seen from the right. A sliding carrier, moved by the pinion *s*, bears at the top a jacket for the condenser, in the middle the diaphragm carrier and at the bottom the mirror.

The **sliding jacket** contains the sliding-sleeve of the double-lens non-achromatic condenser of num. ap. **1,20**, which can be clamped by means of the screw *r*.

The **diaphragm carrier** can be turned aside on the pivot (partly hidden in the drawing by the milled head *s*, when, for instance, it is necessary to remove the condenser. The iris-diaphragm is adjusted to the desired aperture by means of the lever *p*. The cylindrical milled head facing the observer serves to adjust the iris eccentrically and to revolve it, when in that position, round the optical axis for the purpose of changing the azimuth of the incident light.

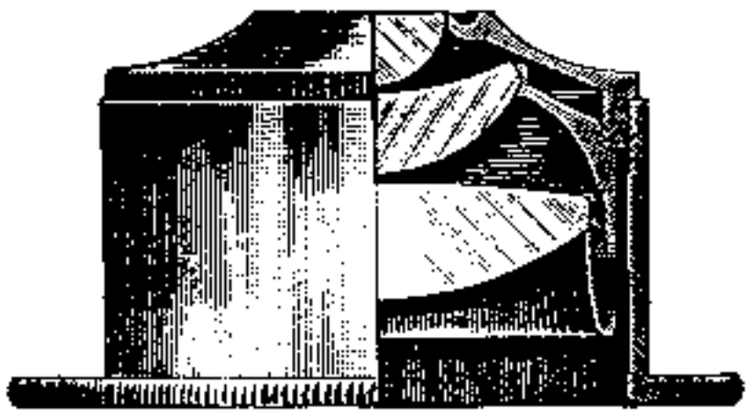
The **mirror** is movable on two horizontal axes. It is slipped upon a cylindrical pin by a short sprung sleeve, so that it is easily removable.

No.	Description	*Price Marks*	*Code-word*

Appliances for illuminating microscopical preparations by transmitted light.

(See our Catalogue of Microscopes, 32nd edition, 1902, pp. 27 to 37.)

The ABBE Illuminating Apparatus, as supplied with all our larger stands, serves for illumination by transmitted light. The more generally used non-achromatic condensers will illuminate the object with cones of light whose incidence and dimensions can be selected within a fairly wide margin, but only where a somewhat extensive source of light is available, such as daylight. If the source of light is small — and this is generally the case, in all photomicrographic work — the illumination will be improved by the use of systems corrected for the more perfect concentration of the rays. It is also essential that it should be possible to focus the condenser on the object plane — which is effected by means of the rack and pinion movement fitted to each complete ABBE illuminating apparatus — and it is, to say the least, very convenient if facilities exist for centring the illuminator in relation to the axis of the microscope. It is therefore advisable to procure one of the centring achromatic condensers, or a centring appliance for microscope objectives when the latter are to be used as condensers. With objectives of very low power, which demand illumination of a large field with light cones of small aperture, the so-called simple-lens condensers take the place of condensers of larger aperture.

No.	Description	*Price Marks*	*Code-word*
	We supply the following illuminating appliances which can be used with the ABBE Illuminating Apparatus:		
	Ordinary Condenser in sliding sleeve		
655	double lens, num. ap. **1,20**, f = about 12 mm (Fig. 6)	20.—	**Diatem**
656	triple lens, num. ap. **1,40**, f = about 8 mm (Fig. 7)	25.—	**Diatesica**
	 Fig. 7. **Condenser in sliding sleeve, num. ap. 1,40.** (Full size.)		
657	**Centring achromatic Condenser** with iris-diaphragm, num. ap. **1,0**, f = 14 mm (Fig. 8) . . .	75.—	**Diatheon**
	On Stands **II**a and **IV**a No. 657 can only be used in the inclined and horizontal position.		
658	**Centring achromatic Condenser,** num. ap. **1,30**, f = 9 mm (Fig. 9)	100.—	**Diathese**
	Owing to its small focal distance, due to its large aperture, this condenser can only be used when the thickness of the object slide is less than about 0.7 mm. On Stands **II**a and **IV**a it can be used only in the inclined position.		
659	**Centring Appliance for Microscope Objectives** which are to be used as condensers (Fig. 10) . .	12.—	**Diatomique**
	Simple-lens Condensers in sliding sleeve		
660	1) double lens	6.—	**Diatonica**
661	**2**) single lens	4.—	**Diatonicum**
662	**3**) single lens	4.—	**Diatonis**

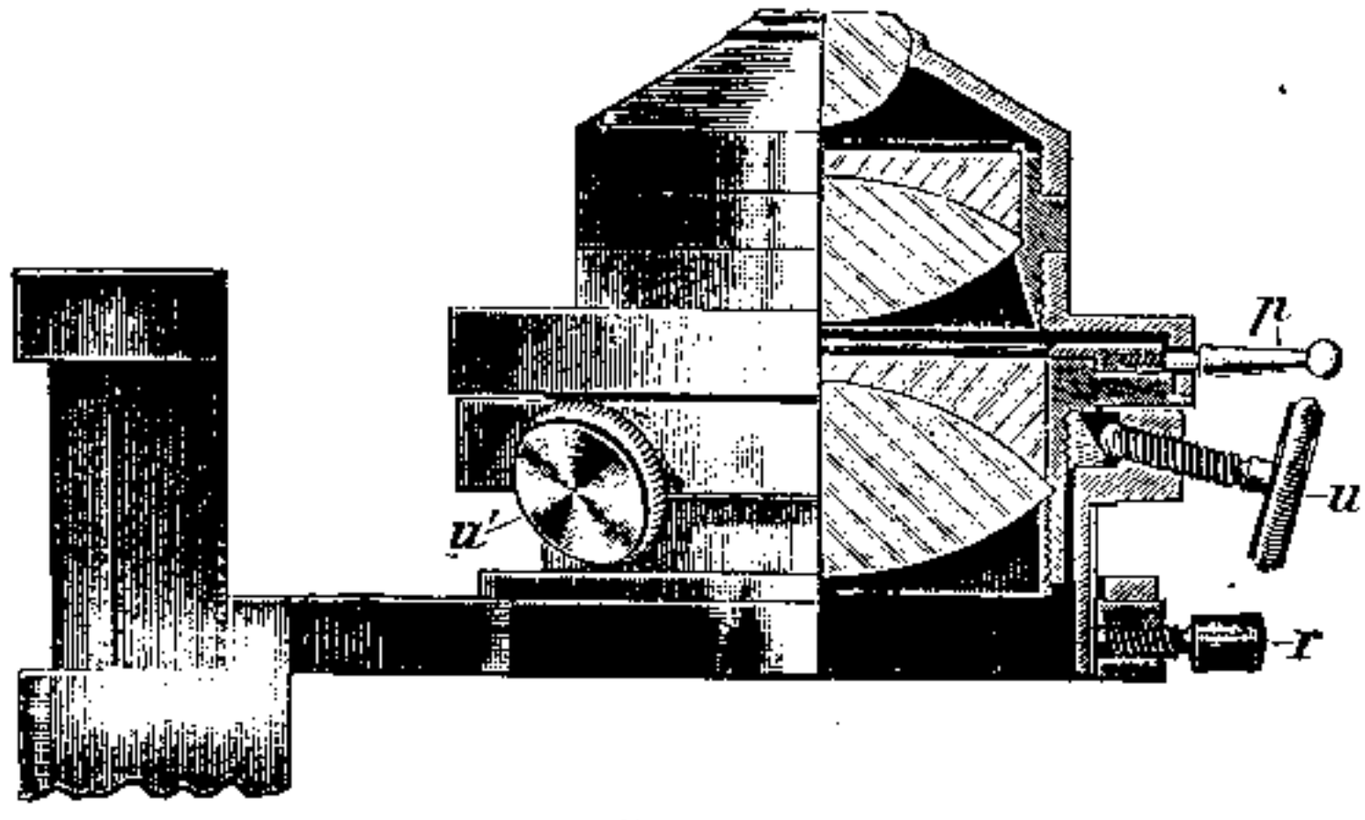


Fig. 8.
Achromatic Condenser, num. ap. 1,0, with centring collar.
(Full size.)

The **condenser,** together with the centring collar and the upper portion of the illuminating apparatus, is shown half in section. The mount proper is fitted with an iris-diaphragm, situated between the first pair of double lenses and which is adjustable by means of the lever *b*. The thread by which the condenser system is screwed into the centring collar is seen close below the projection containing the iris-diaphragm.

The **centring collar** consists of a short sleeve, which slides into the jacket of the illuminating apparatus in a similar manner (but from above) to the non-achromatic condensers and is clamped tight by the screw *r*. A projection on the upper portion of the sleeve bears a ring into which the condenser is screwed. This ring is held in position by the screws *u* and *u'* and a spring-pin, not seen in the illustration. By turning the screws the ring together with the condenser is slighty displaced, and in this manner the condenser combination, or the image of the source of light projected by it, may be accurately centred.

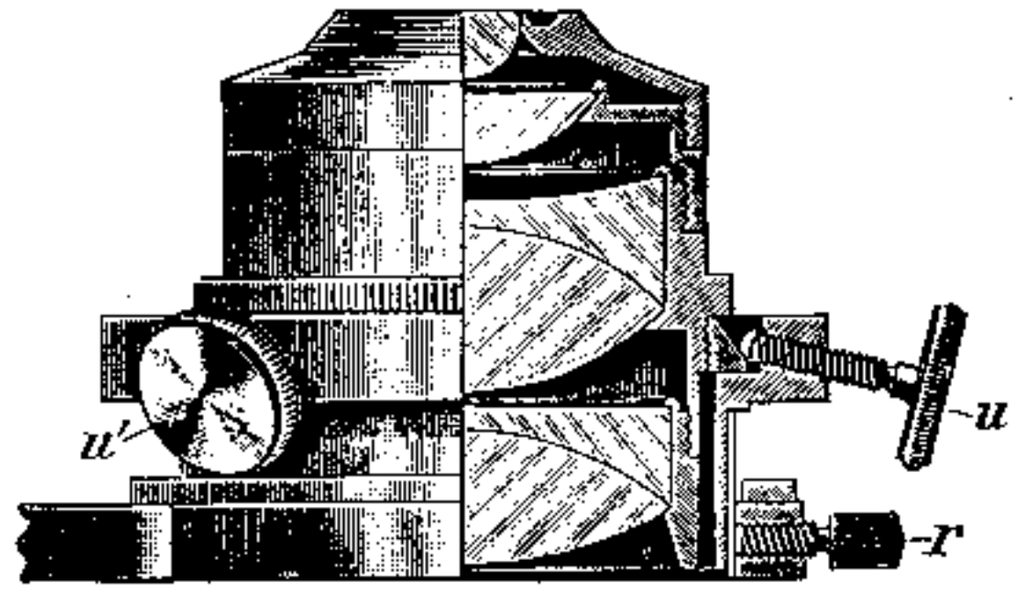


Fig. 9.
Achromatic Condenser, num. ap. 1,30, with centring collar.
(Full size.)

This condenser, like condenser No. 657, screws into the centring collar. It has not, however, an iris-diaphragm of its own, but that in the diaphragm-carrier of the illuminating apparatus must be used.

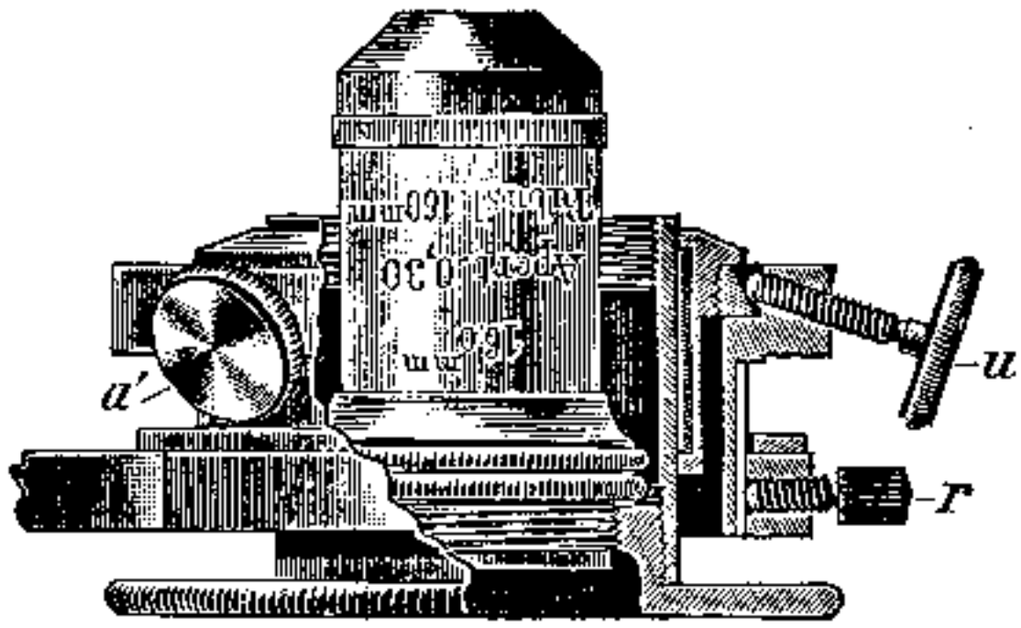
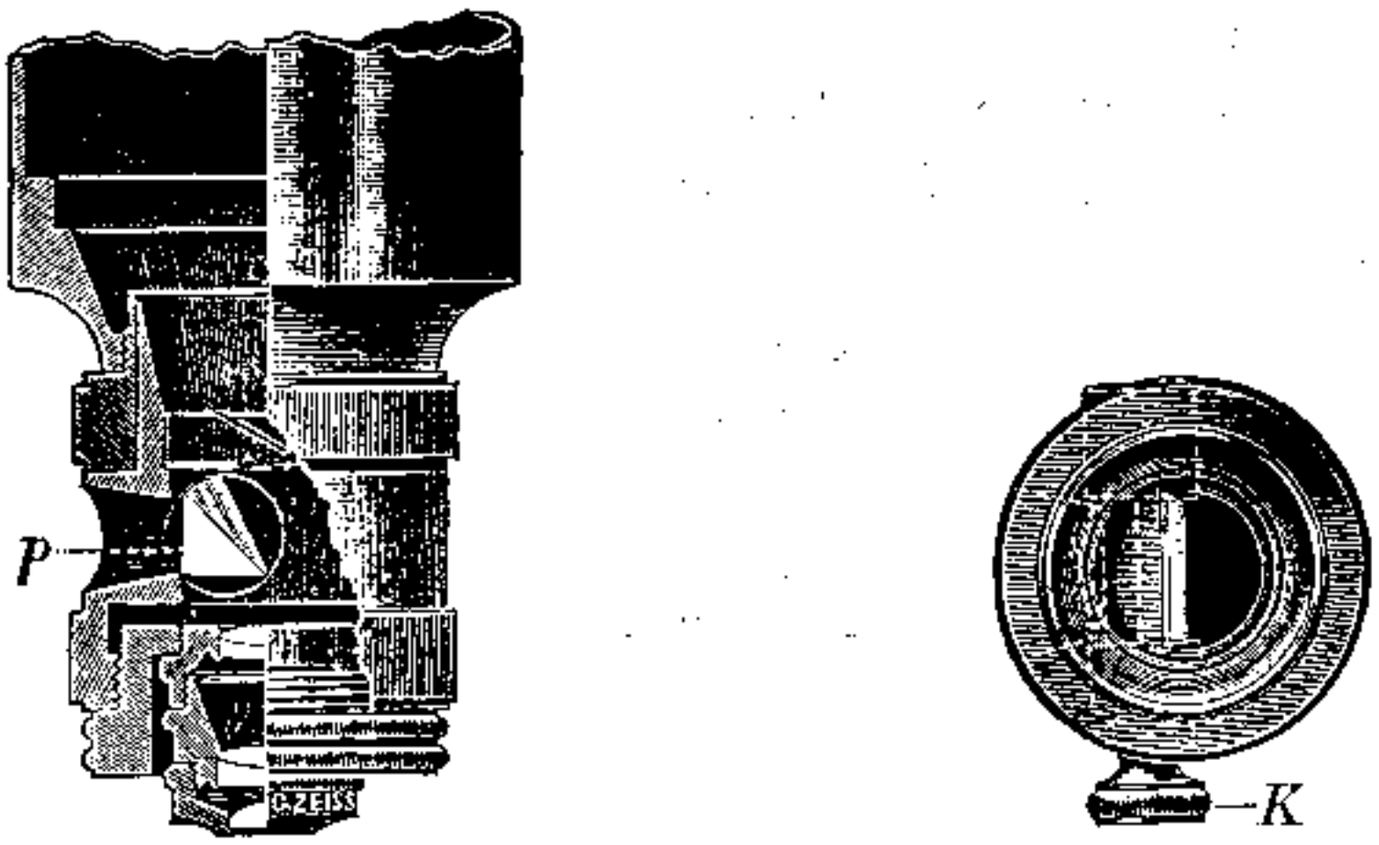


Fig. 10.
Centring Collar for Microscope Objectives used as condensers.
(Full size.)

The centring collar proper is the same as that of the achromatic condensers (Fig. 8 and 9). In place of the condenser a short sliding sleeve is screwed into the collar and a somewhat longer sleeve added. The drawing shows the sleeve with an objective (the **16 mm** apochromatic objective, num. ap. **0,30** mm) screwed in. A second screw thread is seen on the upper extremity of the sleeve into which short-focus objectives in short mounts can be screwed by means of an adapter (not shown in the illustration).

No.	Description	Price Marks	Code-word
	Simple-lens Condensers **1** and **2** are for use with condensers Nos. 635 and 636, **2** and **3** with the collective lens with iris diaphragm, Nos. 639 and 640.		
	Disks of coloured glass, to be used as light-filters, can be inserted into the diaphragm-carrier of the illuminating apparatus, viz: green-yellow disks for orthochromatic and blue for ordinary plates. We supply the following varieties:		
	Green-yellow glass disks		
663	1 mm thick	10.—	**Diatreti**
664	2 „ „	10.—	**Diatretos**
665	4 „ „	10.—	**Diatretum**
	Blue glass disks		
666	1 mm thick	10.—	**Diatribe**
667	2 „ „	10.—	**Diatribist**
	We supply a very simple illuminating apparatus for use with our smaller Stands **VI^a**, **VI^b** and **VII**; this slips into the jacket fitted under the stage of those stands and is adjusted by sliding in the sleeve.		
668	**Illuminating Apparatus,** double lens, num. ap. **1,0**, in sliding sleeve with centrally fixed iris-diaphragm	22.—	**Diatritum**
	The upper lens of this combination can be screwed off, when the lower can be used by itself with low-power objectives.		



a b

Fig. 11.

Vertical Illuminator.

(Full size.)

Fig. *a* represents the vertical illuminator half in section, together with an objective (achromatic objective **C**) and the lower portion of the body-tube. The body proper of the vertical illuminator can be revolved in the screw collar round the axis of the microscope so that the small opening (shown in section on the left of the drawing) can always be turned towards the source of light. A small iris-diaphragm can be placed in front of this opening by means of two pins. A prism is situated behind the opening, on the hypotenuse surface of which the light is reflected and passed to the object through the half of the objective covered by the prism. The image of the object, seen through the eye-piece, is produced by the open half of the objective. In order to minimize reflections on the lens surfaces as much as possible, the objective is mounted so that the upper lens lies close to the prism. With recent constructions we supply special diaphragms for insertion, through slits in the body of the tube, between objective and prism.

Fig. *b* shows a view of the apparatus as seen from above. The prism can be revolved by the milled-head *K* on an axis at a right angle to the optical axis of the microscope.

No.	Description	*Price Marks*	*Code-word*

Appliances for illuminating microscopical preparations by reflected light.

For low magnifications by lamplight the collective lens with iris-diaphragm, Nos. 639 and 640, may be used. When working with our large photo-micrographic apparatus, the sole-plate bearing the microscope is moved aside and the light reflected upon the object by the plane mirror No. 669 with ball and socket joint, placed on the optical bench at the side of the microscope.

For high magnifications the vertical illuminator is used, either in conjunction with the collective lens with iris-diaphragm or, with the large photo-micrographic apparatus, in combination with a collective lens and the plane mirror No. 669.

Objectives to be used with a vertical illuminator must be fitted in special **short mounts.** The upper lens then comes close to the prism, thus as much as possible preventing injurious reflections, and the shadowing of the larger portion of the field by the prism, when used for high magnification.

Preparations under a cover-glass are not suitable for examination with a vertical illuminator. Objectives of high power (from the **8 mm** apochromatic objective and achromatic objective **D** upwards) must therefore be specially corrected **for uncovered objects.** In working with oil immersions the use of cover-glasses is again permitted.

If the thickness of the objects varies widely, inconvenience is felt in working with the vertical illuminator on stands of ordinary construction, because in focusing the position of the illuminator changes and a fresh adjustment of the illumination is entailed

No.	Description	*Price Marks*	*Code-word*
	by each change of object. In that case it is advisable to adopt the stand designed by MARTENS, which is specially constructed for examining and photographing opaque objects. This stand can, if desired, be fitted with the ABBE illuminating apparatus and thus adapted for work by transmitted light also. It cannot be used in any but the horizontal position. With regard to fuller details refer to A. MARTENS and E. HEYN "Über die Mikrophotographie im auffallenden Licht und über die mikrophotographischen Einrichtungen der königlichen mechanisch-technischen Versuchsanstalt in Charlottenburg" ("Mitteilungen aus den königlichen technischen Versuchsanstalten", Berlin 1899), as also to a "Kostenanschlag für die Einrichtung zur Mikrophotographie von Metallschliffen". We shall be pleased to supply, gratis, copies of above-mentioned publications.		
669	**Plane Mirror with ball and socket joint,** on saddle-stand, diameter of circular mirror surface about 10 cm	24.—	**Diaugia**
670	**Vertical Illuminator** without iris-diaphragm (Fig. 11)	18.—	**Diaulos**
671	**Vertical Illuminator** with small iris-diaphragm in front of side opening (specially recommended when using high-power lenses of the dry series) . . .	38.—	**Diavola**
	Movable Stages, Mechanical Stages. (See our Catalogue of Microscopes, 32nd edition, 1902, pp. 37—42.)		
672	**Large Mechanical Stage** for Stands I[a] and I[c] . .	100.—	**Diazeuctic**
673	**Revolving Vulcanite Stage,** interchangeable with the large mechanical stage of Stands I[a] et I[c] . .	25.—	**Diazografe**
674	**Small Mechanical Stage** (older form)	85.—	**Diazomata**
674a	**Case** for same	5.—	**Diazomatis**

No.	Description	*Price Marks*	*Code-word*
675	**Small Mechanical Stage** (new model)	**120.—**	**Dibalas**
675a	**Case** for above	**5.—**	**Dibalo**
	The small mechanical stages can be attached to Stands **II**[a], **IV**[a] and **IV**[b] without special adaptation.		
676	**Carrier for Culture-plates,** diameter 90—100 mm, designed by GEBHARDT (see "Zeitschr. f. wiss. Mikroskopie", vol. XV, 1898, pp. 155—159) . .	**40.—**	**Dibaphorum**
	When ordering please state stand on which the carrier is to be used.		

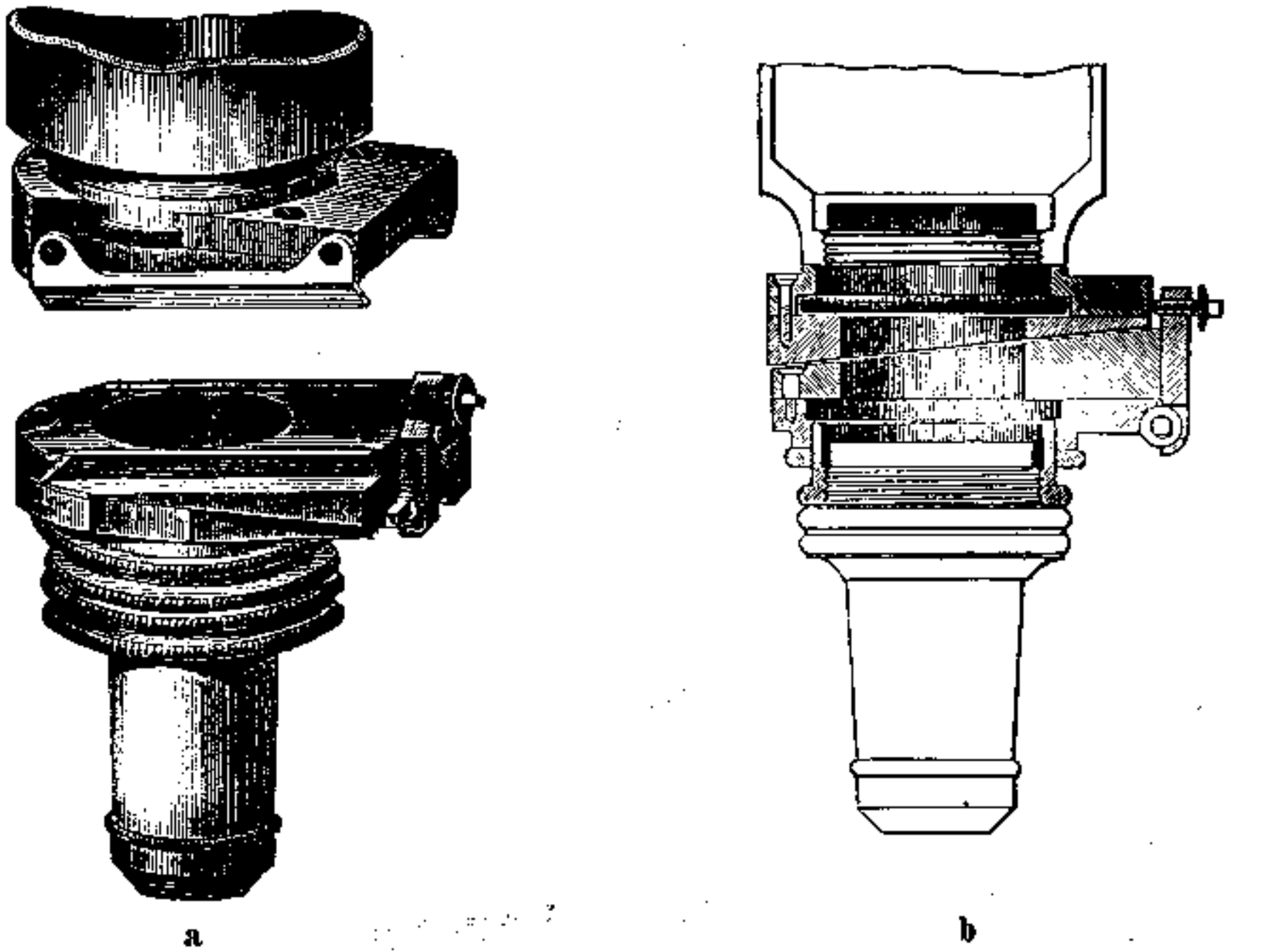
Appliances for interchanging Objectives.

(See our Catalogue of Microscopes, 32nd edition, 1902, pp. 46—49.)

As highly as the revolving nose-piece is appreciated for ordinary microscopic examination, the sliding objective-changer is more to be recommended for photo-micrographic work. It admits of the use of an unlimited number of objectives and is fitted with a means of centring and focusing the objectives in relation to each other. In this way, after the first focusing, the successive objectives will always cover the centre of the field and remain fairly sharp.

The tube is lengthened by 21 mm by the interposition of the sliding objective-changer, and the draw-tube must therefore be shortened correspondingly.

	Sliding Objective-Changer (Fig. 12).		
677	**Tube slide**	**10.—**	**Dibastasse**
678	**Objective-slide,** each	**10.—**	**Dibastero**
679	**Leather Case,** to contain 3 objective-slides with objectives screwed in	**6.—**	**Dibasti**



a b

Fig. 12.
Sliding Objective-Changer.
(Full size.)

Fig. *a* represents the tube slide screwed upon the microscope tube, and below it is seen an objective slide with objective attached.

Fig. *b* shows the two parts in combination, tube and objective being shown in outline only.

The **tube-slide** is shown in section, except the part bearing the screw thread. The slide is not rigidly connected with this part, but may be turned so long as the screw is not drawn quite tight. This admits of the tube slide being clamped with the plane of the slide action turned either to the front or to one side.

The **objective slide** shows on its right a screw for centring the objective in parallel direction to the slide action, while the screw below centres it at right angles to the slide. Both these screws are turned by watch keys, which are supplied. The inclination of the slides causes the objective to rise away from the object during removal. The objective is screwed into a special collar, which can be raised or lowered on a fine screw thread and clamped by a counterscrew. By this arrangement it is made possible to effect such a relative adjustment of our lenses of the dry series (from achromatic lens **A** and the **16 mm** apochromatic lens upwards) that the focusing adjustment is maintained in the interchange of objectives.

No.	Description	*Price Marks*	*Code-word*
680	**Mahogany Case with lock and key,** for 6 objective-slides with objectives screwed in (Fig. 13) . . .	**15.—**	**Dibattuta**

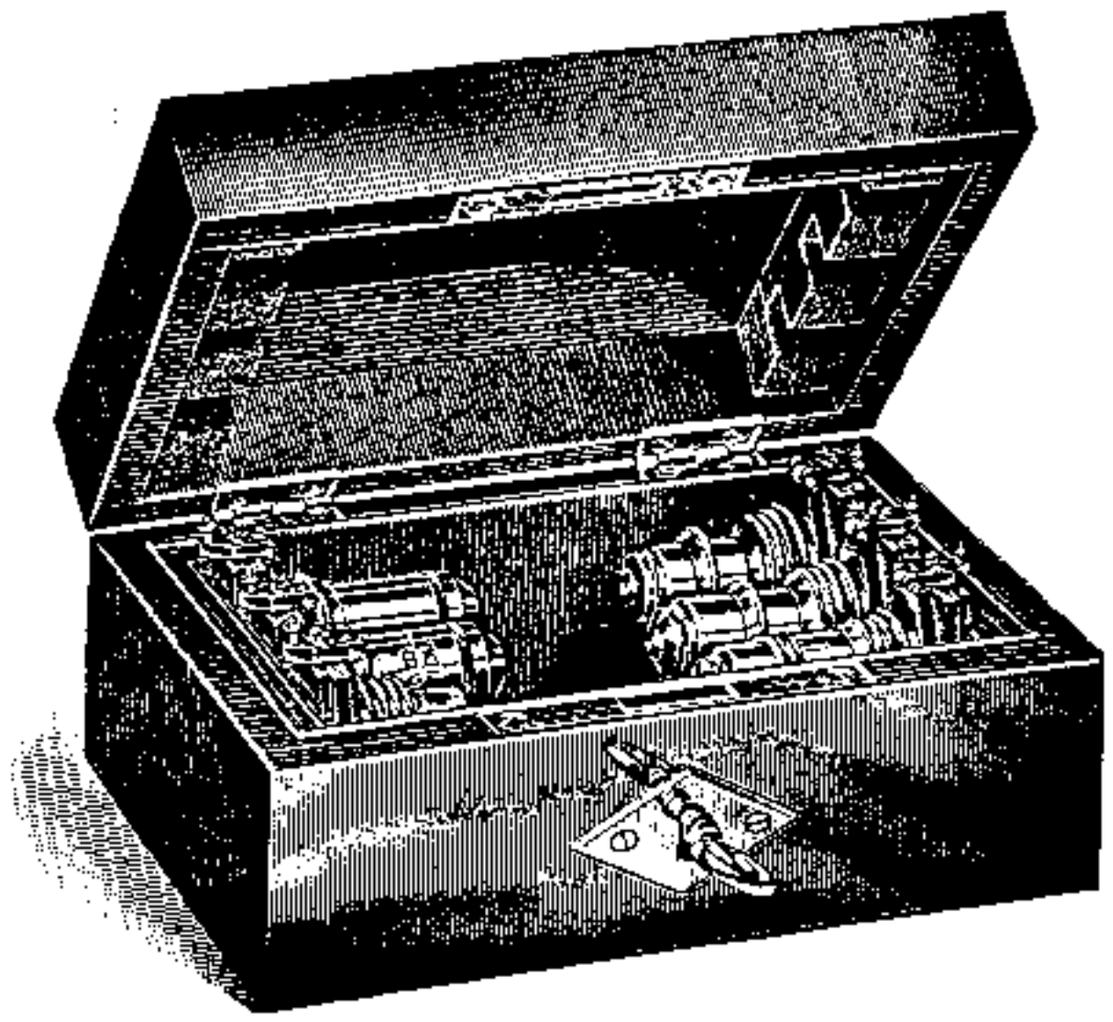


Fig. 13.
Mahogany Case for 6 objective-slides with objectives screwed in, fitted with lock and key. (1/2 full size.)

Revolving Nose-pieces (Fig. 14)

681	for 2 objectives	**20.—**	**Diblaim**
682	„ 3 „	**27.—**	**Diblath**
683	„ 4 „	**32.—**	**Diblathaim**

A special adapter is required for attaching a revolving nose-piece to Stands I[c] and I[d].

The body tube is lengthened by 22 mm by the interposition of the nose-piece and adapter, and the draw-tube must therefore be pushed in by a corresponding amount.

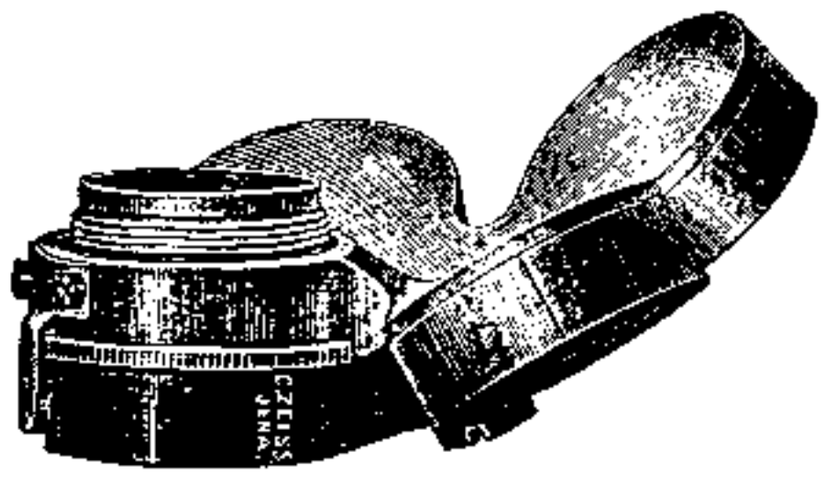


Fig. 14.
Revolving Nose-piece for 4 objectives (full size).

No.	Description	*Price Marks*	*Code-word*
	Appliances for Measuring.		
	(See our Catalogue of Microscopes, 32nd edition, 1902, pp. 91 to 96.)		
	Stage Micrometer, in case		
684	1 mm divided in 100 parts	10.—	**Dibocchi**
685	1 cm divided in millimeters, the last in tenths	6.—	**Dibolie**
686	PLAGGE's **Micrometer Projection Eye-piece 2** .	52.—	**Diboscato**
687	PLAGGE's **Micrometer Projection Eye-piece 4** .	52.—	**Diboscava**
688	**Divided glass slides,** each	10.—	**Dibottata**
689	**Case** for 1 eye-piece and 4 glass slides	5.—	**Dibottero**
	These eye-pieces are really Projection Eye-pieces **2** and **4**, adapted for insertion of glass slides with ruled scale. The projection lens forms an image of the scale on the screen together with that of the object. These eye-pieces are not inserted into the draw-tube like ordinary eye-pieces, but are fitted by means of special adapters. Each eye-piece has a sleeve for light-tight connection with the camera. (See "Veröffentlichungen aus dem Gebiet des Militärsanitätswesens", No. 12.)		
	As the ruling of the glass slides has to be made separately for each objective, the latter should therefore be sent to us when ordering. With objectives in correction mounts the scale corresponds to only one position of the correction collar, because the value of intervals varies with the position of the screw of the correction mount.		
	Rules on plate-glass		
690	5 cm divided in $^1/_2$ mm	2.50	**Dibra**
691	10 cm divided in $^1/_1$ mm	3.50	**Dibraque**
692	20 cm divided in $^1/_1$ mm	7.—	**Dibrucassi**
693	30 cm divided in $^1/_1$ mm	12.—	**Dibruchi**

No.	Description	Price Marks	Code-word
	Rules on plate-glass with double scale (one side in millimetres, the other in English inches)		
694	5 cm divided in ½ mm, and 2 inches in 48 parts	3.50	Dibucciano
695	10 „ „ „ 1/1 „ „ 4 „ „ 48 „	4.50	Dibucciava
	Appliances for microscopic examination with polarized light.		
	(See our Catalogue of Microscopes, 32nd edition, 1902, pp. 101 to 105.)		
	Polarizer, prism with end-surfaces inclined to axis of microscope		
696	**I** to place in the diaphragm-carrier of the ABBE illuminating apparatus	22.—	Dibuccio
697	**II** for use on Stand **VI**b in conjunction with illuminating apparatus No. 41, without iris-diaphragm	25.—	Dibucinas
	Analyzer, prism with end-surfaces at right angles to axis of microscope		
698	**I** to fit on HUYGENIAN and compensating eye-pieces with the microscope standing upright	15.—	Dibujada
	After unscrewing the plate-shaped rim, the cylindrical mount containing the prism can be screwed upon the projection eye-pieces, above the projection lenses, in place of the diaphragm.		
699	**II** to fit on HUYGENIAN and compensating eye-pieces, with divided circle, not adapted for use with the microscope horizontal	30.—	Dibujando
700	**III** in revolving adapter, to screw in between tube and objective if the latter is to be used without eye-piece	25.—	Dibujar

No.	Description	*Price Marks*	*Code-word*
701	**Selenite Films, Red of the I. Order,** mounted on paper disks, to drop into rim of Polarizer I . .	3.—	**Dicabula**
702	**Selenite Films, other Orders,** mounted on paper disks, each	2.—	**Dicacem**
703	**Mica-Films,** mounted on paper disks, each	1.50	**Dicacis**

Other Accessories.

704	MALTWOOD'S Finder	20.—	**Dicacity**

By its use any particular point of an object may be easily re-found, independently of the scale on movable stages (see Catalogue of Microscopes, 32nd edition, 1902, p. 114).

Appliance for photographing comparatively large objects by reflected or by transmitted light.

Object Carriers.

	Iris-diaphragm No. 638, with spring clips, on saddle-stand	30.—	**Diagrafia**

The diameter of the full aperture is about 10 cm.

705	**Iris-diaphragm,** total aperture 10 cm, with spring clips and micrometer movement, on saddle-stand	46.—	**Dicaculum**

Particularly recommended where the objective is screwed to the camera front; in other cases No. 638 answers sufficiently well, because the means of focusing fitted to the microscope or to the projection lens carrier would then be available.

706	**Trough** for photographing test-tube cultures with macro-photographic objectives, **on saddle-stand**	18.—	**Dicalchon**

No.	Description	Price Marks	Code-word
	The trough is filled with water, glycerine, or oil, into which the test-tube is immersed, so as to eliminate refraction caused by its cylindrical surfaces.		
707	**Trough,** same as preceding but mounted **on a round foot**	18.—	**Dicarchi**
707 a	**Trough** separately	5.—	**Dicarpo**
708	**Small Platform on saddle-stand**	15.—	**Dicast**
	In order that it may be possible to adjust the level of the platform as low as required, the pillar of the saddle-stand can be removed and screwed into a joint at the side of the stand. The stem of the platform also must in that case be screwed in at the side of the platform, so that the centre of the latter may again lie above the centre of the optical bench.		
709	**Small Platform on round foot**	15.—	**Dicatto**
	Lens Holders.		
710	**Projection-lens Holder,** with micrometric movement and sliding adapter for screwing in the objectives, on saddle-stand (Fig. 2)	30.—	**Dicebamus**
711	**Light-excluding conical Adapter,** with intermediate collars, to screw into the slide of the projection-lens holder	8.—	**Dicelius**
	This adapter is always supplied with Stands I^{c} and I^{d}. (Fig. 1.)		
	Intermediate Collars for adapting other lenses than our own, each	2.50	

Photo-micrographic Cameras.

Our photo-micrographic cameras are fitted with canvas bellows with leather corners. The large cameras, Nos. 712—714, are made in two parts, a front with conical bellows, which can be used by itself, and a back with square bellows. The other two models have single conical bellows. The back containing the dark slides and the focusing screen is not inclinable to the camera axis. With Nos. 772—719 the bellows are connected with the back by hinges so as to enable the operator, while focusing, to scan the image from the front on a white screen, providing there is sufficient light. A sheet of stiff white paper, placed into the dark slide together with a glass plate, may serve as a focusing screen.

Our slides are folding double dark slides, one of which is supplied with each camera, but without carriers for smaller sizes of plates. The latter, as also any additional slides required, must be ordered separately. Two focusing screens, one ground and one plain glass (the latter with a crossed line ruled upon it), are also supplied with each camera.

Other adjuncts of each camera are two camera fronts, one of them without fittings, being intended to carry the objective either by means of a screw flange or a special focusing attachment, the other being fitted with an arrangement for establishing light-tight connection with the microscope tube or with the light-excluding conical adapter No. 711 (Fig. 15).

Direct contact between microscope and camera is obviated in both cases. With the large cameras, Nos. 712—714, an additional means of keeping the two parts distinct is provided by separate bases for microscope and camera.

The adjustment of the bellows extension is effected by hand. For this purpose the fronts and backs of the cameras are fixed to sleeves which slide upon two parallel iron rods or, in the case of Nos. 719—723, a single rod. These sleeves can be clamped in any desired position. The large cameras, Nos. 712—714, are in addition movable lengthwise as a whole, so as to leave the microscope conveniently accessible for examination; an adjustable screw stop prevents contact between camera and microscope when the former is being replaced.

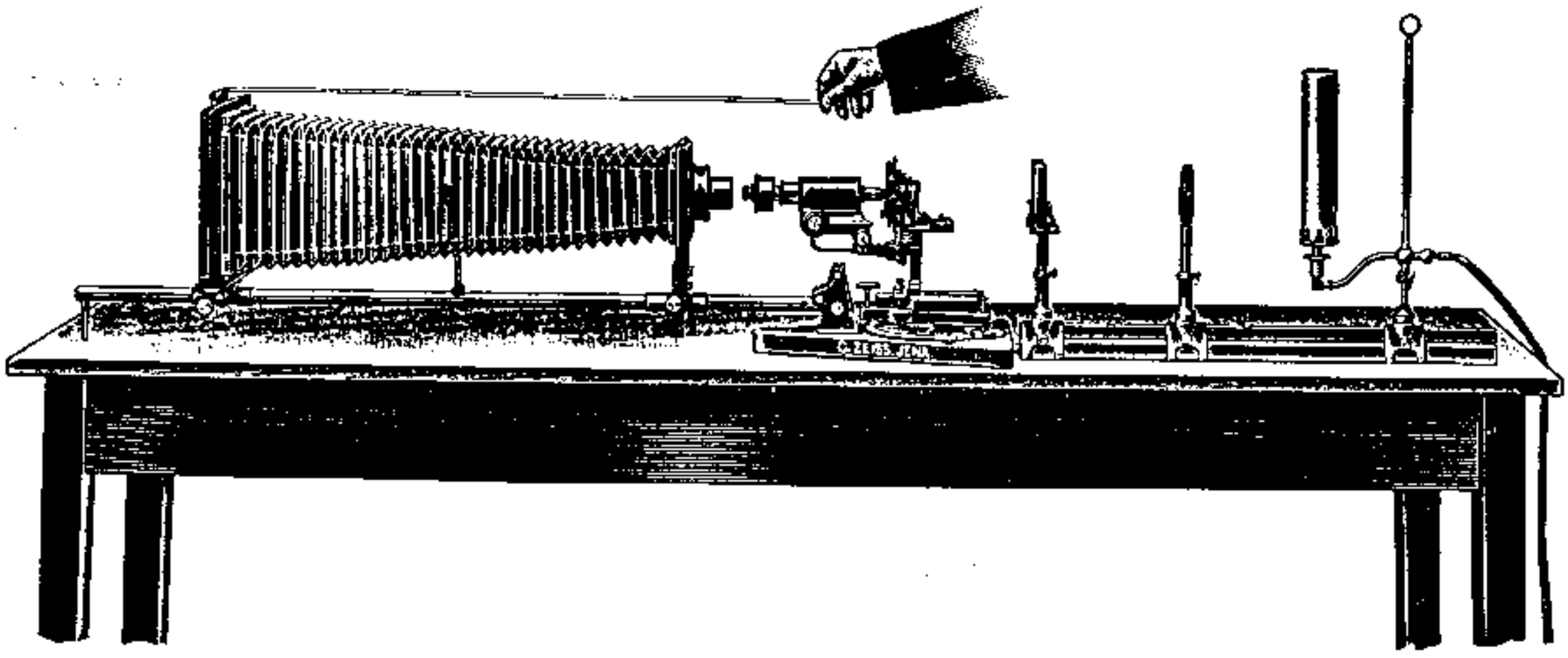


Fig. 15.
Horizontal and vertical Camera.
($^1/_{15}$ full size.)

The drawing represents the camera resting horizontally upon an ordinary steady table. The base is in the shape of an isosceles triangle, to which the optical bench is attached. The latter carries the **lamp, the collective lens with iris-diaphragm** and the **light-filter stand.**

The centre of the base is occupied by a revolving sole plate, for the foot of the microscope, provided with three levelling screws. The correct position of the microscope is ensured by a narrow strip of metal fitted at the front of the sole-plate, and the stand is secured by a bar which crosses the hind foot and is clamped down by two screws.

The **camera is supported** by an iron rod, 1,10 m in length and divided into centimeters. One end of the rod rests in a fork rising from the base close behind the foot of the microscope, the other end is held up by a prop resting on the table. The camera front and back are fixed to sleeves which slide along the rod. These sleeves can be clamped by the screws seen in the drawing. A groove, into which the screws project, prevents the sleeves from turning on the rod. The camera front is fitted with a funnel-shaped sleeve which, in conjunction with the hood on the microscope tube, establishes the light-tight connection. The sleeve is slipped upon a wide collar screwed on to the camera front; this collar alone is connected directly with the microscope when the **light-tight adapter** for low-power objectives is used. A central support prevents sagging of the bellows.

The figure likewise illustrates the manner of using the **tape-measure** for adjusting projection eye-pieces (see p. 13).

No.	Description	*Price Marks*	*Code-word*
712	**Large Photo-micrographic Camera,** with one double dark slide for plates 24 × 24 cm; two focusing screens and two camera fronts, one of the latter fitted for light-tight connection with the microscope; bellows extension = 1,50 m; cast iron stand adjustable in height by rack and pinion, so as to facilitate work with the vertical microscope (with reversing prism, see p. 15); rollers and setting screws on the four feet	290.—	**Dicerati**
713	**Large Photo-micrographic Camera,** same as preceding; cast iron stand not adjustable; without rollers, but fitted with setting screws to the four feet .	200.—	**Diceria**
714	**Large Photo-micrographic Camera,** same as preceding, but having, instead of the cast iron stand, two short feet which may be screwed to a table or to two wall brackets	170.—	**Dicervella**
715	**Double Dark Slide** for 24 × 24 cm plates (without carriers for plates of smaller size)	20.—	**Dicevole**
716	**Plate Carriers** for smaller sizes of plates, as required each	1.50	**Dichas**
717	**Movable Dark Slide** for making exposure scales (without extra carriers for smaller plates) . . .	48.—	**Dichelops**
	By the aid of this slide successive exposures, about 2 cm wide, can be made of the same portion of the field upon the same plate, when a comparison of the results so obtained will show the best exposure. Largest size of plate 24 × 24 cm. With each movable dark slide we supply a special carrier for the focusing screens and the ordinary double dark slides. The difference in the projection distance which, owing to the greater depth of the movable dark slide, would otherwise arise, is compensated by this carrier.		
718	**Stool** on solid iron pillar, adjustable in height to facilitate microscopic examination after pushing the camera back	20.—	**Dichlaro**
	Focusing Lens, see No. 729.		

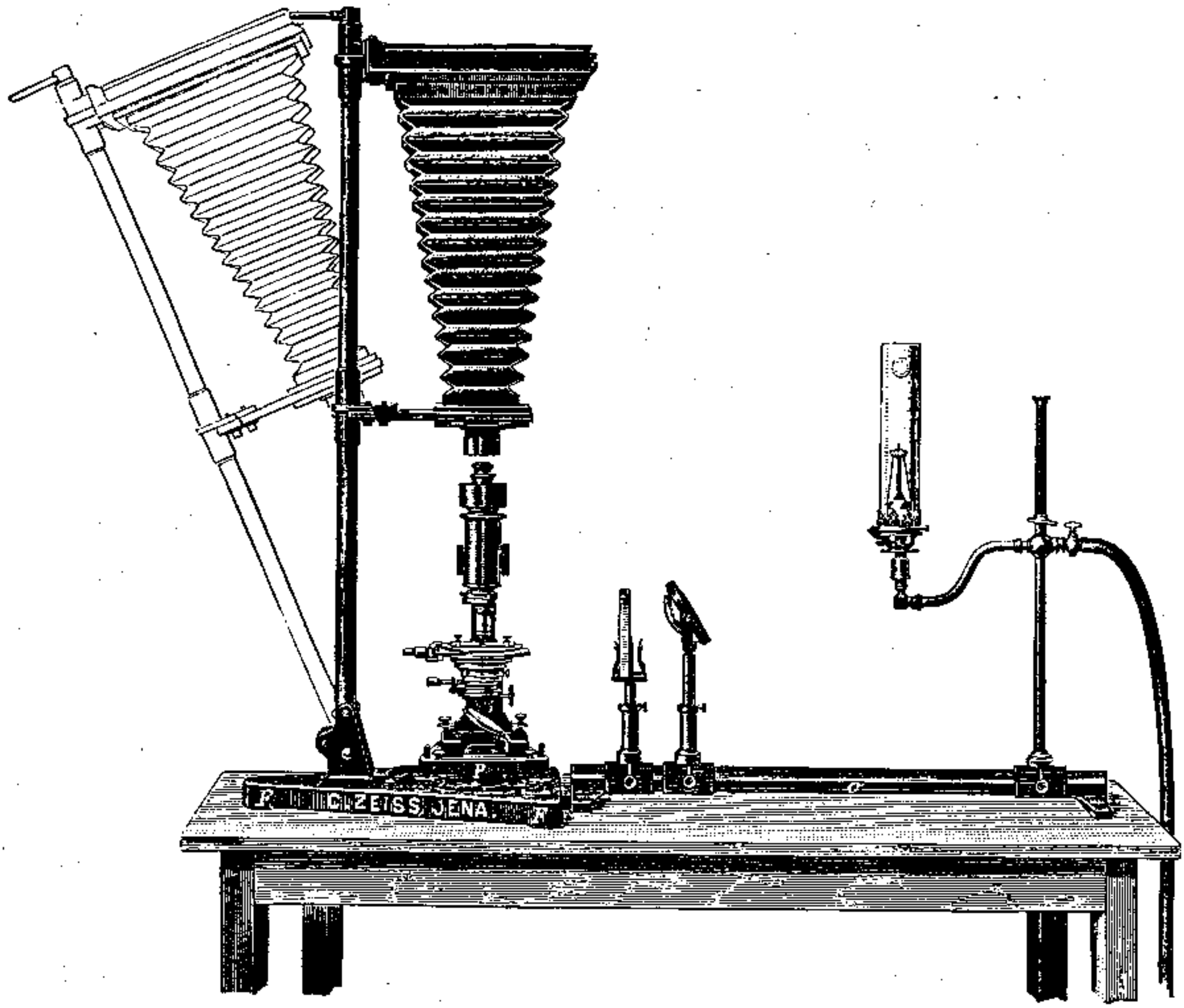


Fig. 16.
Combined Horizontal and Vertical Camera.
(About $^1/_{10}$ full size.)

The drawing shows both camera and microscope in the vertical position. The iron rod supporting the camera is maintained in this position by a pin, which is inserted through holes specially bored for this purpose through the rod and the top of the fork. On withdrawing the pin and inserting it into the holes on the left of the fork, the camera can be rested against the pin in the inclined position outlined above, when direct microscopic observation is possible. The sole-plate with the microscope, as represented in the illustration, has been rotated by 90° out of the position shown in Fig. 15; in this position the manipulation of the coarse and fine adjustments is much easier. The two positions varying by an angle of 90° are indicated by the snapping of a spring catch.

The drawing represents an older form of the camera, which explains a few slight variations from Fig. 15.

No.	Description	*Price Marks*	*Code-word*
719	**Combined Horizontal and Vertical Camera,** with one double dark slide for plates 21 × 21 cm; two focusing screens and two camera fronts, one of the latter fitted for light-tight connection with the microscope; bellows extension about 1 m. To stand on any steady table about 2¼ m in length. (Fig. 15 and 16)	150.—	**Dichinassi**
720	**Double Dark Slide** for 21 cm × 21 cm plates (without carriers for intermediate sizes of plates)	18.—	**Dichinava**
721	**Plate Carriers** for intermediate sizes of plates, as required, each	1.50	**Dichino**
722	**Movable Dark Slides** for making exposure scales. Largest size of plate 21 × 21 cm, otherwise same as No. 717.	40.—	**Dichodon**
	Focusing Lens, see No. 729.		
	Optical Bench, see Nos. 604 and 605.		
723	**Vertical Camera,** with one double dark slide for plates 13 × 18 cm; two focusing screens and two camera fronts, one of them fitted for light-tight connection with the microscope; bellows extension about 60 cm (Fig. 17)	95.—	**Dichoptere**
724	**Double Dark Slide** for 13 × 18 cm plates (without carriers for intermediate sizes)	15.—	**Dichosa**
725	**Plate Carriers** for intermediate sizes, as required, each	1.50	**Dichote**
	Focusing Lens, see No. 729.		
726	**Focusing Mount** for photographic objectives, to screw on to camera front	25.—	**Dichroe**
	The stereoscopic camera made by us on DRÜNER's specifications is specially designed for the preparation of stereoscopic pictures (including moving objects) by low magnifications. (See "Zeitschr. für wiss. Mikr.", vol. XVII, 1900, pp. 282—293.)		
727	**Stereoscopic Camera,** with time and instantaneous shutter, one pair of slides and two focusing screens; adapted for interchange with the double tube of Binocular Stand **X**^{b} (Fig. 18)	125.—	**Dichromene**

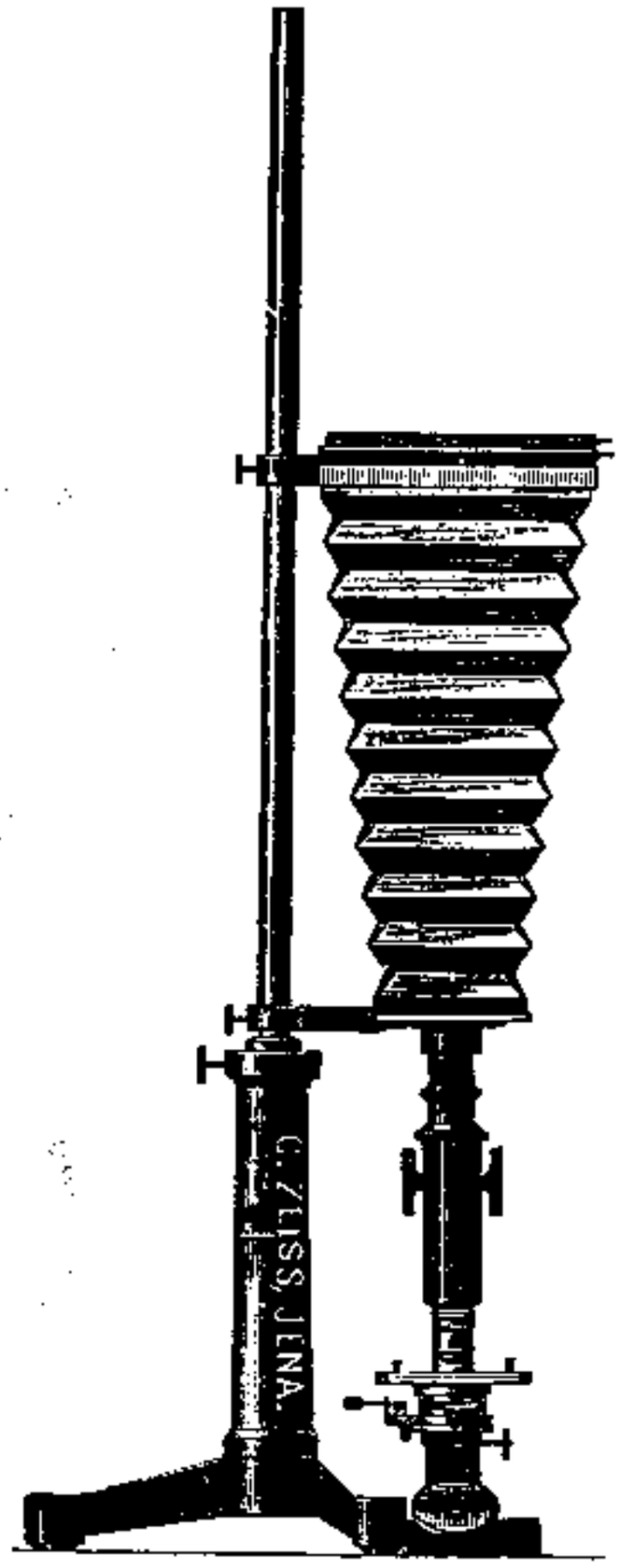


Fig. 17.
Vertical Camera.
(About $^1/_8$ full size.)

The camera is shown in combination with Stand **IV**[a]. As with the horizontal and vertical camera, so here also the **camera** is supported by a strong iron **rod**, divided in centimetres. The sleeves attached to the front and back of the camera slide on this rod **and are** tightly secured at any desired elevation **by the** action of clamping **screws.** The points of the screws engage into a groove running the whole length of the rod, so that the sleeves cannot turn even after the screw pressure has been relaxed. The **rod** itself revolves round its vertical axis within a hollow column. The camera can thus be easily swung away from the eye-piece, when the microscope becomes immediately available for direct observation. The turning movement is arrested **by a** clamping screw at the head of the column.

The tripod support of the column has latterly been superseded by a **base-plate** in the shape of a half moon, fitted with two levelling screws and resting on a solid foot. This form of construction enables the camera to be placed on the **projection table.**

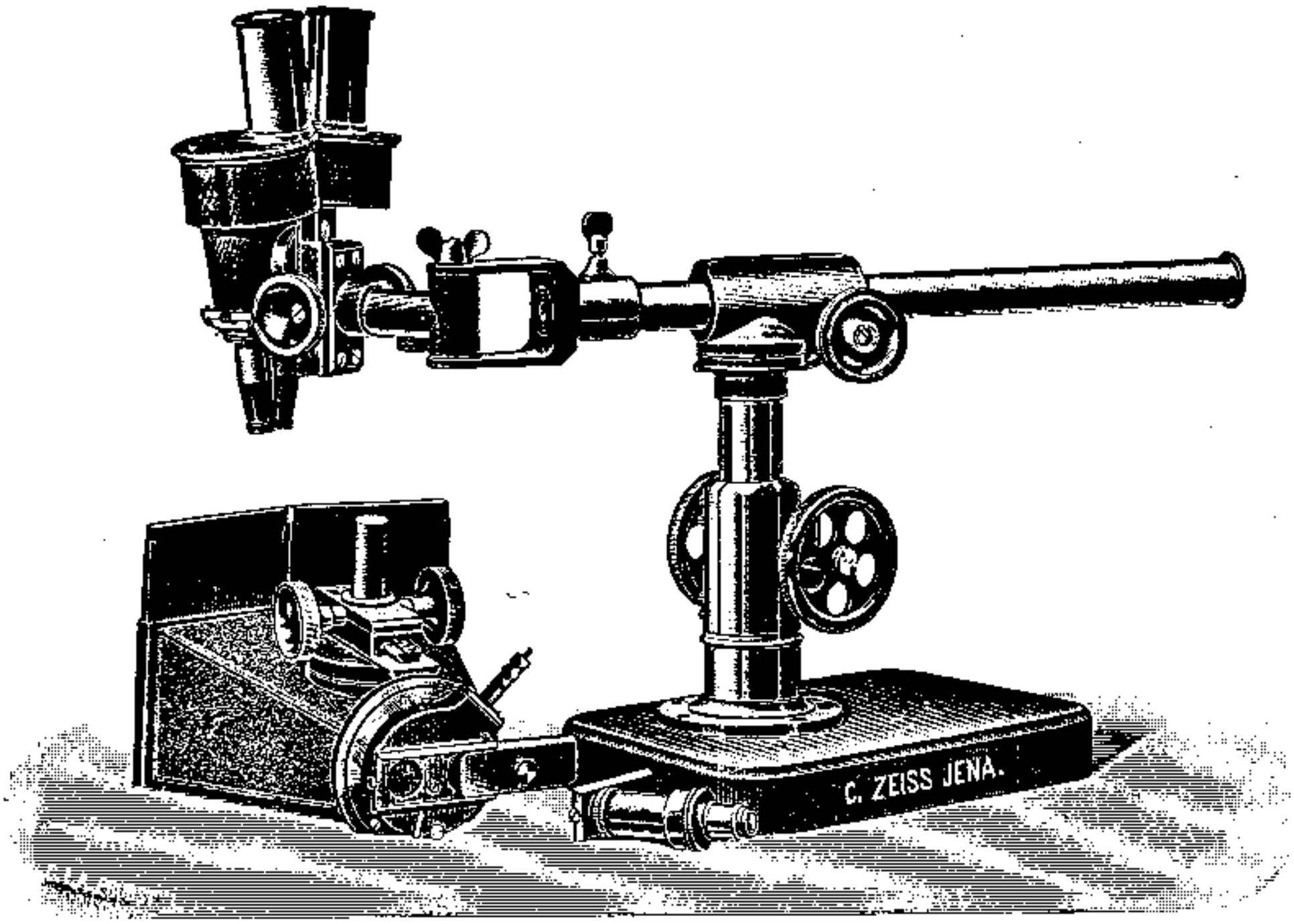


Fig. 18.
Drüner's Stereoscopic Camera and Stand X^b.
($^1/_4$ full size.)

The **camera** consists of two bodies, inclined to each other at the same angle as the tubes of our binocular stands. The focusing screens, or thin plate-metal slides for 6 × 9 cm plates, are inserted at the top.

The **time and instantaneous shutter** is fitted to the lower side — in the drawing the side facing the observer. The shutter is set by pulling the little bead seen very near the bottom. The little lever on the left of the bead serves to adjust the shutter for either "time" or "instantaneous" exposure. The release is effected either pneumatically, or by finger pressure upon the thin pin which is seen projecting from the joint for attaching a rubber tube.

For protection against dust a slide (seen above partly withdrawn) may be pushed into the objective slide.

The camera (like the binocular tube body) has an independent rack and pinion movement. The pinion casing is fitted with a similar stem to the binocular body, so that the two parts may be interchanged on Stand X^b. When using Stand X^a, the stem serves to attach the camera to a special column which screws upon the stage of that stand.

No.	Description	Price Marks	Code-word
728	**Carrier** for attaching the stereoscopic camera to the lower body of Stand **X**[a]	8.—	**Dichrure**
	Fuller particulars regarding Stands **X**[a] *and* **X**[b] *may be found in our Catalogue of Microscopes, 32nd edition, 1902, pp. 72—76.*		
	The following are the prices of Stands **X**[a] and **X**[b], including the double tube, but **exclusive of camera, objectives** and **eye-pieces:**		
	Stand X[a] (Binocular Stand)	195.—	**Dichtkunst**
	Stand X[b] (BRAUS-DRÜNER's Binocular Dissecting Stand) (Fig. 18)	260.—	**Dichtregel**
	Dissecting Stage for Stand **X**[b]	60.—	**Dichtung**
	Pairs of Objectives, applicable to either camera or double tube, see p. 17 of this catalogue.		
729	**Focusing Lens,** magnification × 6	26.—	**Diciamo**

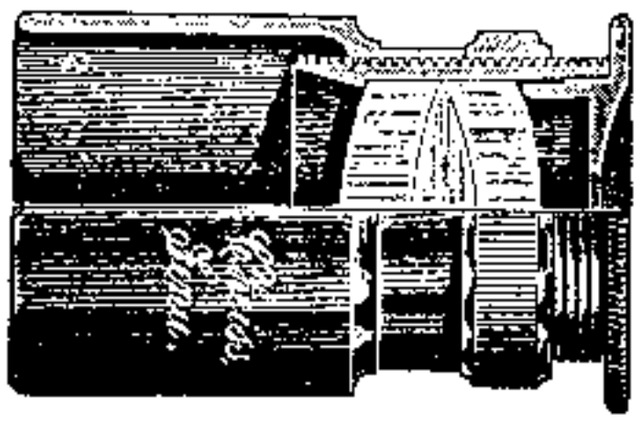


Fig. 19.
Focusing Lens (× 6).
(About ¾ full size.)

The lens combination is adjustable within the outer wide tube by screwing it in or out, so that the crossed line on the polished glass plate can be sharply focused. The correct position is maintained by tightening the milled clamping ring.

In the following pages we submit a series of complete photo-micrographic outfits, which will probably meet the various requirements of regular work in the field of biological research. Each one of the combinations will, of course, admit of expansion or simplification within certain limits. Any proposed variations may be readily decided on by reference to the pages of this catalogue. As regards the equipment of the microscope, we would also refer to our Catalogue of Microscopes, 32nd edition, 1902.

We have not included specifications of outfits primarily intended for some specific purpose as, for instance, sets of appliances for photographing metals, or similar opaque objects, by reflected light; but we shall gladly furnish special estimates whenever required.

The **large Photo-micrographic Apparatus** can also be applied to the **projection** of microscopical preparations for purposes of class demonstration, providing the source of light possesses sufficient power (electrical arc-light or, with low magnification and in small lecture-rooms, limelight also). If the requisite accessory apparatus are available — with regard to which please see our "Price List relating to the large Projection Apparatus" — it may be applied to other projection purposes also.

Appliances for Photo-micrography.

		Price	Total	Code-word
A. Large Photo-micrographic Apparatus.				
a. Camera and Accessories.				
Large adjustable photo-micrographic camera, No. 712	M.	290.—		
or				
Large photo-micrographic camera with non-adjustable stand, No. 713	„	200.—		
or				
Large photo-micrographic camera without stand, No. 714	„	170.—		
1 extra double dark slide for 24 × 24 cm plates, No. 715	„	20.—		
Movable dark slide for making exposure scales, No. 717	„	48.—		
5 plate carriers, No. 716 for each 13 × 18 cm and 9 × 12 cm plates	„	15.—		
Focusing glass, No. 729	„	26.—		
Stool, No. 718	„	20.—	M.	419.— Dicis
	or		„	329.— Dicitis
b. Microscope.	or		„	299.— Dicitore
Stand Ic, No. 646	M.	400.—		
Focusing gear, No. 650	„	45.—	„	445.— Dicitura

Optical Equipment of the Microscope:

1.

Apochromatic objectives:

16 mm, n. Ap. 0,30	8 mm, n. Ap. 0,65	4 mm, n. Ap. 0,95		
80.—	100.—	140.—		
3 mm, n. Ap. 1,40	**2 mm, n. Ap. 1,30**			
400.—	300.—		M.	1020.—

Compensating eye-pieces:

2	4	8	12	18		
20.—	20.—	30.—	30.—	25.—	„	125.—

Projection eye-pieces:

2	4		
40.—	40.—	„	80.—
		M.	1225.—

Carl Zeiss, Optische Werkstaette, Jena.

	Price	Total	Code-word
Brought forward	M. 1225.—		
Achromatic condensers:			
No. 657, n. Ap. **1,0**	„ 75.—		
No. 658, n. Ap. **1,30**	„ 100.—		
Centring appliance, No. 659, for objectives which are to be used as condensers	„ 12.—		
Micro-planars:			
20 mm 100.— **35 mm** 100.— **50 mm** 100.— **75 mm** 120.— **100 mm** 120.—	„ 540.—		
Two simple-lens condensers, Nos. 660—662:			
1 6.— and **2** 4.— (with regard to set c, **1** and **2** on p. 57 see p. 35)	„ 10.—		
or			
2 4.— and **3** 4.— (with regard to set c, **3** on p. 58 see p. 35)	„ 8.—		
Stage micrometer, No. 684, 1 mm divided in 100 parts .	„ 10.—		
Stage micrometer, No. 685, 10 mm, one divided in tenths	„ 6.—		
Rule on plate-glass, No. 691, 10 cm divided in $^1/_1$ mm .	„ 3.50		
Rule on plate-glass, No. 690, 5 cm divided in $^1/_2$ mm .	„ 2.50		
MALTWOOD's Finder, No. 704	„ 20.—		
Sliding objective changers, Nos. 677 and 678, for 5 objectives	„ 60.—		
Case for above, No. 680	„ 15.—	M. 2079.—	**Dickicht**
	or	„ 2077.—	**Dicklaubig**

2.

Achromatic objectives (to be used only with yellow light and orthochromatic plates, see p. 18):			
A 24.— **C** 36.— **DD** 54.— **1/12, n. Ap. 1,30** 160.—	M. 274.—		
HUYGENIAN eye-pieces:			
2 7.— **4** 7.— **5** 7.—	„ 21.—		
Projection eye-pieces:			
2 40.— **4** 40.—	„ 80.—		
Correction lenses for large image distances:			
for **C** and for **DD** a M. 7.—	„ 14.—		
Achromatic condenser, No. 657, n. Ap. 1,0	„ 75.—		
Projection lenses:			
35 mm 35.— **70 mm** 40.—	„ 75.—		
Two simple-lens condensers, Nos. 660—662:			
1 6.— and **2** 4.— (with regard to set c, **1** and **2** on p. 57 see p. 35)	„ 10.—		
or			
2 4.— and **3** 4.— (with regard to set c, **3** on p. 58 see p. 35)	„ 8.—		
	M. 549.—		
	M. 547.—		

	Price	Total	Code-word
Brought forward	M. 549.—		
or	M. 547.—		
Stage micrometer, No. 684, 1 mm divided in 100 parts	„ 10.—		
Rule on plate-glass, No. 690, 5 cm divided in 1/2 mm	„ 2.50		
MALTWOOD's Finder, No. 704	„ 20.—		
Sliding objective changers, Nos. 677 and 678, for 5 objectives	„ 60.—		
Case for above, No. 680	„ 15.—	M. 656.50	Diekrippe
Other combinations, compiled primarily with a view to the requirements of visual microscopic observation, may be found in our Catalogue of Microscopes, 32nd edition,' 1902, pp. 144 et seq.	or	„ 654.50	Dieksonie

c. Projection Table and Accessories.

Projection table with optical bench, No. 601	M. 100.—		
or			
Table top with optical bench, No. 602	„ 40.—		
Sole-plate for the microscope, No. 606	„ 26.—		
Elevating gear, No. 607	„ 15.—		
Mirror, No. 608, to stand on sole-plate	„ 6.—		
Light-excluding screen, No. 609 (only required with limelight or electrical light)	„ 30.—	„ 177.—	Dickwalken
	or	„ 117.—	Dielapode

Equipment of the Projection Table:

1) for electrical arc-light or limelight

Iris-diaphragm on saddle-stand, No. 638	M. 30.—		
or			
Iris-diaphragm on saddle-stand, with micrometer movement, No. 705	„ 46.—		
Light-filter carrier on saddle stand, with 2 troughs, No. 644	„ 24.—		
Concave lens on saddle-stand, No. 637	„ 15.—		
Single-lens condenser component, size I, on saddle-stand, No. 635b	„ 40.—		
Water chamber, size I, on saddle-stand, No. 641	„ 50.—		
Double-lens condenser component, size I, on saddle-stand, No. 635a	„ 55.—	„ 214.—	Dielinate
Arc-lamps, carbons, resistance coils, transformers and gauges as required, according to nature of available electrical installation; see pp. 3—4.	or	„ 230.—	Dicoeca
Limelight lamp, No. 623	M. 52.—		
Lime cylinders, No. 624, per dozen	„ 6.—		
Steel cylinder, No. 625, with oxygen	„ 45.60		
Pressure-reducing valve with gauge, No. 627	„ 45.—	„ 148.60	Dicordio
Where no gas supply is available, add			
Steel cylinder, No. 625 with hydrogen	M. 45.60		
Pressure-reducing valve, No. 627, with gauge	„ 45.—	„ 90.60	Dicrane

2) for lamplight

Iris-diaphragm on saddle-stand, No. 638	M. 30.—		
or			
Iris-diaphragm on saddle-stand, with micrometer movement, No. 705	„ 46.—		

	Price	Total	Code-word
Brought forward	M. 30.—		
or	M. 46.—		
Light-filter carrier on saddle-stand, with 2 troughs, No. 644	„ 24.—		
2 single-lens condenser components, size I, No. 635 b	„ 80.—		
Incandescent gas lamp on round foot, No. 628	„ 15.—	M. 149.—	**Dicroa**
ou		„ 165.—	**Dicrotos**

Specifications **1** and **2** admit of preparations up to 10 cm diameter being photographed by transmitted light, the object resting on an iris-diaphragm (No. 705 for preference) and the objective being attached to the camera front.

3) for lamplight (a simpler set)

Light-filter carrier on saddle-stand, with 2 troughs, No. 644	M. 24.—		
Collective lens with iris-diaphragm, on saddle-stand, No. 639	„ 30.—		
Incandescent gas lamp on saddle-stand, No. 629	„ 18.—	„ 72.—	**Dicrudi**

Specification **3** admits of photographing by transmitted light any preparation the diameter of which does not exceed that of the opening of the microscope stage (30 mm).

4) for sunlight

Iris-diaphragm on saddle-stand, No. 638	M. 30.—		
Light-filter carrier on saddle-stand, with 2 troughs, No. 644	„ 24.—		
Water chamber, size I, on saddle-stand, No. 641	„ 50.—		
Collective lens on saddle-stand, No. 634	„ 20.—		
Plane mirror with coarse and fine adjustment, No. 633	„ 60.—		
Heliostat by FUESS, No. 632	„ 280.—	„ 464.—	**Dictadas**

For medium and low magnifications it is advisable to add one of the sets c, **2** or c, **3**, but without light-filter stand and iris-diaphragm.

d. Appliances for photographing horizontal objects with the microscope in the vertical position

1) only to be used with eye-pieces, camera must be adjustable in height

Small reversing prism in mount (p. 15)	M. 20.—	„ 20.—	**Diaprassio**

2) for use either with or without eye-pieces

Vertical camera, No. 723, to stand on projection table	M. 95.—		
1 extra double dark slide for 13 × 18 cm plates	„ 15.—		
4 plate-carriers for 9 × 12 cm plates	„ 6.—	„ 116.—	**Dictamen**

B. Combined Horizontal and Vertical Camera.

a. Camera and Accessories

Horizontal and vertical camera, No. 719	M. 150.—		
1 extra double dark slide for 21 × 21 cm plates, No. 720	„ 18.—		
	M. 168.—		

	Price	Total	Code-word
Brought forward	M. 168.—		
Movable dark slide for making exposure scales, No. 722	„ 40.—		
5-plate carriers, No. 721, for each 13 cm × 18 cm and 9 cm × 12 cm plates	„ 15.—		
Focusing lens, No. 729	„ 26.—	M. 249.—	**Dictaron**

b. Microscope

Stand **Ic**, No. 646	M. 400.—		
Focusing gear, No. 650	„ 45.—	„ 445.—	**Dictatrix**
or			
Stand **IIa**	M. 290.—		
Simplified focusing gear, No. 654	„ 9.—	„ 299.—	**Dicterais**
or			
Stand **IVa**	M. 250.—		
Simplified focusing gear, No. 654	„ 9.—	„ 259.—	**Dicticos**

Optical Equipment of the Microscope:

with regard to Stand **Ic** see under **A**, p. 55,
for Stand **IIa** and **IVa** as specified below, viz:

I.

Apochromatic objectives:

16 mm, n. Ap. **0,30**	**8 mm**, n. Ap. **0,65**
80.—	100.—
4 mm, n. Ap. **0,95**	**2 mm**, n. Ap. **1,30**
140.—	300.—

. . . . M. 620.—

Compensating eye-pieces:

4	**8**	**12**
20.—	30.—	30.—

. . . . . „ 80.—

Projection eye-pieces:

2	**4**
40.—	40.—

. . . . . „ 80.—

In case of restriction to a single projection eye-piece, No. 4 would be the best to select.

Achromatic condenser, n. Ap. **1,0**, No. 657 . . . . . „ 75.—

Micro-planars:

20 mm	**50 mm**
100.—	100.—

. . . . . „ 200.—

The narrowness of the body tubes of all but Stand **Ic** does not admit of the utilization of the full field of view of above lenses.

Simple-lens condenser **2**, No. 661	„ 4.—		
Stage micrometer, No. 684, 1 mm divided in 100 parts	„ 10.—		
Rule on plate-glass, No. 690, 5 cm divided in $^1/_2$ mm	„ 2.50		
Sliding objective changer, Nos. 677 and 678, with 4 objective slides	„ 50.—		
Case for above, No. 680	„ 15.—	„ 1136.50	**Dictito**

	Price	Total	Code-word

2.

Achromatic objectives (to be used only with yellow light and orthochromatic plates, see p. 18):

A	C	E	1/12", n. Ap. 1,30			
24.—	36.—	66.—	160.—	. . . .	M. 286.—	

HUYGENIAN **eye-pieces:**

2	4	5				
7.—	7.—	7.—	. . . . .	„	21.—	
Projection eye-piece 4	. . . . .			„	40.—	
Achromatic condenser, n. Ap. 1,0, No. 657	. . . . .			„	75.—	
Projection lens 35 mm	. . . . .			„	35.—	
Simple-lens condenser 2, No. 661	. . . . .			„	4.—	
Stage micrometer, No. 684, 1 mm divided in 100 parts	.			„	10.—	
Rule on plate-glass, No. 690, 5 cm divided in 1/2 mm	.			„	2.50	
Sliding objective changer, Nos. 677 and 678, for 4 objectives				„	50.—	
Case for above, No. 680	. . . . .			„	15.—	M. 538.50 **Dictycie**

Other combinations, primarily compiled with a view to the requirements of ordinary visual observation, may be found in our Catalogue of Microscopes, 32nd edition, 1902, pp. 144 et seq.

c. Set of Appliances including an optical bench

1) for lamplight

Optical bench, to attach to camera, No. 605	. . . . .	M.	20.—		
Light-filter carrier on saddle-stand, with 2 troughs, No. 644		„	24.—		
Collective lens with iris-diaphragm, on saddle-stand, No. 639		„	30.—		
Incandescent gas lamp on saddle-stand, No. 629	. . . .	„	18.—	„ 92.—	**Dictyode**

2) for sunlight

Optical bench, to screw on table, No. 603	. . . . .	M.	20.—		
or					
Optical bench, to attach to camera, No. 604	. . . . .	„	20.—		
Iris-diaphragm on saddle-stand, No. 638	. . . . .	„	30.—		
Light-filter carrier on saddle-stand, with 2 troughs, No. 644		„	24.—		
Water chamber, size I, No. 641	. . . . .	„	50.—		
Collective lens on saddle-stand, No. 634	. . . . .	„	20.—		
Plane mirror with coarse and fine adjustment, No. 633	.	„	60.—		
Heliostat by FUESS, No. 632	. . . . .	„	280.—	„ 484.—	**Dicyrte**
		or		„ 484.—	**Didacticos**

For medium and low magnifications it is advisable to add a set c, 1, but without light-filter stand and optical bench.

d. Set without optical bench.

Light-filter carrier on round foot, with 2 troughs, No. 645	M.	24.—		
Collective lens with iris-diaphragm on round foot, No. 640	„	30.—		
Incandescent gas lamp on round foot, No. 628	„	15.—	„ 69.—	**Didam**

With sunlight it is best to make use of a set including an optical bench.

	Price	Total	Code-word

C. Vertical Camera.

a. Camera and Accessories

Vertical Camera, No. 723	M. 95.—		
1 extra double dark slide, No. 724, for 13 × 18 cm plates	„ 15.—		
4 plate carriers, No. 725, 9 × 12 cm plates	„ 6.—		
Focusing lens, No. 729	„ 26.—	M. 142.—	Didatis

b. Microscope

Stand Ic, No. 646	M. 400.—		
Simplified focusing gear, No. 652	„ 4.—	„ 404.—	Dideau
or			
Stand IIa	M. 290.—		
Simplified focusing gear, No. 654	„ 9.—	„ 299.—	Didelpho
or			
Stand IVa	M. 250.—		
Simplified focusing gear, No. 654	„ 9.—	„ 259.—	Didendo

Optical Equipment of the Microscope:

as specified under A and B, pp. 55, 59 and 60.

For more moderate requirements the following may suffice, viz:

Stand VIa with condenser, No. 668	M. 150.—	„ 150.—	Didicero

Other specifications, compiled principally with a view to the requirements of ordinary visual observation, may be found in our Catalogue of Microscopes, 32nd edition, 1902.

c. Outfit for Lamplight, without optical bench

Light-filter stand with 2 troughs, on round foot, No. 645	M. 24.—		
Collective lens with iris-diaphragm, on round foot, No. 640	„ 30.—		
Incandescent gas lamp, on round foot, No. 628	„ 15.—	„ 69.—	Didimele