Catalogue No. 44 D.

Microscope Accessories.

E. LEITZ

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Notices and Terms.

This Catalogue supersedes all previous editions.

Continual additions to the existing number of Accessories for the Microscope and improvements upon instruments described in previous editions occasion unavoidable changes in the item numbers prefixed to the appliances listed in any new edition which we may bring out from time to time.

To obviate errors, all written orders should indicate the prefixed item number as well as the edition (in this case No. 44 D) from which the required articles have been selected.

In telegraphic orders it will be sufficient to use the codewords appended to the respective items, and these will be found useful for the purpose of identifying any required item in written orders.

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44 J. **Prismatic Binoculars.**

We shall be pleased to lend authors electros of illustrations contained in our catalogues and supplementary publications.

The illustrations contained in these catalogues should not be regarded as binding upon us in every detail, it being our continual aim to improve upon designs as experience may suggest.

Telegraphic Address: Microtome, Westcent, London.

London, March 1913.

E. LEITZ.

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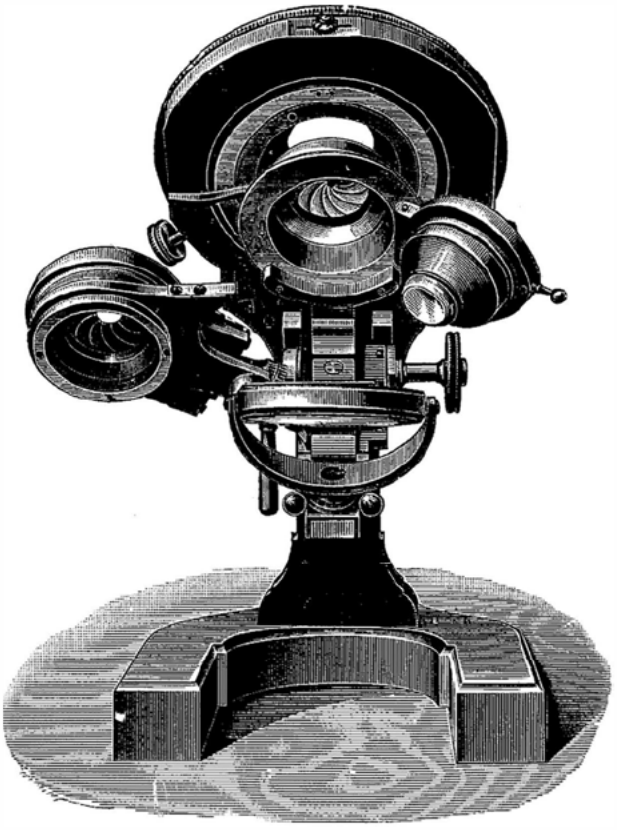
Substage Mechanism and Condensers.

The most convenient means of regulating the illumination of an object which is to be viewed by transmitted light under the microscope is furnished by the apparatus known as Abbe's Illuminating Apparatus. The larger patterns of our stands are provided with this illuminator, whilst the stands of intermediate size have a simplified illuminator or are fitted with provisions by means of which it may be supplemented at any future time.



Large Substage, Pattern a.

The illuminators are of various more or less elaborate forms to suit general and special requirements and differ in size according to the stands for which they are designed.

Moreover, the substage fittings may be provided with condensers differing in their apertures and their optical correction. Condensers of high aperture afford a means of bringing out the full resolving powers of an objective and possess the further advantage that they are available for the purpose of producing dark-ground illumination.

When used dry, i. e. without the interposition of an immersion fluid, the condenser cannot have a greater aperture than 1.0 N. A. since rays inclined beyond a certain limit are totally reflected. For ordinary observation in transmitted light the dry condenser amply suffices and has the advantage of being simple and easy to manipulate. In more exacting cases, where it becomes necessary to employ the full aperture of the condenser, the gap between the latter and the object slide should be filled up with a layer of oil. Under these conditions it is most desirable to have the object embedded in a highly refracting medium to obviate total reflection at the upper surface of the object slide. Spherical and chromatic correction have an important bearing upon results in photo-micrography and observation by the method of dark-ground illumination, where much depends upon the absence of colour and the brightness of the field.

No.		£ d. s.	Codeword
80.	**Large substage, Type a***). This apparatus is made up of the following parts: Plane and Concave Mirror of 50 mm diameter, above which are mounted a Swing-out and Rotating Iris-Diaphragm in a carrier fitted with a Rack and Pinion for oblique illumination and a Cylinder Iris Diaphragm, together with a Swing-out Two-lens Condenser having a numerical aperture of 1.20 (No. 99). The condenser and iris-diaphragm are made to slip into a sprung sleeve. A small recess is provided in the mount below the iris-diaphragm for the accommodation of ground glass and coloured glass discs, which are supplied with the substage for use with artificial light. The substage is fitted with rack and pinion by means of which it may be raised and lowered in an axial direction so as to focus the illuminating pencil in the most advantageous position relatively to the plane of the object .	**3. 15. 0.**	**Illuminant**

*) Stands A and B are invariably provided with a substage of the A pattern fitted with a three-lens condenser No. 100. If desired, Stands C, D, Ia and Ib may likewise be equipped with a substage of this type.

No.		£ s. d.	Codeword
81.	**Large Substage, Type a,** with **three-lens Condenser** of N. A. 1.40 No. 100	**4. 0. 0**	**Illumano**
82.	**Large Substage, Type a,** with **aplanatic Condenser** of N. A. 1.40 No. 101	**6. 0. 0**	**Illumiante**
83.	**Large Substage, Type b,***) which comprises the following parts: Plane and Concave Mirror of 50 mm diameter, Swing-out and Rotating Iris Diaphragm with rack and pinion for oblique illumination, and above this a Two-lens Condenser of N. A. 1.20, and a Cylinder Diaphragm with a set of three stops for use in the place of the condenser, together with a ground glass and coloured glass discs	**3. 0. 0**	**Illuminer**
84.	**Large Substage, Type b,** with **three-lens Condenser** of N. A. 1.40 No. 100	**3. 5. 0**	**Illumare**
85.	**Large Substage, Type b,** with **aplanatic Condenser** of N. A. 1.40 No. 101	**5. 5. 0**	**Illumiar**
86.	**Medium sized Substage, Type ccs,** with Swing-out Two-lens Condenser, Cylinder Iris Diaphragm, and Side Screw for raising and lowering the condenser**). This substage comprises the following parts: Plane and Concave Mirror of 40 mm diameter, mounted in various ways to suit the pattern of stand to which it is to be attached, Substage Fitting with sprung sleeve, Cylinder Iris Diaphragm to slide into this sleeve, Two-lens Condenser of N. A. 1.20 No. 99, with permenently attached Iris-diaphragm and connected thereto by a joint, about which it may be swung aside, and Side Screw for raising and lowering the substage as a whole along the optic axis, a set of ground glass and coloured glass discs to rest on the swing-out ring fitting below the iris-diaphragm	**2. 5. 0**	**Illumassi**
87.	**Medium sized Substage, Type ccs,** with **three-lens Swing-out Condenser** of N. A. 1.40 No. 100, **Cylinder iris-diaphragm** and **side Screw**	**2.10. 0**	**Illumaste**

*) This substage forms part of stands C, D, Ia and Ib, unless a different pattern of substage condenser is expressly ordered.

**) The Medium Sized Substages ccs and cc, as well as cs and c as the case may be, can be adapted to the large stands C, D, Ia, and Ib, as well as to the medium sized Stands E. F. G. H. GH, II, IIa and IIb.

No.		£. d. s.	Codeword
88.	**Medium Sized Substage Illuminating Apparatus, Type ccs,** with **aplanatic Swing-out Condenser** of N. A. 1.40 No. 101 with **Cylinder iris diaphragm** and **side screw**	**4. 10. 0**	**Illumera**
89.	**Medium Sized Substage, Type cc,** with **Swing-out Two-lens Condenser** of N. A. 1.20 No. 99 and **Cylinder Iris Diaphragm.** This substage is identical with that described under Item No. 86, except that the fitting with side screw for raising and lowering it is dispensed with, the entire fitting being screwed directly to the underside of the microscope stage	**2. 0. 0**	**Illumerete**
90.	**Medium Sized Substage, Type cc,** with **Swing-out Three-lens Condenser** of N. A. 1.40 No. 100, and **Cylinder Iris Diaphragm**	**2. 5. 0**	**Illumiadas**
91.	**Medium Sized Substage, Type cc** with **Swing-out Aplanatic Condenser** of N. A. 1.40 No. 101, and **Cylinder Iris Diaphragm**	**4. 5. 0**	**Illumianda**
92.	**Medium Sized Substage, Type cs,** with Side Screw for raising and lowering the substage. The substage comprises a Plane and Concave Mirror of 40 mm diameter, a Substage Fitting with elastic sleeve capable of being raised and lowered by means of a Side Screw, a Two-lens Condenser of N. A. 1.20 No. 99, with a fixedly attached Iris Diaphragm to slide into the sprung sleeve of the substage, and a Cylinder Diaphragm provided with a set of Three Stops and interchangeable against the condenser, also ground glass and coloured glass discs to rest on the swing out ring below the iris-diaphragm	**1. 10. 0**	**Illuminism**
93.	**Medium Sized Substage, Type cs,** with **Side Screw** for raising and lowering the substage, **Three-lens Condenser** of N. A. 1.40, No. 100, with **Iris Diaphragm,** and **Cylinder Diaphragm** with set of three stops, and ground glass and coloured glass discs	**1. 15. 0**	**Illuminate**
94.	**Medium Sized Substage, Type cs,** with **Side Screw, Aplanatic Condenser** of N. A. 1.40, **Iris Diaphragm** with set of **Three Stops,** ground glass and coloured glass discs	**3. 15. 0**	**Illuminado**
95.	**Medium Sized Substage, Type c.** This illuminator is in every detail similar to No. 92, excepting that, being without a side screw, it fits direct into the sprung sleeve under the stage	**1. 5. 0**	**Illuminist**

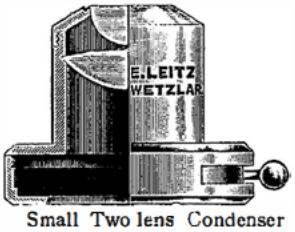
No. £ s. d. Codeword

96. **Medium Sized Substage, Type c,** with **Three-lens Condenser** of N. A. 1.40 No. 100, **Iris Diaphragm,** and **Cylinder Diaphragm** with set of Three Stops, ground glass and coloured glass discs . . . . . **1. 10. 0 Illuminavi**

97. **Medium Sized Substage, Type c,** with **Aplanatic Condenser** of N. A. 1.40 No. 100, **Iris Diaphragm,** and **Cylinder Diaphragm** with set of Three Stops, ground glass and coloured glass discs . . . . . **3. 10. 0 Illumineis**

In addition to the illuminators described above we supply the following smaller pattern:

98. **Small Condenser, Type d,** for attachment to the small Stand IV, assuming this to be fitted with a cylinder diaphragm. This illuminator consists likewise of a somewhat smaller two lens condenser than that forming part of the substage c and an iris-diaphragm permanently attached to the condenser **1. 0. 0 Illuminum**

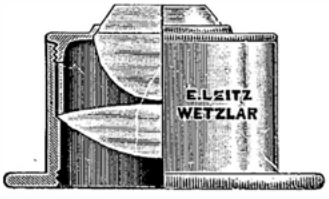


Small Two lens Condenser
N. A. 1.0.

There is no extra charge for the subsequent adaptation of any of these illuminators to our stands.

Condensers.

The various condensers which can be supplied with the substage fittings described above differ both in their optical features and their light-gathering power.



Two-lens Condenser
N. A 1.20



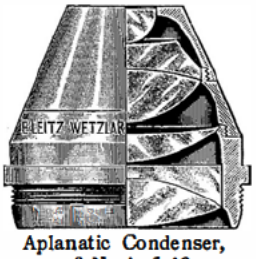
Three lens Condenser
N. A. 1.40.

99. **The Two-lens Condenser** has a N. A. 1.20 and suffices for all practical observations in a bright ground field with dry as well as immersion lenses. It is not available for producing dark ground illumination . . . **0. 15. 0 Illuminem**

No. £ s. d. Codeword

100. **The Three-lens Condenser** of N. A. 1.40 is primarily intended for use as an immersion condenser, and when so used will render the full aperture of an oil-immersion objective available for observation. It can be used with excellent results in the examination of objects embedded in a highly refracting medium. It can also be used in conjunction with the Centre Iris Diaphragm No. 104, or with the Centre Stop No. 105 for dark-ground illumination. . . . . **1. 0. 0.** Illuming

101. **The Aplanatic Condenser** is an application of the principle of oil-immersion lenses and, like these, is chromatically and spherically corrected and satisfies the sine condition. Its focal length is 8.5 mm and the working distance is 1.2 mm, which admits of the use of object slides up to 1.2 mm thick. This condenser is capable of extensive and varied application. In ordinary observation it may serve as a dry condenser of N. A. 1.0, and it offers special advantages in **photo-micrographic work** owing to the uniform and **colour-free** illumination which it supplies. When used as an **Immersion Condenser** of N. A. 1.40 it may be made the means of obtaining very wide angled or very oblique illuminating pencils. Its great light gathering power is of considerable practical advantage in observations under high magnifications. As an illuminator in connection with photo-micrographic work it reduces the requisite time of exposure by about 30%*) When used in conjunction with a centre stop placed upon the diaphragm carrier it constitutes a very efficient **dark-ground condenser** furnishing illuminating pencils having numerical apertures ranging from 1.1 to 1.40.



Aplanatic Condenser, of N. A. 1.40.

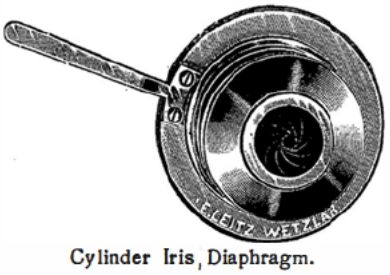
As a result of its very high degree of aplanatic and chromatic correction the image as seen in the eyepiece is remarkably free from colours and the effects of diffraction and reflections.

Aplanatic Condenser of N. A. 1.40 in screw mount . **3. 0. 0** Illumi

*) Dry mounted preparations, such as the usual kinds of test slides of Scales and diatoms, are not adapted for testing this condenser, and they are not rendered so by the interposition of a layer of immersion-oil, since the total reflection which occurs at the upper surface of the slide prevents the effective aperture from rising above N. A. 1.0.

No. £ s. d. Codeword

102. **Cylinder Iris Diaphragm** for **Substage b** and **c.** This iris-diaphragm fits in the place of the condenser into the sprung sleeve below the stage of the microscope . . **0.10. 0 Zylinder**



Cylinder Iris, Diaphragm.

103. **Iris Diaphragm** for the older patterns of our substage illuminators . . . . . **0.10. 0 Iris**

104. **Centre Iris Stop** for dark-ground illumination in con junction with condensers Nos. 100 and 101 . . . . **0.10. 0 Zentral**

105. **Centre Stop** with three interchangeable stops for dark-ground illumination in conjunction with Condensers Nos. 100 and 101 . . . . . **0. 2. 6 Zentro**

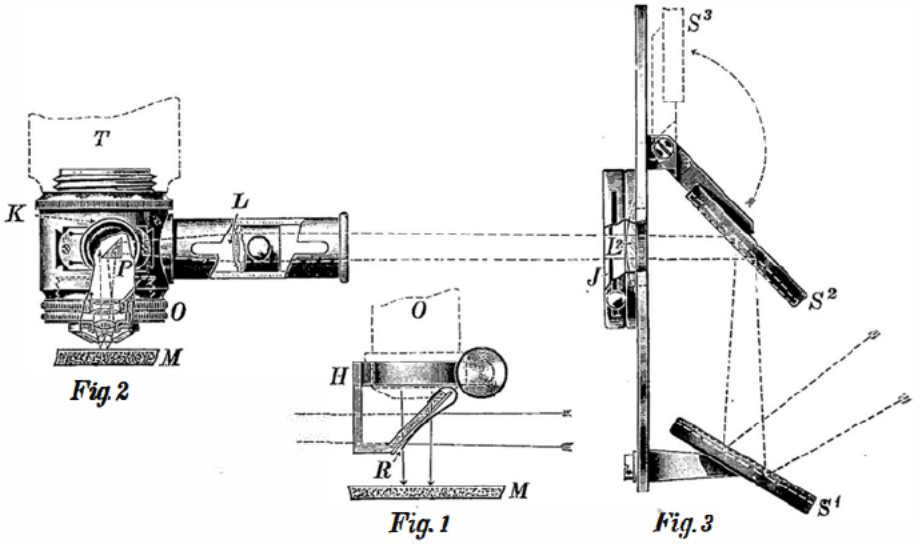


Fig. 2 *Fig. 1* *Fig. 3*

Vertical Illuminator with Mirror & Lens Stand No. 109.

Vertical Illuminator. For the illumination of opaque objects viewed under the microscope we have devised a Vertical Illuminator which is available for use with daylight as well as artificial light, and in either case gives sharp images which are absolutely free from flares and haziness. It consists of three separate parts. For observation in conjunction with the Low Power Objectives Nos. 1 and 2 the Illuminator takes the form of Holder H, which carries a

thin glass plate inclined at an angle of 45° and which attaches by a clamping ring to the objective mount, as shown in Fig. 1.

The **Vertical Illuminator** proper, as designed for use with high power lenses from No. 3 up to and including oil-immersion lenses, is shown in Fig. 2. It consists of a cylindrical body with an upper screw thread for attachment to the microscope, whilst the lower one receives the objective.*) In front, the cylindrical portion of the body is fitted with a short tube within which moves a draw-tube fitted with a condensing lens. On the right the cylindrical casing has a rectangular aperture for the insertion of small interchangeable and movable slides. One of these carries a totally reflecting prism, the other a spring clip for the attachment of a mica plate.

The **Mirror and Lens Stand.** (Fig. 3). Is mounted on a heavy iron foot from which rises an upright iron rod having a circular disc attached to it by a sliding fitting. At the centre this round disc is fitted with an immovable mounted plano-convex lens L_2 and in front of this lens is an iris-diaphragm I, by means of which the pencil of light transmitted through the lens may be diminished as may be required in any given case. At the back of the disc the frame carries two mirrors S_1 and S_2. Of these the lower one is fixed at an angle of 45°, whilst the upper mirror above the lens L_2 can be folded down. When not in use, this mirror will occupy the position S_3 indicated by dotted lines.

For accurately centring the condensing lens L_2 with respect to the optic axis of the Vertical Illuminator the disc is fitted with a finely cut screw.

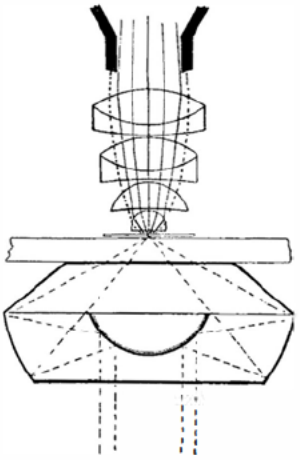
Each apparatus is supplied with detailed Directions.

No.		£ s. d.	Codeword
106.	**Reflecting Plate Holder**	**0. 5. 0**	**Opacabam**
107.	**Vertical Illuminator,** for use with high power objectives with two interchangeable slides, one being fitted with a prism and the other a reflecting plate holder to carry a plate of mica. In case	**2. 5. 0**	**Opacabis**
108.	**Mirror and Lens Stand,** consisting of a large screen disc with fixedly mounted condensing lens, iris-diaphragm and two movable mirrors	**1. 5. 0**	**Opacamus**
109.	**Vertical Illuminator** with **Mirror and Lens Stand** . .	**3. 15. 0**	**Opaca**

*) For use with the Vertical Illuminator we supply objectives from No. 3 upwards in special short mounts

Reflecting Condensers.

Our improved Concentric Reflecting Condensers, as computed by Dr. F. Jentzsch,*) of our Research Dept., serve for observation in darkground illumination and are more especially adapted for bringing into view living and unstained bacteria.

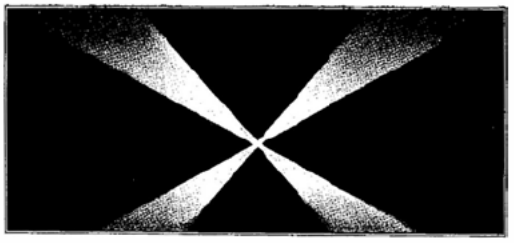


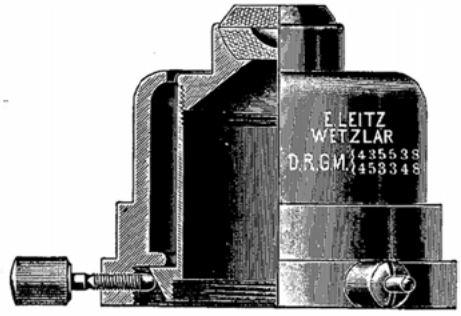
Trace of rays through condenser and $^1/_{12}$" oil immersion lens fitted with a conical stop No. 113.

The essence of this mode of observation lies in the establishment of striking contrasts between the intensely bright bacteria and the dark back ground against which they are viewed. The condenser devised for this purpose has two reflecting surfaces, one convex, the other concave, as shown in the diagram, which are so arranged as to bring the rays to a point in a very perfect manner, with the result that an intense illumination of the bacteria is obtained. Since the optical arrangement consists of reflecting surfaces only it follows that no chromatic defects can arise, whilst the amount of spherical aberration which is left uncorrected does not exceed 0,7 pe_r mille, which is practically negligible. It will thus be seen that the Concentric Reflecting Condenser approaches very closely the ideal condition of aplanatism.

That the actual trace of the rays conforms to what it should be theoretically will be seen from the annexed photo-micrograph.

*) Physikalische Zeitschrift, Vol. XI, pp. 993 1000, 1910. and Verhandlungen der Deutschen Physikalischen Gesellschaft, Vol. XII pp. 975—991.





In view of the refined optical correction of this condenser it is essential that it should be accurately centred and focussed.

To ensure this the Reflecting Condenser A is fitted with a Centring Device.

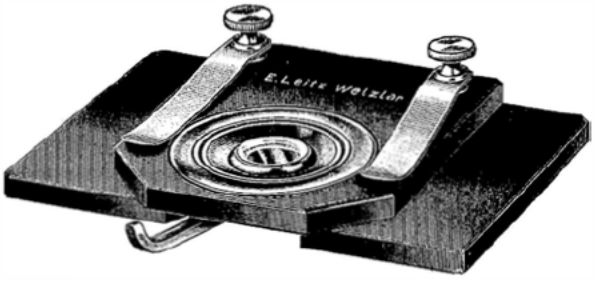
Since the illumination of the object is produced through the agency of rays comprised within an apertural zone of 1 to 1,35, N. A. it becomes necessary to stop down lenses of high apertures, such as immersion lenses, to about 0,9, so as to obviate the entrance into the objective of direct rays. This is effected by means of a conical stop.



Funnel Stop.

The funnel Stop, as shown in the annexed illustration, consists of the body of an objective mount with the funnel stop proper screwed in, over which screws the nickel-plated part of the lens mount.

In addition to the standard pattern of the Concentric Reflecting Condenser, as described above, we supply it mounted on a plate fitted with object clips. In this form it is simply laid on the stage of the microscope and held in position by means of the stage clips. This pattern will be referred to as the Reflecting Condenser B.



Reflecting Condenser, Pattern B.

The **Reflecting Condenser B** does not require to be specially adapted to any given existing microscope and is particularly useful in those cases where a microscope is either not of our make or has no substage, and also where the circumstances render it impracticable to send to our works the entire substage or even the cylinder diaphragm for the adaptation of a condenser of the A pattern.

For use with those of our stands which are fitted with the new draw-out pattern of the large Abbe substage apparatus we have devised another concentric reflecting condenser mount of extra large size listed as the **Reflecting Condenser AA.** This condenser is mounted in a sliding sleeve, whilst the centring device is dispensed with.

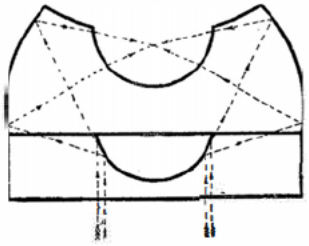
Detailed Directions are supplied with each Reflecting Condenser and may also be had on application.

No.		£	s.	d.	Codeword
110.	**Concentric Reflecting Condenser A** with Centring Device	**2.**	**0.**	**0**	**Condensera**
111.	**Concentric Reflecting Condenser B**	**2.**	**0.**	**0**	**Condensor**
112.	**Concentric Reflecting Condenser AA**	**2.**	**0.**	**0**	**Condenseis**
113.	**Funnel Stop** for use with oil immersion lenses . . .		**1.**	**0**	**Trichter**
	For observations with ultra-violet light we are prepared to supply Reflecting Condensers of fused quartz. In this case the price of the Condenser No. 110, 111, 112, will be	**4.**	**10.**	**0**	**Condentium**

The **Ultra Condenser,** an arrangement for bringing into view microscopically small particles, has been devised by Dr. F. Jentzsch*), of our Research Department, and serves for ultra-microscopic observations of Gases and Liquids, but it is not available for the examination of solids.

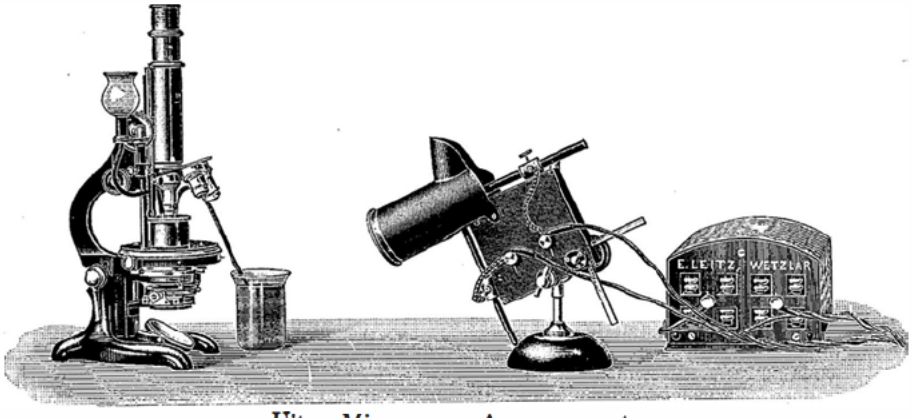
The designation "Ultra Condenser" is intended to suggest that the apparatus is an attachment by which an ordinary microscope can be rendered available for ultra-microscopic observations.

*) Physikalische Zeitschrift, Vol. XI, pp. 1000—1001. Verhandlungen der Deutschen Physikalischen Gesellschaft, Vol. XII, pp. 991—993, 1910.



Trace of Rays within the Ultra Condenser.

Whilst in the earlier applications of the principle of ultra-microscopic observation the illuminating pencil enters the system from one side only, the light transmitted through the Ultra Condenser is made to converge to a single point from all sides. This is achieved by the arrangement of two spherical reflecting surfaces furnished by two optically worked pieces of glass, as shown in the above diagram. Each ray is subjected to four successive reflections, twice before it encounters the particle and twice after leaving it. In this way the whole of the rays, with the exception of a small fraction, are made to leave the Ultra Condenser on the side on which the light enters. In the upper piece of glass a spherical chamber is ground out concentric with the point at which the rays intersect. This chamber provides a containing vessel for gases, vapours or liquids.



Ultra Microscope Arrangement.

The optical part of the condenser is permanently fitted into a metal case. The cover attaches by a bayonet joint and is fitted with a rubber ring which makes an air-tight joint between the cover and the rim of the container in the condenser. The cover

is also provided with two short tubes for the inlet and outlet of liquids or gases. Observation is made through a thin disc of quartz mounted in the middle of the cover.

If desired, the Ultra Condenser can be supplied with provision for producing electric sparks within the substance under examination. In this case the Ultra Condenser is supplied with an additional cover of ebonite fitted with terminals and two platinum electrodes reaching to the centre of the chamber.

The above illustration shows a convenient arrangement of a microscope with the Ultra Condenser attached. The condenser outfit includes a glass vessel with stand, a pinch cock and tubing for passing liquids into and out of the hollow chamber.

No.		£ s. d.	Codeword
114.	**Ultra Condenser** with **Glass Vessel, Holder,** and **Pinch Cock**	**4. 0. 0**	**Ultraismo**
115.	**Ultra Condenser** with **Sparking Device**	**5. 0. 0**	**Ultrato**

Artificial Sources of Light

for use with the microscope.

Luminescence Lamp. This lamp furnishes a beam of light which contains ultra-violet rays only and is used for the observation of fluorescent substances. The apparatus consists in the main of a Liliput Arc Lamp taking a current of 5 amperes, a condensing lens made of a material which transmits ultra-violet light, and U. V. light filter the function of which is to absorb the visible rays and transmit none but ultra violet radiation and at the same time give rise to less heat than ordinary carbons,

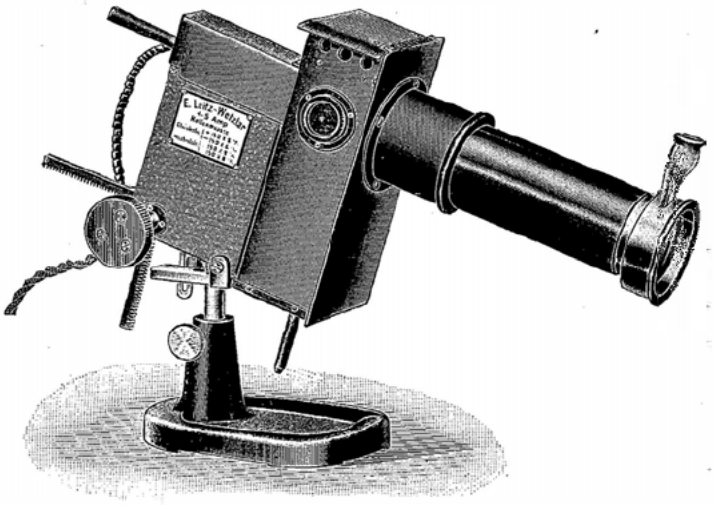
The entire lamp is contained in a light-proof casing, in such a way, however, as not to interfere in the slightest degree with the perfect regulation of its function.

It is advisable to perform all work with the Luminescence Lamp in a darkened room.

The U. V. filter derives its peculiar efficacy from the use of nitrosodimethyl anilin. To eliminate the last traces of red light the filter trough should be filled with a 20 % solution of copper sulphate with the aid of the two funnel tubes supplied with the apparatus; this solution serves the additional purpose of acting as a cooling

medium. The trough should not, however, be kept filled with this solution; it should, on the contrary, be emptied immediately after use and vigorously rinsed out in clean water to protect the glass from premature deterioration.

The fluorescent or phosphorescent bodies which are to be prepared for examination should be simply placed in front of the light filter. When somewhat extensive surfaces, such as samples of rocks, chemicals, or organic objects, are to be prepared in this way for examination the surfaces should be exposed to the action of the rays at some distance from the light filter.



Luminescence Lamp No. 116.

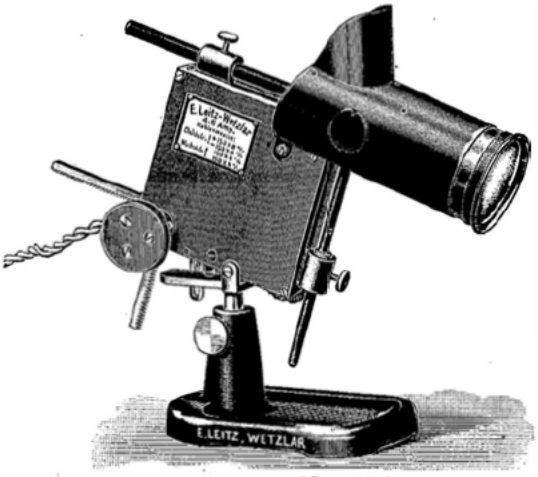
To prepare very small fluorescent particles for observation under the microscope it will be necessary to employ a concave mirror silvered on the surface. (This mirror should be expressly ordered, if required). It attaches to the stage of the microscope, and the luminescence lamp should be so placed that its beam of light may fall on the mirror. By holding a piece of paper in front of the mirror it is easy to control the adjustment, as all papers fluoresce with a greenish light. Care should, however, be taken to prevent the rays, before falling on the mirror from reaching directly or even grazing the microscope objective or the preparation. Finally, the silvered mirror should be turned until the ultra-violet rays fall by reflection on the preparation which is to examined; but every precaution should be exercised to prevent ultra-violet light reaching the objective by reflection at the preparation, as this would

cause the lenses of the objective themselves to fluoresce, which would not fail to interfere with the observation by casting a general haze over the field. To obviate this the ultra violet as emitted by the lamp should be so reflected at the silvered mirror as to fall on the preparation at an angle which amounts to little more than a grazing incidence. To achieve this the luminous crater of the lamp should be roughly on a level with the centre of the silvered mirror above the stage.

Preparations intended for observation in this way under the microscope must not be mounted in Canada Balsam as this is in itself an actively fluorescing medium.

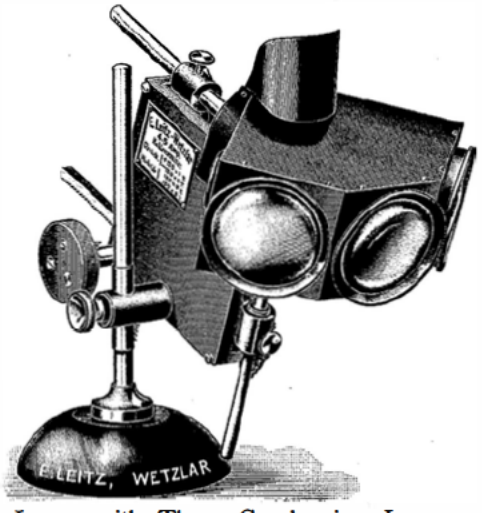
The lamp is available for ordinary microscopic observations and for dark ground illumination, it being in this case only necessary to withdraw the U. V. filter and the condenser for ultra-violet light from the lens and filter tube and to replace it by a condensing lens of the usual kind.

No.		£ s. d.	Codeword
116.	**Luminescence Lamp** on Stand with Condensing Lens for ultra-violet light, and U. V. Filter	**5. 0. 0**	**Lumen**
117.	**Silvered Concave Mirror** for Microscopic Observations with the Luminescence Lamp	**0. 5. 0**	**Lumia**
118.	**Luminescence Lamp** on Stand with Silvered Mirror .	**5. 5. 0**	**Luminatior**
119.	**Ordinary Condensing Lens** fitting the tube attachment on the Luminescence Lamp	**0. 5. 0**	**Luminar**
120.	**Liliput Arc Lamp for a current of 4 to 5 amperes on Stand.** This lamp is of the hand regulating type and is for this purpose fitted with a geared ratio mechanism. It is one of the best and most convenient sources of light available for use in conjunction with Dark-ground illuminators, the Ultra Condenser, as well as the Vertical Illuminator. The positive carbon, which supplies the luminous crater, is arranged in a horizontal position, which ensures that the centre of luminosity may remain immutably in the optic axis The lamp may be operated from any electric house supply, to which it may be connected by means of a plug switch, a resistance being put in circuit with the lamp to suit the existing voltage. In orders it should be stated whether the lamp is to be operated by a continuous or an alternating current	**1. 10. 0**	**Liliput**



Liliput Lamp No. 121.

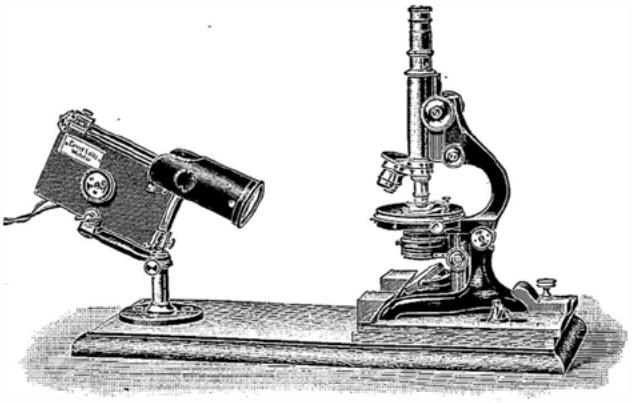
No.		£ s. d.	Codeword
121.	**Liliput Arc Lamp for a current of 4—5 amperes, mounted on a Stand and fitted with a Condensing Lens** for use with dark-ground condensers	**2. 0. 0**	**Liliputer**



Liliput Arc Lamp with Three Condensing Lenses, No. 122.

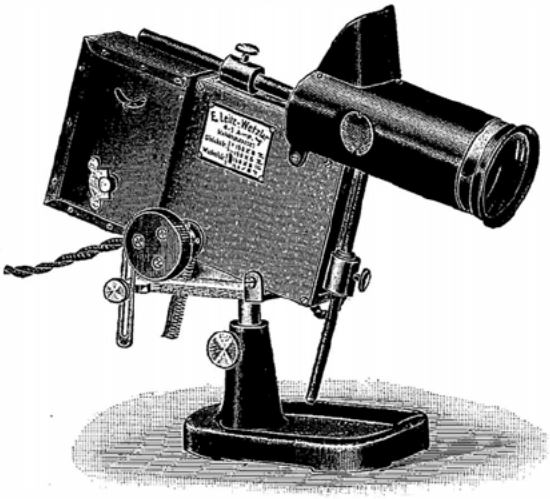
122.	**Liliput Arc Lamp to burn at 4 5 amperes, mounted on Stand and fitted with attachment containing three Condensing Lenses.** The latter are so arranged as to direct the light emitted by the crater of the positive carbon in three directions. This enables three observers to share one lamp, which in many cases where light has to be provided for a large number of students, may effect a considerable saving in the initial outlay and in the current consumption	**3. 0. 0**	**Triplex**

No. £ s. d. Codeword



Wooden Base with Liliput Lamp, No. 123.

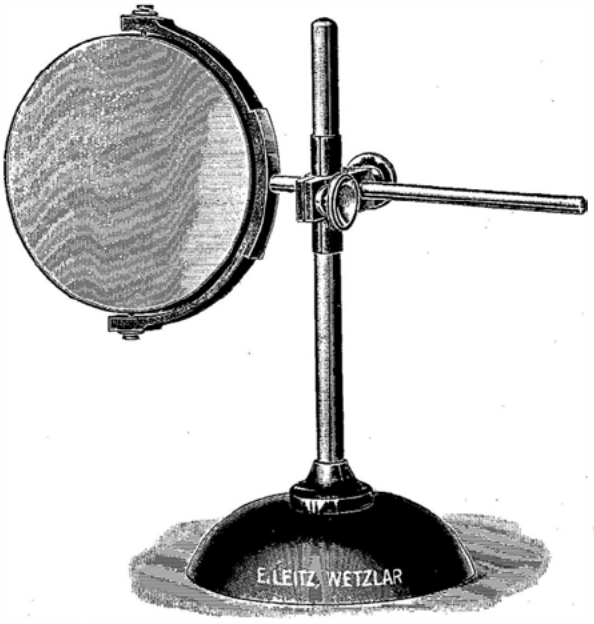
123. **Wooden Base with Liliput Arc Lamp and Condensing Lens,** on rigidly mounted stand and clamping attachment for microscope. The lamp is mounted at such a distance from the base provided for the accomodation of the microscope stand as to secure the best conditions for observation by the method of dark-ground illumination and for ultra-microscopic observation. This arrangement does away with the time-wasting necessity of having to find out by trial the best position of the lamp . . **2. 15. 0** Lilium



Liliput Arc Lamp with Clockwork, No. 124.

124. **Liliput Arc Lamp taking a current of 5 amperes, regulated by Clockwork Mechanism, and fitted with Condenser, the whole mounted on a Stand.** The lamp is in every essential similar to the Liliput Arc Lamp

No.		£ s. d.	Codeword
	described under item No. 121, but instead of being regulated by hand is provided with a clockwork regulating mechanism. This has over all other automatic regulating devices this great advantage that the carbon is made to advance with perfect regularity, instead of being pushed forward in jerks, with the result that the luminous arc remains perfectly stationary with respect to the condensing lens throughout the whole time that the lamp is working	**3. 5. 0**	**Liliputian**
	The Clock regulated Liliput Arc Lamp should be used exclusively with resistances and carbons supplied by us. When ordering the nature and voltage of the available current should be specified.		
125.	**"Ivory" Glowbulb on Stand.** This is a 16-c. p. electric lamp, which will work equally well on a direct current and alternating current circuit. It furnishes a soft light which is exceedingly well adapted for microscopic observations and very pleasant to the eyes. It can be connected to any domestic supply system by a plug contact. When ordering, the voltage of the system should be stated	**0. 15. 0**	**Birne**
126.	**Ground Glass Screen on Stand**	**0. 1. 0**	**Matt**
127.	**Resistance** for 110 volts, for use with Liliput Arc Lamps	**0. 10. 0**	**Widerstand**
128.	**Resistance** for 220 volts, for use with Liliput Lamps .	**0. 18. 0**	**Widerstehe**
129.	**Carbons for Liliput Lamp,** per pair	**0. 0. 2**	**Kohle**



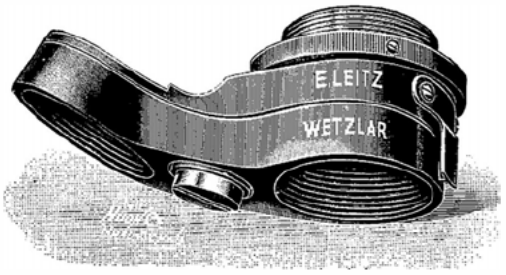
Illuminating Lens on Stand, No. 130.

130.	**Illuminating Lens,** 100 mm diameter, on Stand and capable of being raised and lowered as well as rotated in all directions	**1. 0. 0**	**Illuminize**

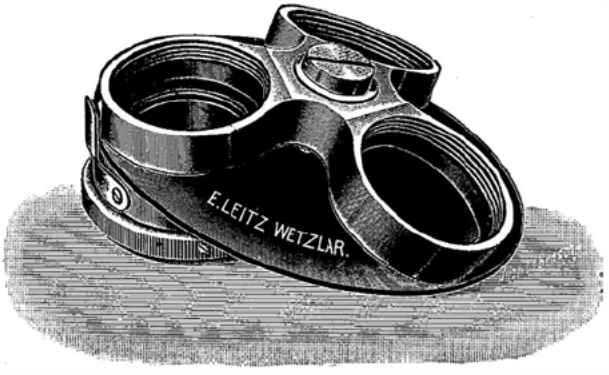
Objective Changing Appliances.

We supply the following appliances for rapidly substituting one objective for another:

Revolving Nosepieces for two, three or four objectives, and **Clutch Objective Changers** with loose adapters for the objectives.



Double Nosepiece No. 131.



Triple Nosepiece with Guard Disc. No. 132.

Revolving Nosepieces, apart from the rapidity with which they serve to effect the transition from one objective to another, have the useful property that they can be so adjusted that, having focussed one of the objectives, one need not focus the others separately as they are brought into operation, excepting that a small turn of the micrometer screw may be needed to complete the adjustment

To attain this condition the nosepiece should either be purchased together with the microscope, or, if purchased subsequently, the objectives for which it is required should be sent to us for adaptation.

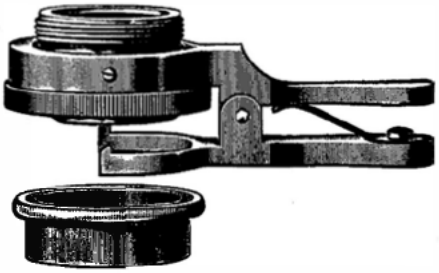
No.		£ s. d.	Codeword

The Prices of the Revolving Nosepieces are:

131.	**Nosepiece** for two objectives	**0. 15. 0**	**Duplo**
132.	**Nosepiece** for three objectives	**1. 0. 0**	**Triplo**
133.	**Nosepiece** for four objectives	**1. 5. 0**	**Quadruplo**

The subsequent adaptation of a Revolving Nosepiece to a Stand is not subject to an extra charge.

It should be noted that a nosepiece has a depth of 18 mm. and that its attachment to the microscope adds therefore 18 mm. to the length of the tube. Hence, to maintain the prescribed tube-length of 170 mm. the draw-tube should be set at 152 mm.



Clutch Objective Changer No. 134.

134. The **Clutch Objective Changer** will be found particularly useful in those cases where investigations requiring frequent changes of several objectives have to be carried out on a single microscope.

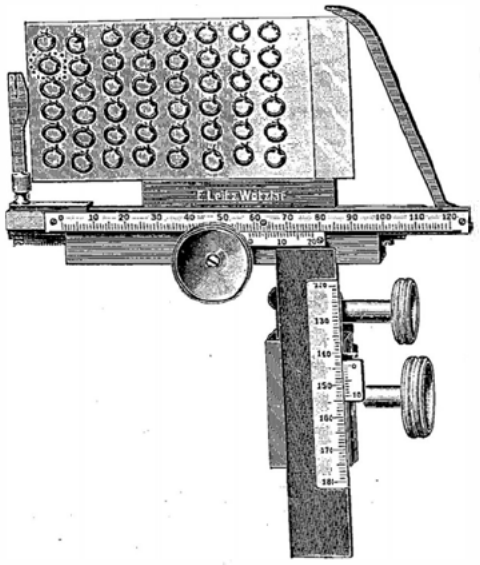
The Clutch Changer consists of a collar which screws into the microscope tube, and a clutch. The upper part of the latter is attached to the screw collar, whilst the lower one is hinged to it after the manner of a bulldog paper clip. At its lower end the screw collar has a conical shoulder which accurately fits a conical recess in a series of loose collars provided with a screw thread to take the screw of the objective. The claw of the lower hinged fitting takes the form of a semi-circular fork with two upturned prongs and, when released, presses the loose collar with its conical seating firmly into the recess in the fixed collar.

Obviously, as many loose collars will be needed as there are objectives in the equipment of the microscope.

	Clutch Objective Changer with three Loose Collars	**0. 15. 0**	**Clutch**
135.	**Loose Collars,** each	**0. 1. 0**	**Adapter**

The Clutch Objective Changer has likewise a depth of 18 mm. To maintain the standard tube-length of 170 mm. the draw-tube should accordingly be set at 152 mm.

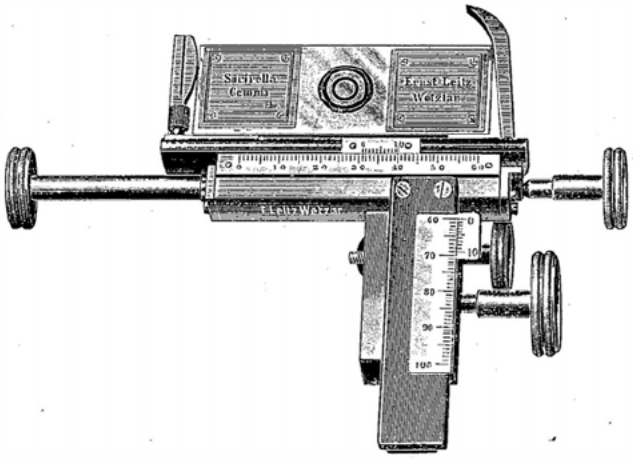
Mechanical Stages and Heating Stages.



Large Mechanical Stage No. 136.

No.		£ s. d.	Codeword
136.	**Large Mechanical Stage** for Stands A and B. This stage is provided with finely cut rack and pinion motions and gives a range of travel of 100 mm by 50 mm. The vernier for the advance and return motion reads to $^1/_{10}$ths mm. that for the transverse motion to $^1/_{20}$ths mm. To attach the apparatus to the microscope it should be placed upon the stage of the microscope with the wedge at the back of the mechanical stage resting in the notch in the column of the stand and finally secured in position by tightening the milled thumb screw. This mode of fixation ensures an immutable position of the stage		**4. 0. 0. Platina**
	This mechanical stage may be added to a microscope at any time.		
137.	**Mechanical Stage***) for Stands C, D and E, for use with which it may be obtained at any time independently of the stand. It attaches much in the same manner as the Mechanical Stage No. 136.		
	The advance and return motion in this stage is effected through the medium of a rack and pinion arrangement,		

*) This mechanical Stage is also adaptable to Stands A and B; it requires in their case a different attachment fitting.



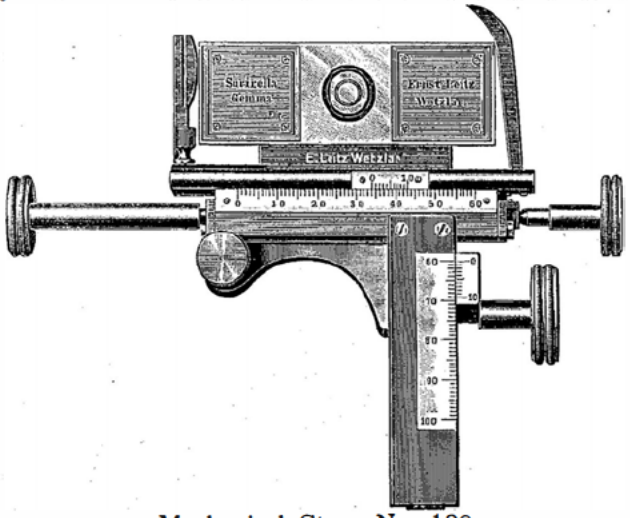
Mechanical Stage No. 137.

No. £ s. d. Codeword

whilst the transverse motion is derived from the action of a long screw.

Both motions are fitted with a scale and vernier reading to $^1/_{10}$ mm.

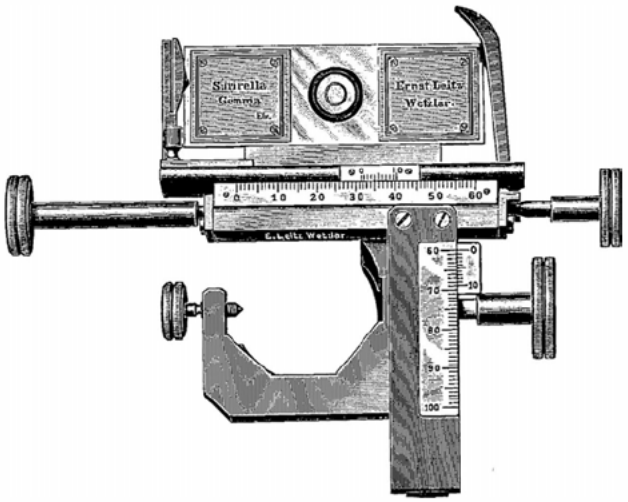
With this stage objects measuring 50×30 mm can be searched systematically, and any element of special interest may be promptly brought into the centre of the field at any time. The stage may be detached as often as the observer pleases without prejudice to its accuracy as a finder since its mode of attachment ensures its fixity of position . . . . . **3. 10. 0 Platinait**



Mechanical Stage No. 138.

138. **Mechanical Stage** for the older patterns of Stands Ia and Ib, to which it requires to be specially adapted by us.

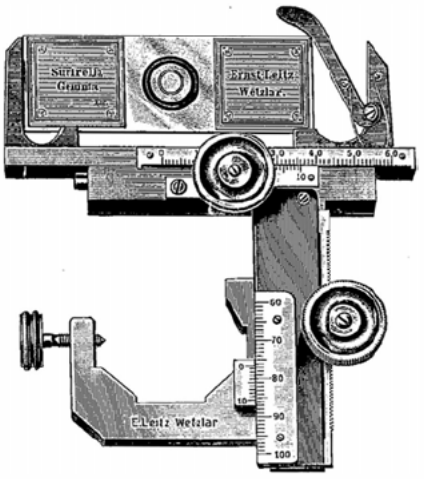
It cannot therefore be attached by the user to a microscope purchased without a mechanical stage at some earlier date. In other respects it is identical with the Mechanical Stage No. 137 . . . . . **3. 10. 0 Platinato**



Mechanical Stage No. 139.

139. **Mechanical Stage** for immediate attachment by the user himself to any of the Stands Ia, Ib, II, IIa, so that it may be purchased at any time independently of the stand. At the back of the frame of the stage is formed a hexagonal claw which embraces the collar of the upper body. When the stage has been placed in its correct position, care being taken that it does not dip in front, it should be attached to the collar by means of a pointed screw at the side of the claw. When replacing the mechanical stage care should be taken to ensure that the point of the screw may enter the indentation produced by the attachment of the stage in the first instance . . . . **3. 10. 0 Platineras**

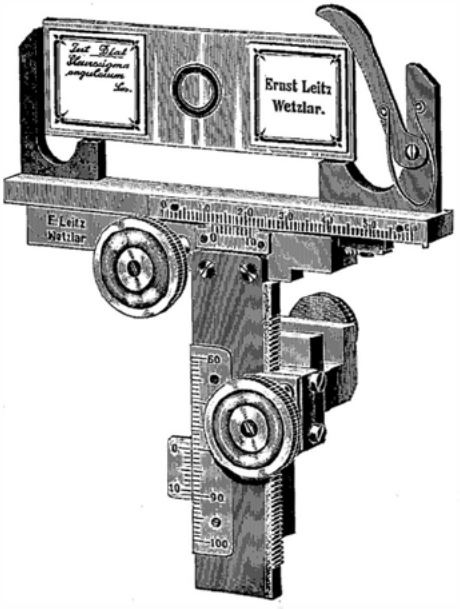
140. **Small Mechanical Stage.** This stage is a little smaller and rather simpler than the No. 139 pattern. It is adapted for use with the Medium Sized Stands II, IIa,



Mechanical Stage No. 140.

No. £ s. d. Codeword

IIb, and attaches to these in the same way as the preceding pattern . . . . . **3. 0. 0 Platinoid**



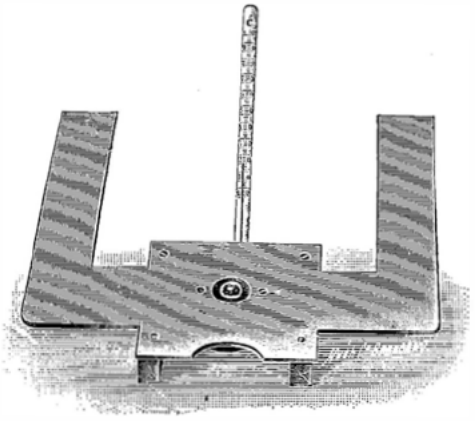
Mechanical Stage No. 141.

141. **Mechanical Stage** adapted for use with Stands F, G, H and GH. Both movements are in this case effected by rack and pinion. They are fitted with scales and verniers

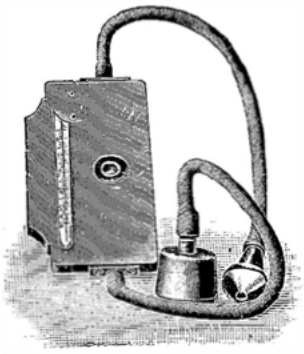
No. £ s. d. Codeword

reading to $^1/_{10}$ ths. mm. The attachment fitting in this case rests with its side firmly against the pillar of the stand and in front clutches the edge of the microscope stage. The arrangement is fixed in position by means of a thumb screw . . . . . **3. 0. 0 Platinize**

Warm Stages.



Schultze's Pattern No. 142.



Stricker's Pattern No. 144.

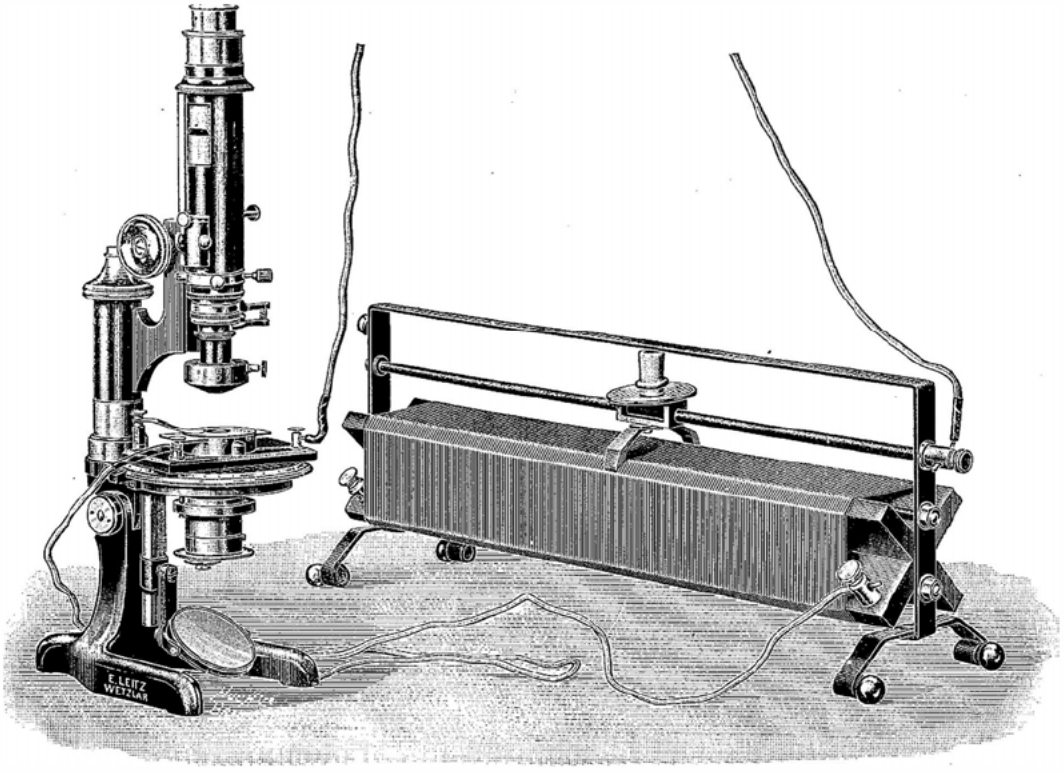
142. **Schultze's Warm Stage.** This stage consists of an U shaped metal plate with extension pieces to which heat is applied by means of small lamps or burners placed below them. The stage is fitted with a condenser which renders it available for observations under a high power, and has a thermometer to indicate the temperature, which may be as high as 100° C. . . . . **1.10. 0 Schultze**

143. **Pfeiffer's Warm Stage.** This stage consists of a flat rectangular glass chamber, the upper surface of which has six cavities serving as moist chambers. One side of the box has three openings for the accommodation of an inlet and outlet glass tube and of a glass thermometer. The chamber is heated by sending a stream of warm water through it . . . . . **1. 0. 0 Pfeiffer**

144. **Stricker's Warm Stage.** This stage consists of a flat metal chamber through which warm water may be passed. At the centre it is fitted with a lens which renders it available for observations under high magnifications, and the temperature is indicated by a thermometer having its bulb contained within the chamber. This stage may be attached to microscopes having square stages . . . . **1.15. 0 Stricker**

Electrically Heated Stages

as devised by Dr. F. Jentzsch*)



Electrically Heated Stage as it appears when set upon the stage of the microscope.

These Heating Stages are adapted for use on the object stage of any microscope, and, if necessary, they may be fixed thereon by means of large clips.

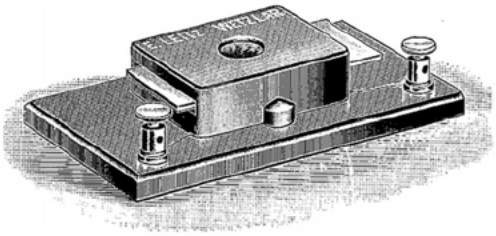
As a rule, the requisite heat energy is derived from the ordinary supply system, the temperature being regulated by the interposition of a rheostat. The apparatus is so designed that by varying the strength of the current temperatures up to 800° C. may be realised without any risk of damaging it. An accumulator will serve where it is intended to work at moderate temperatures only.

To protect the heating apparatus from damage by over running through an error in the manipulation of the regulating resistance**) we fit the latter with a limit step to the sliding contact.

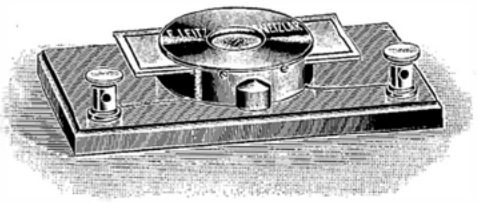
*) Felix Jentzsch. Ein elektrischer Heizapparat für mikroskopische Beob achtungen. Z. f. wissenschaftl. Mikroskopie, Vol. XXVII, pp. 259 264, 1910.

**) To enable us to quote for, or supply, a suitable resistance adapted for the available circuit and the required range of temperatures correspondents will facilitate matters by furnishing with their initial enquiries particulars of the nature of the local supply system, its voltage, and the required temperature.

We make three patterns of the Electrically Heated Stage. Of these, Type A No. 145 and Type B No. 146 are primarily designed for maintaining a constant high temperature during prolonged periods,



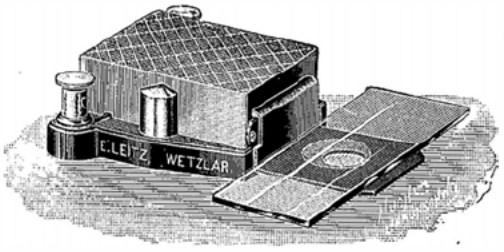
Electrically Heated Stage
Type A, No. 145.



Electrically Heated Stage
Type B, No. 146.

the latter being arranged for use with high power objectives. Both patterns are mainly intended for the study of mineralogical and petrological sections.

Type C, No. 147, is in a less degree adapted for observation at high temperatures; on the other hand, it admits of the use of



Electrically Heated Stage
Type C, No. 147.



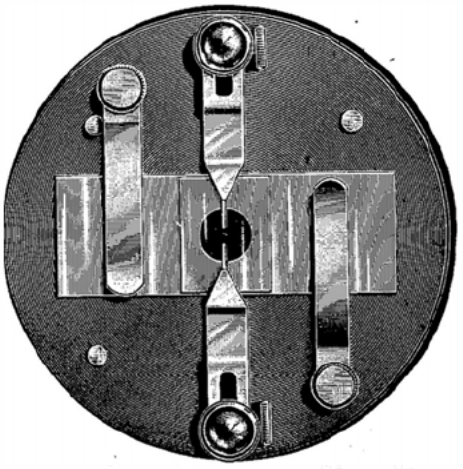
Objective Shield.

substage condensers. Type C is adapted for the observation of micro chemical reactions interference figures in convergent polarised light, and for the study of fluid crystals.

To protect short focus objectives employed in observations at high temperatures from damage due to the action of direct heat rays we supply an Objective Shield with each of our electrical heating stages.

If desired, the Electrically Heated Stages can be fitted with a mercury thermometer registering temperatures up to 200° C. Where very accurate readings are required it is, however, advisable to employ a thermo-couple.

No.		£ s. d.	Codeword
145.	**Electrically Heated Stage,** Type A, with Objective Shield	**1. 15. 0**	**Electric**
146.	**Electrically Heated Stage,** Type B, with Objective Shield	**1. 15. 0**	**Electrical**
147.	**Electrically Heated Stage,** Type C, with Objective Shield	**1. 15. 0**	**Electricis**
148.	**Mercury Thermometer,** registering to 200° C. . . .	**0. 5. 0**	**Thermo**



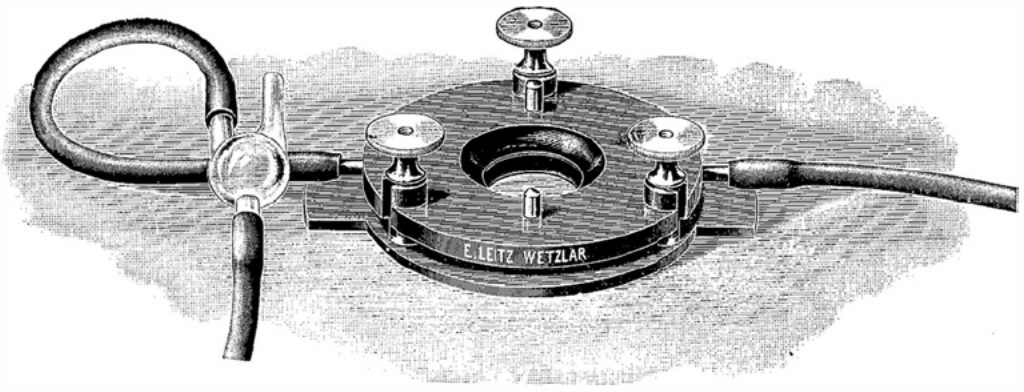
Electrical Object Stage No. 149.

149. **Electrical Object Stage.** This stage affords a means of electrically stimulating histological preparations during observation under the microscope, and can also be used for studying microscopic changes occurring in electrolytic processes.

The current is conveyed to the object or a potential difference established by means of two simple terminals and two adjustable electrodes capable of being displaced in every direction. At their extremities these electrodes carry fine platinum wires which may be brought right up to the object.

The whole is mounted on a vulcanite plate which, by means of two pins, may be securely placed upon the stage of the microscope . . . . . **1. 5. 0** **Electreus**

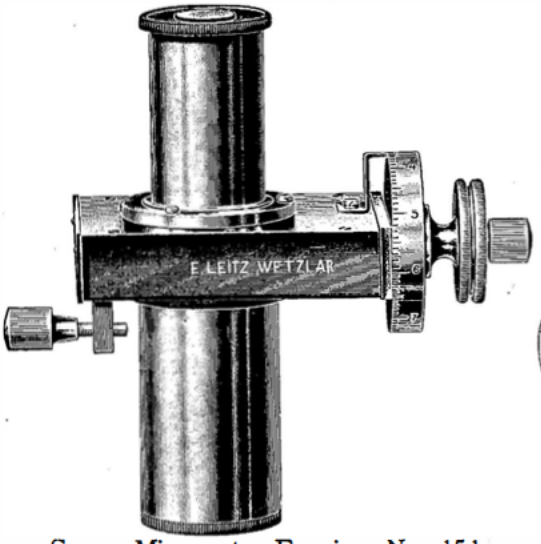
When ordering, the stand with which the Electric Object Stage C is to be used should be specified.



Ziegler's Water-jacketed Compressor No. 150.

No.		£ s d.	Codeword
150.	**Ziegler's Water-jacked Compressor.** This apparatus is admirably adapted for the observation of small transparent organisms, such as worms, larvae, and such like. The compressor consists of two metal rings, the lower one being closed by a disc of plate glass, which forms the object slide, whilst the upper ring accommodates a hollow ring of rubber which can be compressed by the action of three thumb screws, whereby the gap between the plate and the cover-glass may be varied within certain limits. The upper ring is fitted with two small metal tubes forming respectively the inlet and outlet for the stream of water. Rubber tubes of any required length may be attached to the metal tubes, the inlet being fitted with an U tube to supply a current of water by syphonage. The apparatus includes fifty cover-glasses 25 mm in diameter	1. 5. 0	Ziegler

Micrometers.



Screw Micrometer Eyepiece No. 151.



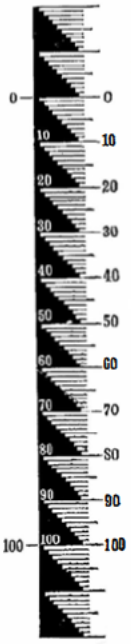
Micrometer Eyepiece with Movable Scale No. 152.

No.		£ s. d.	Codeword
151.	**Screw Micrometer Eyepiece** for the accurate measurement of objects as seen in the eyepiece. The apparatus is provided with a Ramsden eyepiece having below its field lens a scale divided on glass in whole and half millimetres, below and across which a single line index is made to travel under the action of a micrometer screw. The latter is fitted with a drum divided into 100 parts, and by one complete rotation of the drum displaces the index $^1/_2$ mm across the fixed scale; hence each division on the drum corresponds to an interval of 0,005 mm = 5 μ. The micrometer value of each interval should be calibrated for each objective with the aid of a stage micrometer. The eye-lens of the eyepiece is adjustable to enable the observer to accurately focus the scale. The apparatus slips into the draw-tube of the microscope like any ordinary eyepiece and may be fixed in position by the milled head screw shown at the side	**2.10. 0**	**Microdon**
152.	**Micrometer Eyepiece with movable scale** of 10 mm divided into 100 parts. The scale is situated in the plane of the eyepiece stop and can by the rotation of the micrometer screw be made to travel across the field of view. This enables one to set any convenient line of the scale accurately to the extreme boundary of an object which is to be measured without having to displace the object on the stage. The eyelens of the eyepiece is made to slide up or down and may thus be accurately adjusted to suit the user's sight	**1. 5. 0**	**Micromeria**

No.		£ s. d.	Codeword
153.	**Micrometer Eyepiece** with intermediate screw-fitting containing the micrometer scale. The eyelens is contained in a sliding mount and can be accurately adjusted to suit the observers's sight	0.10. 0	Microlite

Any of the Huyghenian Eyepieces Nos. 0 to IV may be arranged for use as a micrometer eyepiece. In the absence of an expressly stated requirement to the contrary we invariably supply the micromter fitted to Eyepiece No II.

154. **Step Micrometer Eyepiece***). In this micrometer the intervals are arranged in groups of ten, each group being indicated in an unmistakable manner by a black echelon rising from the first to the tenth interval.



Step Micrometer No. 154.

This arrangement possesses the great advantage that the divisions can always be seen distinctly whether the objects be light or comparatively dark.

The intervals of the scale, instead of being $^1/_{10}$ or $^1/_{20}$ mm wide, as is usually the case in eye piece mircrometers, have a definite value of 0.06 mm. The object of this departure is to obtain for each objective and for a given tube length convenient, and in the majority of cases integral, micrometer values, which greatly facilitates the use of the instru ment. The actual tube length differs in most cases but little from the standard length.

Each Step Micrometer is supplied with a Table of Micrometer Constants and corresponding Tube Lengths computed for the Huyghenian Eyepiece No. II and each of the Leitz Objectives . . . . . | 0. 15. 0 | Micrometro

155.	**Glass Eyepiece Micrometer,** to place on the eyepiece diaphragm, the scale being 5 mm divided into 100 parts	0. 6. 0	Micrologo
156.	**Glass Eyepiece Micrometer,** scale of 10 mm divided into 100 parts	0. 5. 0	Micrometer
157.	**Eyepiece Micrometer** divided into squares for counting scattered objects in the field, the intervals between the lines being 0,5 mm	0. 5. 0	Microporos
158.	**Large Screw Stage Micrometer** to rest on the stage of the microscope stand. With divided drum reading to 0,002 mm	6. 0. 0	Micronisus

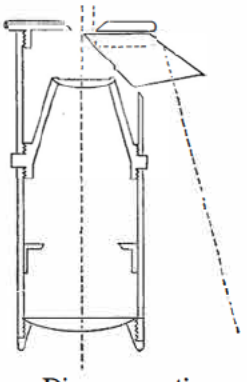
*) Cf. C. Metz. "The step Micrometer with Simplified Micrometer Scale". Translated reprint from the Zeitschrift für wissenschaftliche Mikroskopie, XXIX, 1912, pp. 72 79.

No.		£ s. d.	Codeword
159.	**Stage Micrometer** being a scale ruled on glass, 1 mm, divided into 100 parts	**0. 9. 0**	**Micronisi**
160.	**Stage Micrometer,** with photographed scale being 2 mm divided into 200 parts	**0. 5. 0**	**Micropoda**
161.	**Glass Slide with Cell,** 0,2 mm deep with eyepiece micrometer divided into squares No. 157 in case . . .	**0. 8. 0**	**Microptera**
162.	**Glass Slide with Cell** having its floor divided into squares of $^1/_{20}$ mm sides, in case	**0.10. 0**	**Micropus**

Drawing and Demonstrating Appliances.



Drawing Eyepiece No. 163.



Diagrammatic Section of Drawing Eyepiece No. 163.

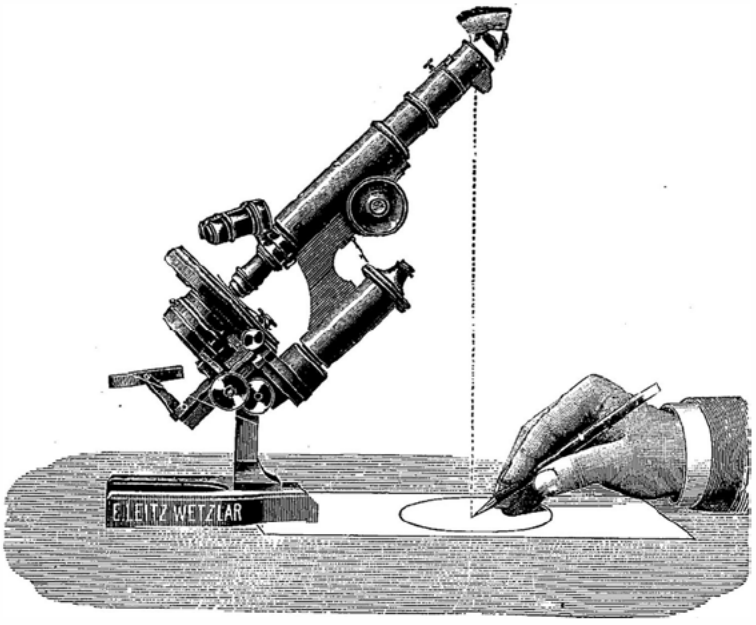


Drawing Eyepiece No. 164.

No.		£ s. d.	Codeword
163.	**Drawing Eyepiece***). This eyepiece is designed for use with the microscope in the upright position, whilst the drawing surface is at the side of the microscope. The drawing eyepiece slips into the tube of the microscope like any ordinary Huyghenian Eyepiece No. II**). The drawing surface is at once seen clearly and sharply in the eye-piece without laborious adjustments. The rays proceeding from the drawing surface and the pencil point meet the lower and upper faces of the prism at right angles and are totally reflected at the other faces. Secondary images due to reflection by coated mirrors are thus obviated. Any excess of light which may proceed from the drawing surface can be moderated by means of two neutral tint glasses mounted in two collars under the prism	1. 0. 0	Desinand

*) Cf Zeitschrift für wissenschaftliche Mikroskopie Vol. XII, 1895, pp. 289—292.

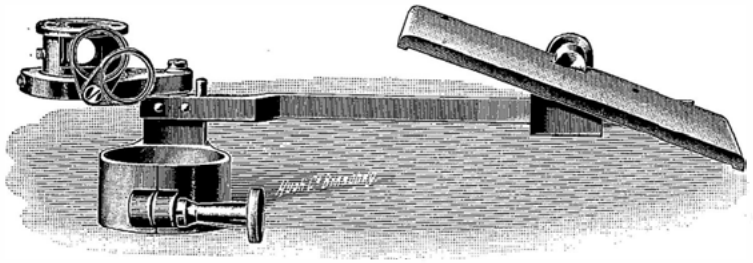
**) If desired any other eyepiece of this series, excepting No. V may be adapted and supplied for this purpose.



Drawing Eyepiece for Drawing with the Microscope inclined.

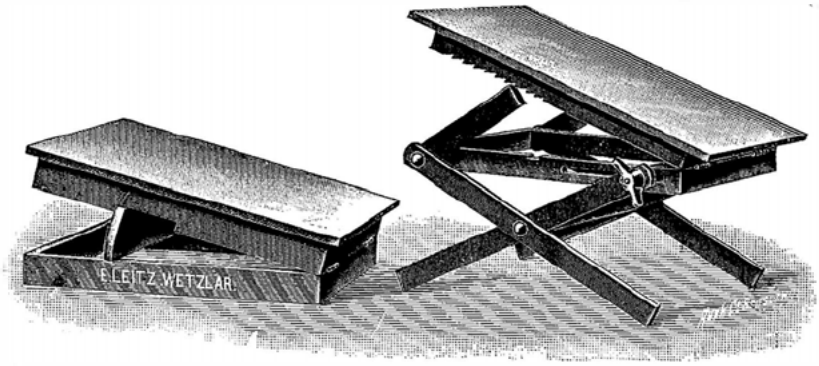
No.		£ s. d.	Codeword
164.	**Drawing Eyepiece,** similar to the preceding eyepiece but with a slightly modified prism, so that when the microscope is inclined at 45° the image of the object may be seen on a drawing surface placed immediately behind the stand at the distance of normal vision. When the drawing surface is in its proper horizontal position relatively to the eye the image will be seen clearly and without distortion. The light may be moderated by means of two neutral tint glasses fitted in hinged mounts. The advantageous position of the drawing surface and the convenience of drawing while the microscope is in an inclined position have brought this little instrument rapidly into favour	1. 5. 0	Desinare

This Drawing Eyepiece is generally supplied in the form of an adaption of the ordinary Eyepiece No. II, but any other Huyghenian Eyepiece. with the exception of No. V, may be supplied as a drawing eyepiece of this type.



Abbe Drawing Apparatus No. 165.

No.		£ s. d.	Codeword
165.	**Abbe Drawing Apparatus.** In this apparatus the drawing surface is seen by reflection at a mirror at the side of the instrument and a double prism mounted above the eyepiece is seen through an aperture in the silver coating between the prisms. The double prism is so mounted that it may be swung aside, as shown in the illustration, which renders the eyepiece free for ordinary observation. Two moderating glasses mounted in pivoted rings may be swung in front of the prisms so as to modify the light coming from the drawing surface	**1.10. 0**	**Desinatior**
166.	**Large Abbe Drawing Apparatus.** This instrument resembles in every essential the apparatus just described; it has, however, a larger mirror (125×80 mm) . . .	**2.10. 0**	**Desinatis**

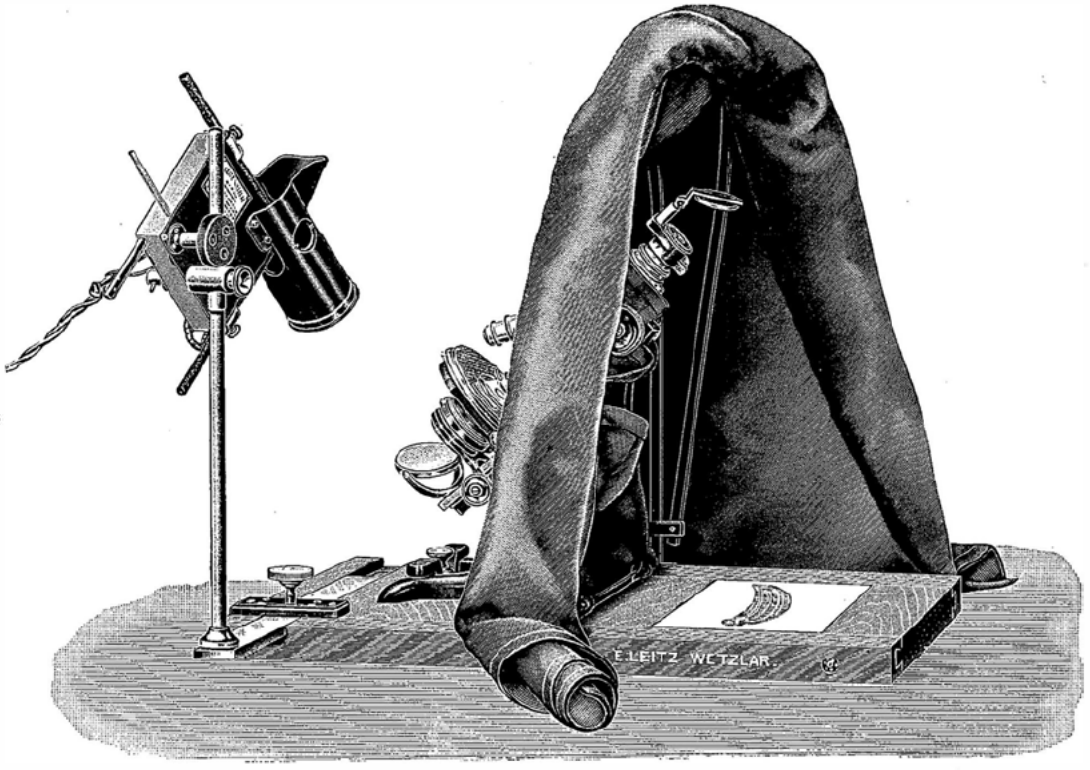


Drawing Board No. 167. Gisenhagen's Drawing Board No. 168.

The above Drawing Boards, having limewood tops, afford in the first place a smooth and flat surface to draw upon; they possess, however, the further advantage that they can be raised, lowered, and inclined as may be required.

No.		£ s. d.	Codeword
167.	**Drawing Board.** When set up this board provides a drawing surface inclined at 12°. which in the case of the Drawing Eyepiece No. 163 obviates the appearance of any distortion	**0. 5. 0**	**Desinatum**
168.	**Giesenhagen's Drawing Board** is adjustable and may be fixed at various angles of slope as well as raised and lowered	**0.10. 0**	**Desinavero**

In the case of Drawing Eyepiece No. 164 and the Abbe Drawing Camera the drawing boards should be horizontal.



Apparatus for Drawing and Demonstrating Projected Images No. 172.

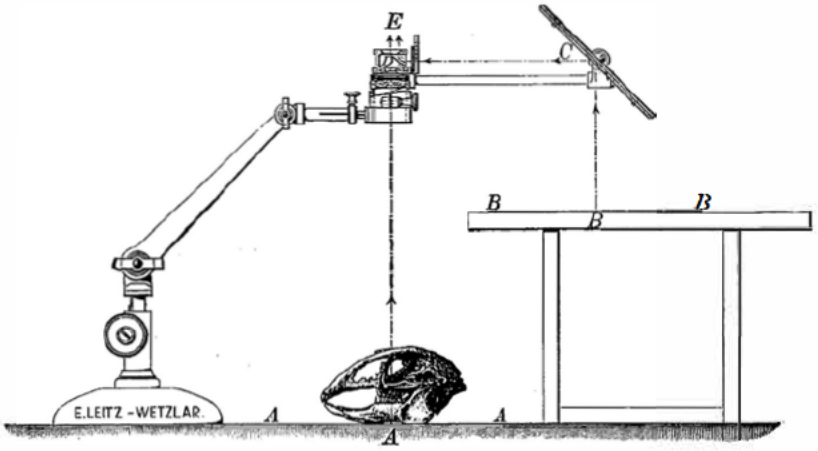
Apparatus for Drawing and Demonstrating Projected Images. At the suggestion of Prof. Edinger we have devised a Drawing Mirror Attachment which may be affixed to any inclinable micro scope and clamped in any required position above the eyepiece.

The illumination of the object, which naturally requires to be very intense, is best supplied by means of a Liliput Lamp. The drawing surface lies behind the microscope and is screened off from adventitious light by a tent arrangement of black cloth. The mirror,

which is inclined at an angle of $22^1/_2{}^0$ with respect to the optic axis of the microscope, forms a sharp flat picture on the drawing surface, which can either be traced on paper or demonstrated to a small number of students.

To facilitate the use of the arrangement we have designed a drawing board surmounted by a Liliput arc Lamp with sliding foot and a clamp for securing the foot of the microscope to the board, together with an iron frame and black cloth tent.

No		£ s. d.	Codeword
169.	**Drawing Mirror with Clamping Ring**	**0.15. 0**	**Desinabit**
170.	**Drawing Board with Foot Clamp and Liliput Arc Lamp with Condensing Lens** mounted on upright to raise and lower	**2. 15. 0**	**Desinabo**
171.	**Light-Proof Tent with Collapsible Iron Frame** . .	**1.10. 0**	**Desinai**
172.	**Apparatus for Drawing and Demonstrating Projected Images as Suggested by Prof. Edinger** complete .	**5. 0. 0**	**Desinamus**



Apparatus for Drawing Objects in their Natural Size No. 173.

Apparatus for Drawing Objects in their Natural Size or Slightly Magnified or Minified. *) The apparatus consists of a lens stand No. 218 with heavy iron foot and a drawing apparatus proper which attaches to the stand by means of a ring adapter. In its general arrangement the drawing apparatus is similar to that of Abbe, from which it differs only in that the usual cube has been replaced by an equilateral rectangular prism having its hypothenuse surface silvered.

The mirror measures 10×8 cm and when required for use is slid to the end of the arm, inclined at an angle of 45^0 and finally

*) Zeitschrift für wissenschaftliche Mikroskopie, Vol. XXIX 1912, 79—81.

clamped in this position. The prism reaches only over one half of the opening E to which the eye is applied. The object at A is seen with the naked eye through the other half of the opening at E whilst the drawing surface at B is seen by the rays proceeding from it and then reflected at the mirror and prism.

Since it is essential that the object and drawing surface should be equally bright the apparatus is provided with two neutral tint glasses, either or both of which may be placed in front of the prism, on the side facing the mirror, to moderate the brightness of the drawing surfaces, whilst three moderating glasses Nos. I, II, III serve to moderate the brightness of the object. These moderating glasses should be placed upon the intermediate adapter ring between the stand and the apparatus or, in the event of a lens being used, they may be placed on the latter.

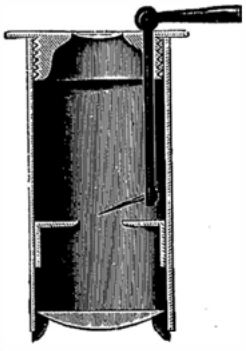
To be able to employ small magnifications, say 2-, 3 , 4- and 5-fold, the apparatus is provided with four appropriately mounted bi-convex lenses having focal lengths of 150, 110, 75 and 50, which are placed on the intermediate adapter below the prism. These same lenses will furnish numerically analogous minifications if object and drawing surface be interchanged.

The apparatus is available for drawing horizontal as well as vertical objects. For this purpose the entire apparatus should be turned through an angle of 90°.

No.		£ s. d.	Codeword
173.	**Apparatus for Drawing** objects in their natural size as well as magnified or minified 2, 3, 4 or 5 diameters	**4. 5. 0**	**Desinea**



No. 174.


No. 175.

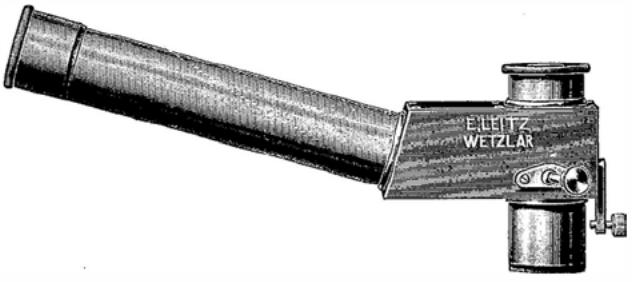
174. **Object Marker** with Diamond Point. This instrument serves to mark an interesting element in a specimen in such a manner that it may easily be found on any future occasion. It does so by describing a small circle about

No. £. s. d. Codeword

the element in question. To use the instrument the object should be focussed and brought into the centre of the field and the object marker substituted for the objective. The object marker screws to the microscope tube or the nosepiece after the manner of an objective. The diamond point is placed slightly out of centre and in the act of being rotated rules a small circle upon the cover-glass . . . . . **0.10. 0 Markirer**

175. **Demonstrating Eyepiece.** (Pointer Eyepiece, as devised by Kuznizky). This eyepiece serves the purpose of pointing out special features in the field. It contains a pointer which may be directed by a small external lever. By this movement in conjunction with the rotation of the eyepiece within the tube the demonstrator is enabled to direct attention to any point in the field of view . . **0. 8. 0 Indicator**

Double Demonstrating Eyepiece. This device slides into the tube of the microscope like an ordinary eyepiece. It contains above the plane of the eyepiece stop an arrangement of prisms by means of which the image formed by the objective can be viewed simultaneously by two observers.



Double Demonstrating Eyepiece No. 176.

To enhance the utility of this double eyepiece as a means of demonstrating microscopic objects it is fitted in the plane of the stop, which is the plane where the image is formed, with a movable pointer that can be seen by both observers and which enables either to indicate any element to which he wishes to direct the attention of the other. To this end the pointer is so arranged that it may be pushed in and out, and, in addition, it may be made to describe radial movements about a ball point.

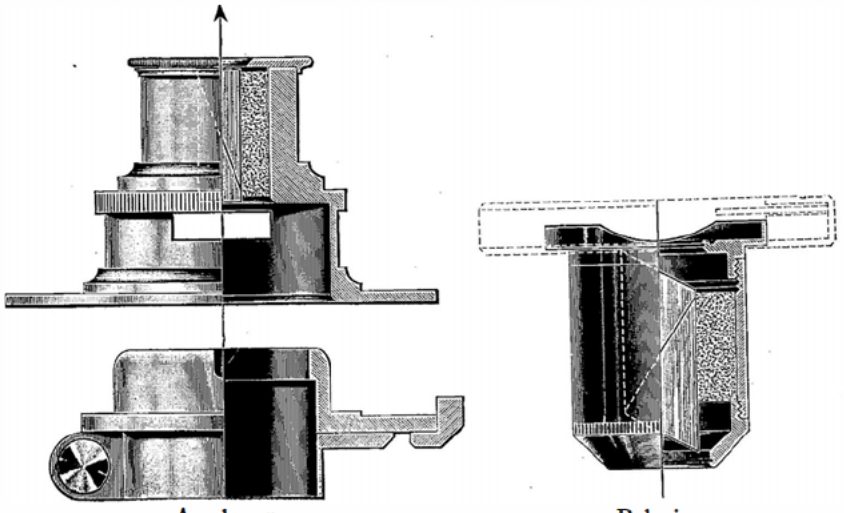
To compensate differences in the sight of the two observers the eyepiece at the side is so arranged that it may be adjusted independently.

Apart from its function as a demonstrating eyepiece the Double Demonstrating Eyepiece is a useful adjunct in the instantaneous photography of living bacteria illuminated with the dark ground condenser. It affords an excellent means of hitting off the most propitious moments for taking the photographs.

The Double Eyepiece is made in three powers giving respectively magnifications of 4, 6, and 8 diameters.

No.		£ s. d.	Codeword
176.	**Double Demonstrating Eyepiece 0** magnifying 4 diameters	**2. 15. 0**	**Double**
177.	„ „ „ **II** „ 6 „	**2. 15. 0**	**Doublon**
178.	„ „ „ **III** „ 8 „	**2. 15. 0**	**Doubleur**
179.	**Erecting Prism** to fit over ordinary eyepiece. The instrument serves to erect the inverted image as seen in the eyepiece and thereby renders it easier to dissect under the compound microscope	**0. 18. 0**	**Prisma**

Polarising Apparatus.



Analyser. Polariser.

180. **Large Polarising Apparatus.** This apparatus is primarily designed for the examination of food-stuffs and other edible or potable substances. It consists of an analyser having a Nicol prism with an aperture of 6 mm to slip over the top of the draw-tube and a polariser

with a Nicol prism having an aperture of 9 mm, which in the case of stands fitted with substage illuminators of the types **a** and **b** drops into a diaphragm carrier of the iris-diaphragm, whilst in the case of stands equipped with substage illuminators of types **c** and **d** it is supplied in a special mount, by means of which it may be slipped into the substage fitting in the place of the condenser.

In order that the boundary of the Nicol prism may not encroach upon the field of the objective, if this should happen to be one of low power, we have recently replaced the protecting glass disc above the Nicol prism by a condensing lens, of very long focus.

(When ordering, correspondents should specify the stand for which the polarising apparatus is required.)

The lower part of the analyser, which carries the divided circle, fixes independently upon the top of the drawtube and is for this purpose provided with a clamping screw. The eyepiece having been dropped into the tube in the usual manner, the upper part of the analyser together with its Nicol prism and divided circle is slipped over, the index to the circle being on the extension of the lower fitting. Below the Nicol prism the upper fitting has rectangular slit for the insertion of a mica plate mounted on a slider. Any eyepiece may be used in conjunction with this polarising apparatus . . . . **2. 18. 0 Polarizar**

For use with stands in which the polariser slides into the substage sleeve in the place of the condenser it can be provided with a simpler condenser above the Nicol prism.

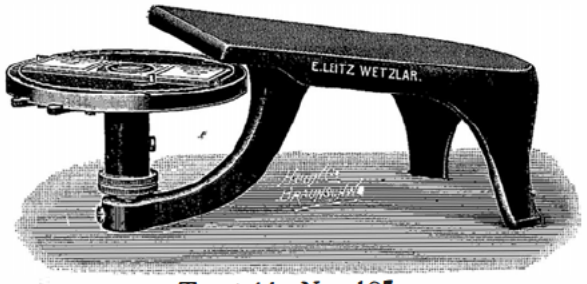
181. **Large Polarising Apparatus with Simple Condenser** above the Nicol Prism . . . . . **3. 3. 0 Polarizzo**

182. **Simple Polarising Apparatus.** The analyser has no divided circle, the polariser being as described above . **2. 0. 0 Polarisant**

183. **Selenite and Mica Films,** set of eight . . . . . **0.15. 0 Selenitis**

184. **Selenite in Sliding Mount** for the large polarising apparatus . . . . . **0. 4. 0 Selenit**

Sundry Requisites for the Microscope.



Turntable No. 185.

No.		£ s. d.	Codeword
185.	**Turntable** for ringing cover-glasses, with clips for holding slides	0.10. 0	**Turntable**
186.	**Cover-glass Gauge** for measuring the thickness of cover-glasses	0. 9. 0	**Taster**
187.	**Square Cover Glasses,** 15×15 mm, per 100	0. 1. 6	**Varcato**
188.	,, 18×18 mm, per 100	0. 1.10	**Vascelli**
189.	,, 20×20 mm, per 100	0. 2. 3	**Vedova**
190.	**Circular Cover-Glasses,** 15 mm diameter, per 100	0. 1. 9	**Vegetor**
191.	,, 18 mm ,, per 100	0. 2. 3	**Vehentor**
192.	,, 20 mm ,, per 100	0. 2. 9	**Velamos**
193.	**Glass Slides,** 3×1 inch, plate glass, with polished edges, per 100	0. 2. 9	**Venador**
194.	**Glass Slides,** with concave depression, per dozen	0. 1. 6	**Ventrigo**
195.	**Glass Slide** with circular well for use as a moist chamber	0. 1. 0	**Verpos**
196.	**Thickened Cedar-wood Oil** for immersion lenses, 50 grm	0. 1. 0	**Cedar**
197.	**Capped Bottle** with Horn Rod for Immersion Oil	0. 0. 9	**Capuchon**
197a.	,, ,, entirely of glass	0. 1. 6	**Capuchona**

Dissecting and Mounting Cases.

No.		£ s. d.	Codeword
198.	**Case** containing a razor, section lifter, two scalpels, fine straight and curved forceps, two dissecting needles, two lancet pointed needles	0. 13. 6	Wittol
199.	**Case** containing a razor, section lifter, scalpel, two dissecting needles, scissors, forceps	0. 10. 0	Wiston
200.	**Case** containing a scalpel, scissors, forceps, two needles	0. 6. 0	Wingolf
201.	**Botanical Dissecting Case** containing scalpel, forceps, crossed forceps with horn handles, two scissors, two magnifiers	0. 13. 6	Botanic
202.	**Meat Inspector's Outfit** comprising scalpel, forceps, two dissecting needles, pipette with rubber teat . . .	0. 5. 0	Trichinius
203.	**Sputum Case** (Kaatzer's) comprising: Platinum needle, rubber bellows, crossed forceps, rubber plate	0. 15. 0	Sputum
204.	**Leather Travelling Case** according to the size of the mahogany microscope case . . . . . 20/- to	1. 15. 0	Leather
205.	**Fine Leather Travelling Case** with nickel mountings, according to the size of the mahogany microscope case . . . . . 40/- to	2. 10. 0	Leatheroid
206.	**Bell Jar** for medium sized microscopes	0. 6. 0	Bell
207.	**Bell Jar** for large microscopes	0. 8. 0	Belljar

Engraving on Microscopes . . 1/- upwards.

Engraved Metal Shields . . . 2/- „

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* Signifies that the apparatus is illustrated.

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