Microscopes and accessory apparatus / Ernst Leitz.

MICROSCOPES
AND
MICROSCOPICAL ACCESSORIES

ERNST LEITZ
WETZLAR

CATALOGUE NR. 36.

Microscopes and Accessory Apparatus.

ERNST LEITZ

WETZLAR

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Notice.

All previous editions of this catalogue are superceded by the present one, which should be exclusively used in ordering.

All prices are net, payable, without discount, at Wetzlar, Germany or New York.

All orders will be filled within a week after their receipt.

In ordering care should be taken to give the ***number*** *of each article desired.*

Goods are forwarded at the expense and risk of the purchaser.

Our instruments for use in ***Universities, Colleges, Schools*** *&c. of the* ***United States*** *are by law free of duty and we shall be pleased to make specially low quotations for such orders.*

Ernst Leitz.

In presenting to our patrons this third edition of our English catalogue we would call their attention to the fact, that we have now manufactured upwards of **40,000 microscopes** and **14,000 oil-immersion lenses.** These are distributed over the whole civilized world, wherever scientific investigation is being carried on, and the report which reaches us from all quarters is that they yield most excellent satisfaction in every particular. As far as the United States is concerned, the establishment of our **branch in New York** has been productive of the most gratifying results, materially facilitating the importation of our goods for educational institutions, laboratories, hospitals, etc. and enabling us to make any repairs or alterations which may be desired with a minimum loss of time and at greatly diminished expense for transportation. The result is that we have reason to believe that there are more microscopes of our manufacture now in use in the United States than of any other make.

This cordial reception is the more significant and gratifying since in competing with instruments of American manufacture we have been forced to contend with a very high import duty. But notwithstanding this, the solidity and convenient size and arrangement of our stands and the unsurpassed excellence of our objectives have obtained for our instruments the general acceptance above referred to.

With the rapid advance in all departments of natural science many increased demands have been constantly made upon the microscope, to meet which we have spared no labor or expense, and a number of new features will be found in the present catalogue. The most material of the improvements of the past few years is to

be seen in the quality of our objectives, which we believe to be the best in every particular which are to he had today. Notwithstanding this improvement, made at very considerable expense, our prices remain the same. It has always been our practice to repair without expense any defect in our objectives which may develop spontaneonsly and not as the result of abuse.

The management of our New York house is still in the hands of Mr. WILLIAM KRAFFT, who is thoroughly acquainted with every detail of the construction of our instruments. Duplicate parts of all instruments of our manufacture are kept constantly in stock, and every facility is at hand for as careful and accurate workmanship as at Wetzlar.

We would also announce that **Mr. KRAFFT is our Sole Agent for the United States,** and that we can fill no orders, which are not transmitted to us through him.

As heretofore, microscopes, bacteriological apparatus and all other scientific instruments expressly imported for use in educational institutions are exempt from duty.

Catalogues may be had on application.

Address:

WILLIAM KRAFFT

411 West 59th Street

NEW YORK CITY.

A. The Objectives.

The construction of our objectives is based upon a system of complete mathematical predetermination of their optical elements in combination with spectrometric analysis of the refractive and dispersive properties of the materials used. In order to practically realise the results of our calculation in the most perfect manner possible the objectives are tested by exacting methods with respect to their optical properties. The correction is brought to such a degree of perfection as to eliminate, over the entire surface of the image, the appearance of coloured fringes and the effects of spherical aberration. We have excluded from use in our objectives all those kinds of glasses which have been found to be apt to deteriorate, even if in an optical respect they possessed certain advantages.

The lenses employed in the achromatic objectives have been tested by experience extending through many years and are not subject to deterioration due to chemical and atmospheric influences. Hence our modern achromatic objectives are absolutely permanent.

The apochromatic objectives, which include in their construction some of the new Jena glasses, became in many instances cloudy, even from the very beginning. We have ceased using material subject to such changes. Recurrences of these cases have, therefore, become rarer and rarer. We have, of course, never hesitated to rectify any such defects, free of charge, even if appearing after years of use.

The proper glasses having been selected, the radii, thicknesses and distances of the lenses and the apertures etc. of the objectives are determined, and the lenses are, while in process of manufacture, accurately tested with our own apparatus by exacting methods, so

as to practically ensure strict conformity with mathematical calculation. The single lenses and pairs of lenses are not combined to form objectives unless in the course of these tests they satisfy individually all requirements. By repeated and careful tests with the aid of the most sensitive test-objects with respect to resolving power and colour correction such objectives only are issued which satisfy all modern requirements and which fully reach the high standard which our firm has adopted.

We manufacture two kinds of objectives, viz:

Achromatic Objectives

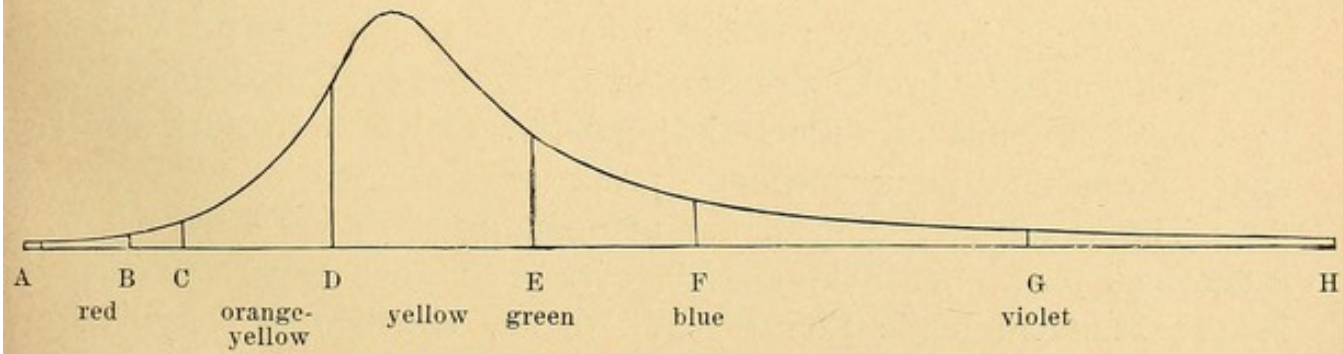
and

Apochromatic Objectives.

The distinguishing properties of these may be described in the following manner:

The achromatic objectives have a comparatively simple formula, but they fully satisfy all the requirements of a good objective, beside being handy and rigidly mounted.

1. They are chromatically corrected for the brightest part of the spectrum within the lines D and F.
2. The rays are spherically united with respect to all zones.
3. The numerical aperture, upon which the resolving power of the objective essentially depends, is made as wide as possible, without the adoption of hazardous means.



Intensity curve of the rays of the spectrum.

The above Fraunhofer curve of the light-rays of the solar spectrum shows that the colour correction of the achromatic lenses within the lines D and F embraces the brightest part of the spectrum.

The apochromatic objectives envolve chromatic correction of a higher order. Their construction is complicated and necessitates, as a means of realising their advanced aims, the use of borate, phosphate and baryta glasses, and even that of fluorite. The elimination of the secondary spectrum is not apparent in all preparations alike. Stained preparations show this achromatic superiority in the least degree. It is particularly marked in low power objectives when the object is of the nature of the scales of butterfly's wings, e. g. of *Hipparchia Janira* and *Podura plumbea,* and in the high power objectives this is more especially shown in the examination of diatom valves, e. g. *Pleurosigma angulatum* or *Surirella gemma.*

Microscopists will, however, find the achromatic objectives sufficient for all their purposes, since in defining and resolving power our achromatic objectives are not appreciably surpassed by apochromatic objectives. The achromatic objectives do also good service as photographic objectives. We have demonstrated the eminent utility of these objectives in photo-micrography in our pamphlet entitled »Der mikrophotographische Apparat und Anleitung zur Mikrophotographie« (Photo-micrographic apparatus and guide to photo-micrography), to which are appended four photo-micrographs representative of some of the best work of the kind known.*) These achromatic objectives have no difference of optical and chemical focus. It is therefore possible to use them without cutting out portions of the solar or any other spectrum by means of light-filters or coloured screens. Nevertheless it is advisable to employ in photo-micrography orthochromatic plates and monochromatic light in order to bring out sharply on the plate the contrasts produced in the preparation by simple or double staining. In a case like this any theoretical superiority which the apochromatic lenses may posses becomes practically useless.

The great perfection of our achromatic objectives leaves but little room for a further advance of correction, such as is embodied in our Pantachromatic Lenses. We have, therefore, decided to discontinue the manufacture of the latter.

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*) This elegant little volume is sent free on application to those interested in photo-micrography.

In order to secure the best results in using the higher powers from No. 5 upwards care should be taken to use cover-glasses of 0.17 mm thickness and to make the length of the tube equal to 170 mm. This length of tube must in particular be adhered to in the use of oil-immersion lenses. If the microscope be provided with a nose-piece the draw-tube should be drawn out to 160 mm; in its absence it should be at 170 mm. A deviation of 10 mm or more from the correct tube length greatly mars the efficiency of the oil-immersion lenses.

Thickened cedar-wood oil, having a refractive index of 1.515, is employed with the oil-immersion lenses. A bottle of this oil is supplied with each of these homogeneous immersion lenses.

A lens of 600 to 700 magnifying power is generally used in examining bacteria. We endeavoured, therefore, by constructing a new lens, called $^1/_{10}$ *oil-immersion,* of 2.5 mm focus, to add to the resources of bacteriology. This immersion lens has a lower magnification than the $^1/_{12}$ oil-immersion, but it is more easily made and hence cheaper. With eye-piece No. 3 it gives a magnification of 600.

Dry and immersion lenses of similar magnification have in general the same angular aperture. Their pencil of rays differs, however, in density and intensity, for the rays emerging from the cover-glass into the air are considerably reflected and the entire cone suffers a corresponding loss of brightness. If a medium of greater refractivity than air ($n = 1.0$), e. g. water ($n = 1.33$), cedar-wood oil ($n = 1.52$) or monobromide of naphtaline ($n = 1.66$), be placed between the front-lens and the cover-glass the rays are, in proportion to the value of this refractive index, made to enter the front-lens. The cone of light incident upon the objective gains in intensity proportionately. The numerical aperture (num. Ap.)

$$a = n \sin u$$

is a standard quantity for the dry and immersion lenses. It is a quantity which takes into consideration both the

Diameter of the incident pencil and its
Intensity.

We append a small table affording a comparison of the numerical apertures of the various objectives, the angular apertures being equal. The resolving power of an objective increases however with the numerical aperture.

Angular aperture $2u$	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°
Numerical apertures.														
Dry series $n = 1.00$	0.09	0.18	0.26	0.34	0.42	0.50	0.57	0.64	0.71	0.77	0.82	0.87	0.91	0.94
Water-Immersion $n = 1.33$	0.12	0.24	0.35	0.46	0.56	0.66	0.76	0.85	0.94	1.02	1.09	1.15	1.20	1.25
Homogeneous Oil-immersion $n = 1.66$	0.14	0.26	0.40	0.52	0.64	0.76	0.87	0.98	1.07	1.16	1.24	1.32	1.38	1.43
Monobromide of Naphtaline-Immersion $n = 1.66$	0.15	0.29	0.43	0.57	0.70	0.83	0.95	1.07	1.17	1.27	1.36	1.44	1.50	1.56

Micrometer Values. The micrometer eye-piece is a convenient means of measuring microscopic objects. The value of each division of the scale is determined for each objective with the aid of a stage-micrometer by ascertaining how many divisions of the stage-micrometer are superimposed by an eye-piece micrometer scale divided into $^1/_{10}$ mm, care being taken that the tube-length is accurately 170 mm. The micrometer values for the various objectives are given in the tables on page 9. If a scale divided into $^1/_{20}$ mm No. 64 be used these values must be divided by 2.

Take for example a scale of butterfly's wing and measure it with objective 6. Let its image cover 50 divisions of the eye-piece micrometer scale lengthwise and 18 divisions in breadth.

Then its length is $50 \times 0.0034 = 0.170$ mm and its

Breadth is $18 \times 0.0034 = 0.061$ mm.

Tables of magnifications. These tables are compiled by taking a scale divided into $^1/_{100}$ mm (stage-micrometer) as a standard for each pair of objective and eye-piece working at a tube-length of 170 mm and by measuring the length of the image of this scale as appearing in a plane situated 250 mm (10") from the eye-lens. The magnification is obtained by dividing the length of the image of the scale by its actual length.

In the absence of a micrometer these tables can also be used for measuring microscopic objects. For this purpose place a sheet of paper at the foot of the microscope at a distance of 250 mm (10") from the eye-lens and with dividers mark off the apparent size of the object as seen in the microscope, care being, of course, taken that the tube-length is accurately 170 mm. To find the actual size of the object divide the apparent size of the image by the magnification corresponding to the objective and eye-piece as found from the table.

Achromatic Objectives.

No. of Objectives		Focal length	Numerical Aperture (num. aper.)	Micrometer Values	Price $
Low power Dry Series	1	44 mm ($1^{2}/_{4}$")	0.09	0.054 mm = 54 μ	**6.—.**
	2	30 mm ($1^{1}/_{4}$")	0.14	0.028 mm = 28 μ	**6.—.**
	3	18 mm ($^{3}/_{4}$")	0.28	0.015 mm = 15 μ	**6.—.**
	4	13 mm ($^{1}/_{2}$")	0.45	0.012 mm = 12 μ	**10.—.**
High power Dry Series	5	5.8 mm ($^{1}/_{4}$")	0.77	0.0048 mm = 4.8 μ	**10.—.**
	6	4.4 mm ($^{1}/_{6}$")	0.82	0.0034 mm = 3.4 μ	**12.—.**
	7	3.2 mm ($^{1}/_{8}$")	0.85	0.0026 mm = 2.6 μ	**12.—.**
	8	2.5 mm ($^{1}/_{10}$")	0.87	0.0020 mm = 2.0 μ	**16.—.**
	9	2.1 mm ($^{1}/_{12}$")	0.87	0.0017 mm = 1.7 μ	**24.—.**
Water-Immersion	10	2.2 mm ($^{1}/_{12}$")	1.10	0.0018 mm = 1.8 μ	**26.—.**
Homogeneous Oil-Immersion	$^{1}/_{10}$	2.5 mm ($^{1}/_{10}$")	1.30	0.0022 mm = 2.2 μ	**30.—.**
	$^{1}/_{12}$	2.1 mm ($^{1}/_{12}$")	1.30	0.0018 mm = 1.8 μ	**40.—.**
	$^{1}/_{16}$	1.7 mm ($^{1}/_{16}$")	1.30	0.0014 mm = 1.4 μ	**60.—.**

An objective with a focus of 80 mm, constructed on the principle of a photographic lens, serves as a projection objective. It screws into the tube of the microscope and forms a large and distinct image.

Price: $ **12.—.** — The same with Iris-diaphragm: $ **16.—.**

Huyghenian Eye-pieces.

Number	0	I	II	III	IV	V
Focal distance mm	50	40	35	30	25	20

Price of each Eye-piece: $ **2.—.**

Magnification

of the Achromatic Objectives in combination with the Huyghenian Eye-pieces.

Tube-length 170 mm. Distance of image 250 mm.

Objectives		Eye-pieces.						Objectives	
		0	I	II	III	IV	V		
Low Power Objectives	1	15	20	24	28	34	43	1	
	2	25	33	40	47	57	72	2	
	3	46	60	70	85	105	130	3	
	4	58	78	90	110	135	165	4	
High Power Objectives (Cover-glass thickness 0.17 mm)	5	150	190	235	280	345	420	5	
	6	210	275	330	390	480	595	6	
	7	270	370	440	525	625	770	7	
	8	360	490	570	650	800	990	8	
	9	430	560	670	770	960	1200	9	
Water-Immersion	10	395	515	615	720	860	1070	10	Water-Immersion
Homogeneous Oil-Immersion	1/10	330	430	510	600	730	870	1/10	Homogeneous Oil-Immersion
	1/12	435	570	680	800	1000	1250	1/12	
	1/16	540	710	820	980	1220	1500	1/16	

Apochromatic Objectives.

Objectives		Focal length mm	Numerical Aperture	Micrometer Values	Price $
Dry Series	16	16	0.30	0.016 mm	**24.—.**
	8	8	0.65	0.008 mm	**32.—.**
	4	4	0.95	0.004 mm	**48.—.** with correction collar
Homogeneous Oil-Immersion	2	2	1.30	0.002 mm	**100.—.**

Compensation Eye-pieces

for Apochromatic Objectives.

Eye-pieces	4	6	8	12	18
Price . . . . . $	**6.50.**	**6.50.**	**10.—.**	**10.—.**	**8.—.**

Magnification

of the Apochromatic Objectives in combination with the Compensation Eye-pieces.

Objectives		Eye-pieces 4	6	8	12	18
Dry Series	16	62	93	125	187	280
	8	124	190	250	370	560
	4	250	375	500	750	1120
Oil-Immersion . . .	2	500	750	1000	1500	2250

B. The Stand.

We make twelve forms of stands adapted to meet all the requirements of natural science, medicine and technology. Their judicious construction, the exactness of all the working parts and elegant finish combined with the excellence of the optical apparatus have secured for these instruments a vast popularity in laboratories throughout the world.

The following are the leading features of our stands:

Stand I is an instrument of considerable size. It is particularly useful on account of its large stage.

There are two patterns **of Stand Ia**, one being fitted with a horse-shoe foot, the other with the English tripod. This Stand with its mechanical arrangement satisfies all modern requirements. It is a favourite instrument with bacteriologists.

Stand Ib differs from the preceding stand only in that its stage is fixed.

Stand IIa will be found to render good service to bacteriologists. It is widely used and appreciated as a student's microscope.

Stand IIb is a new and inexpensive instrument for the same purpose.

Stand III is of medium size, but without rack and pinion and is less suitable for the adaptation of a nose-piece.

Stands IV and V are small instruments satisfying modest requirements.

Stand VI is provided with rack and pinion movement and has a very large stage. Being of strong and heavy built it is admirably suited for the examination of trichinae. It is also found to be a valuable adjunct in laboratories and scientific institutions.

Three stands have been constructed to meet the requirements of mineralogical investigation. The first two, which have the dimensions of Stands I and Ia respectively, are fitted with all the complex mechanism necessitated by modern mineralogical research. The third is provided with only such of these fittings as are required for the purposes of polarization.

The **coarse adjustment** is effected by rack and pinion with the Stands I, Ia, Ib, IIa and IIb, but by draw-tube with Stands III, IV and V. Stand VI has only coarse adjustment by rack and pinion, all other stands are fitted with a smoothly working fine adjustment. In Stands I, Ia, Ib the head of the micrometer-screw is divided into 50 parts, each of which indicate $^1/_{100}$ mm.

The tube of Stands I—IV can be drawn out, the extension being provided with a scale giving the length of the entire tube. Tubes and objectives have the wide gauge "*Society screw*".

Stands I, Ia, Ib and IIa are inclinable.

Stands IIb, III, IV, V and VI are not inclinable.

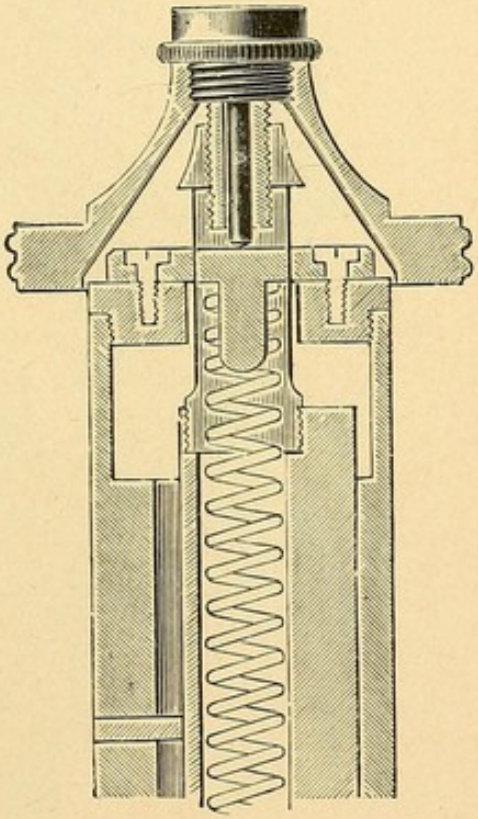
Stands I, Ia, Ib, IIa, IIb and III are supplied in upright mahogany cases fitted with nickel-plated handles.

Cases are included in the price of the stands.

Clips and test-objects accompany each microscope.

The objectives of Stands I, Ia, Ib, IIa, IIb, III are supplied in brass capsules; those of Stands IV, V, VI in leather cases.

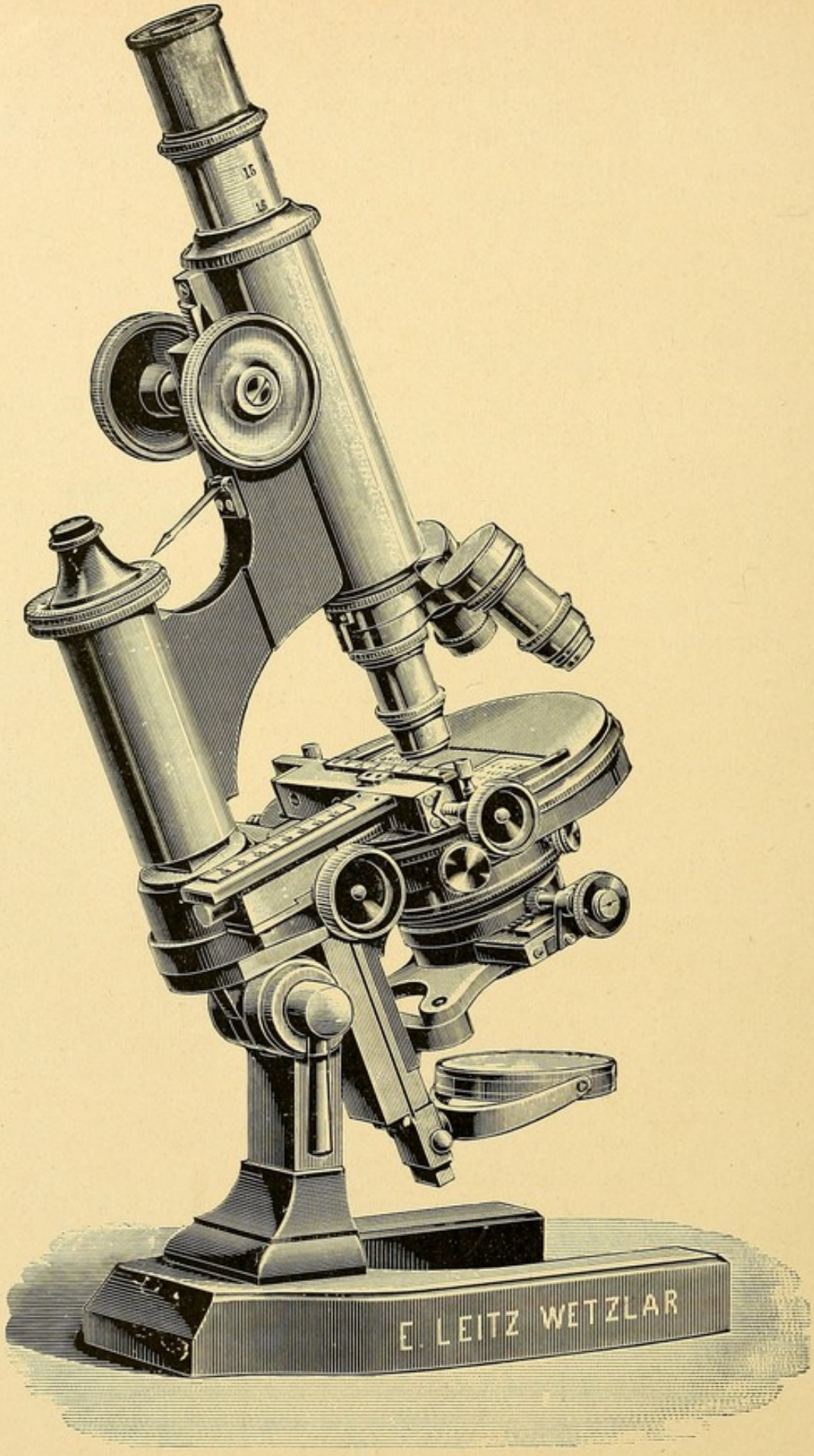
A nose-piece is best adapted for stands with coarse adjustment by rack and pinion. Our lenses, with the exception of the achromatic lens No. 1, are so adjusted that in changing them the image remains in focus, only the fine adjustment remaining to be accomplished by means of the micrometer screw.



The micrometer-screw.

An illuminating apparatus may be added to a microscope at any time. For a description of the various forms of these condensers see page 34. The instruments specified in the following pages are provided with carefully corrected achromatic objectives, to suit all purposes.

Microscopes can be equipped so as to suit any particular requirement. The cost of the instruments can easily be ascertained by summing up the cost of the individual items.



Stand I.

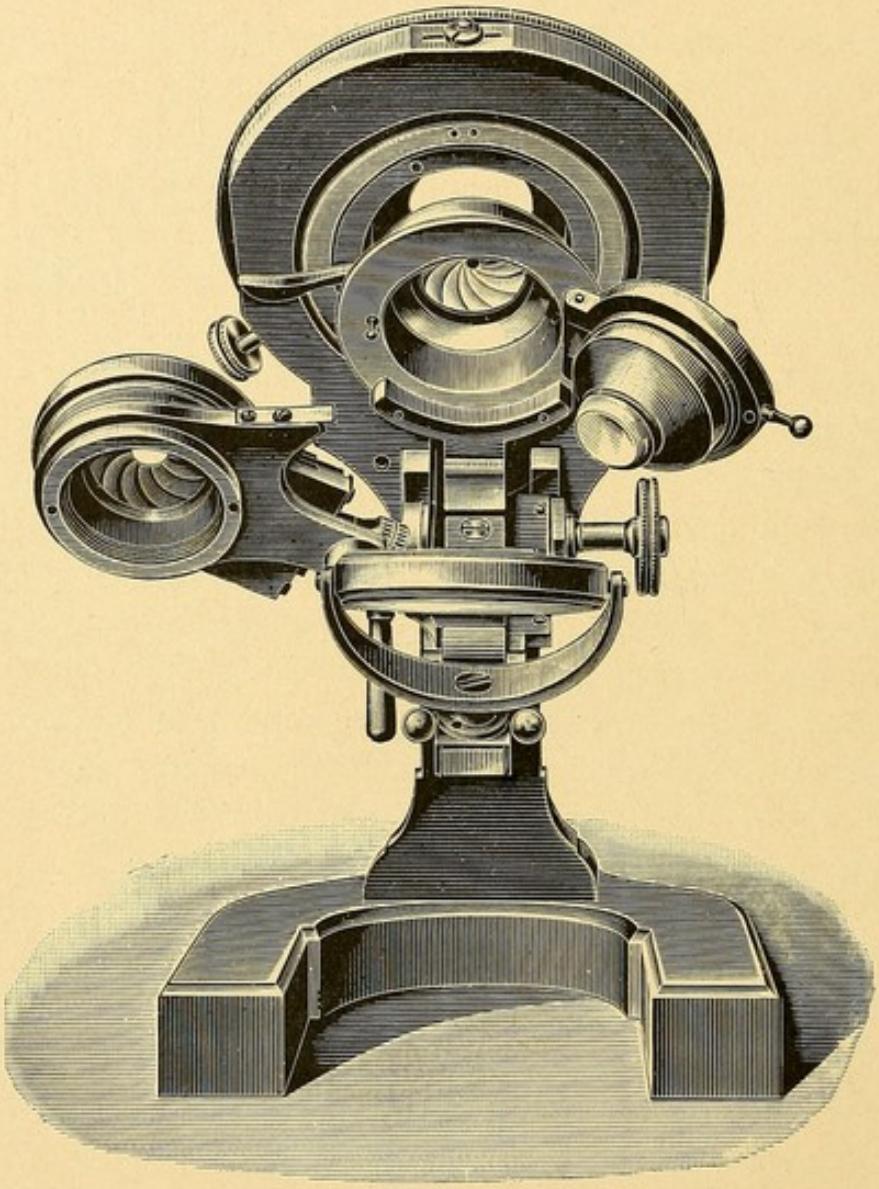
Stand I.

No. $

1. **Large microscope**, inclinable, with hinged joint and clamping lever and fitted with round revolving centering stage. Coarse adjustment of the objective by rack and pinion, fine adjustment by micrometer-screw, the head of which is provided with a scale reading $^1/_{100}$ mm. Draw-tube with millimetre scale. Large Abbe Illuminating Apparatus with rack and pinion for raising and lowering, and Iris-diaphragm with oblique movement. The Condenser is hinged and can be removed and swung aside by pressing on a button. When the condenser is swung aside the illumination is regulated by the **Cylinder-Iris-diaphragm** above it. The latter is opened and closed by means of a lever attached to one side. (See cut on next page.) The Mechanical Stage No. 100 is attached to the ordinary stage by means of a set-pin, which fixes the stage in an invariable position. By removing the screw the stage can easily be detached. (See cut, page 59.)

   Triple nose-piece.
   Drawing eye-piece No. 80 (See cut, page 48).
   Large polarising apparatus No. 101.
   Micrometer eye-piece No. 62.
   Object micrometer No. 67.
   Cover-glass gauge.
   Glass slides and cover-glasses.
   Achromatic objectives Nos. 1, 2, 3, 4, 5, 6, 7, 8.
      Oil-immersion lenses $^1/_{10}$, $^1/_{12}$, $^1/_{16}$", numerical aperture 1.30.
   Eye-pieces 0, I, II, III, IV, V.
   Magnification from 15 to 1500. **400.—.**

Stand with Abbe's Illuminating Apparatus, Cylinder-Iris-diaphragm, triple nose-piece and mechanical stage No. 100 . . . . . **140.—.**



Abbe's Illuminating Apparatus for Stand I.

Swing-out Condenser.

Cylinder Iris Diaphragm.

Stand I.

No. $

2. **Large Microscope**, same as No. 1, inclinable, with hinged joint, clamping lever and round revolving centering stage.

Coarse adjustment of the objective by rack and pinion, fine adjustment by micrometer-screw with scale on head, reading $^1/_{100}$ mm. Draw-tube with millimetre scale.

Large Abbe Illuminating Apparatus with rack and pinion for raising and lowering and Iris-diaphragm with oblique movement.

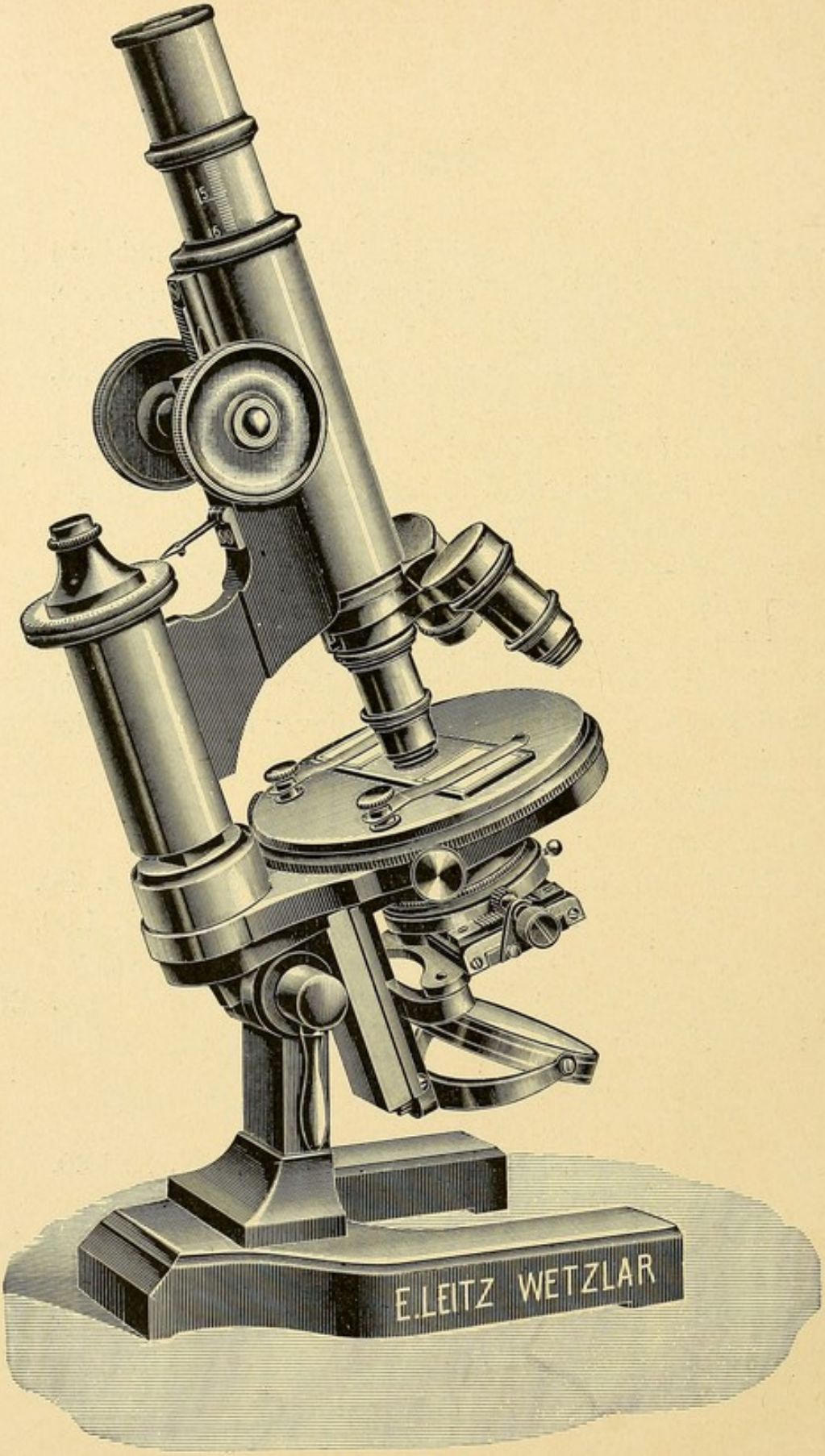
The condenser is hinged and can be removed and swung aside by pressing on a button. When the condenser is swung aside the illumination is regulated by the Cylinder Iris-diaphragm situated above it. The latter is opened and closed by means of a lever attached to its mounting (See cut p. 16).

Triple nose-piece.
Micrometer eye-piece No. 62.
New drawing eye-piece No. 80. (See cut p. 48).
Objectives 2, 4, 6, Oil-immersion $^1/_{12}$, N. A. 1.30.
Eye-pieces I, III, IV, V.
Magnifications 33—1250 . . . . . **202.—.**

3. **The same.**

Micrometer eye-piece.
Triple nose-piece.
Objectives 1, 3, 6, Oil-immersion $^1/_{12}$, N. A. 1.30.
Eye-pieces I, III, IV.
Magnifications 20—1000 . . . . . **186.—.**

Stand with Abbe's Illuminating Apparatus, cylinder iris-diaphragm, without objectives and eye-pieces, without nose-piece . . . . . **104.—.**



Stand Ia.

Stand Ia.

No. $

4a. **Large Microscope,** of smaller size than Stand I, fitted with horseshoe foot (page 18), or with English foot. (See page 62). The stand is inclinable and fitted with revolving centering stage, coarse adjustment by rack and pinion, fine adjustment by micrometer screw with scale. Draw-tube with millimetre scale. Large Abbe Illuminating Apparatus with rack and pinion, and iris-diaphragm with oblique movement. The cylinder-diaphragm and condenser can easily be removed.
Triple nose-piece.
Objectives 2, 4, 6, Oil-immersion $^1/_{12}$, N. A. 1.30.
Eye-pieces I, III, IV, V.
Magnifications 33—1250 . . . . . **160.—.**

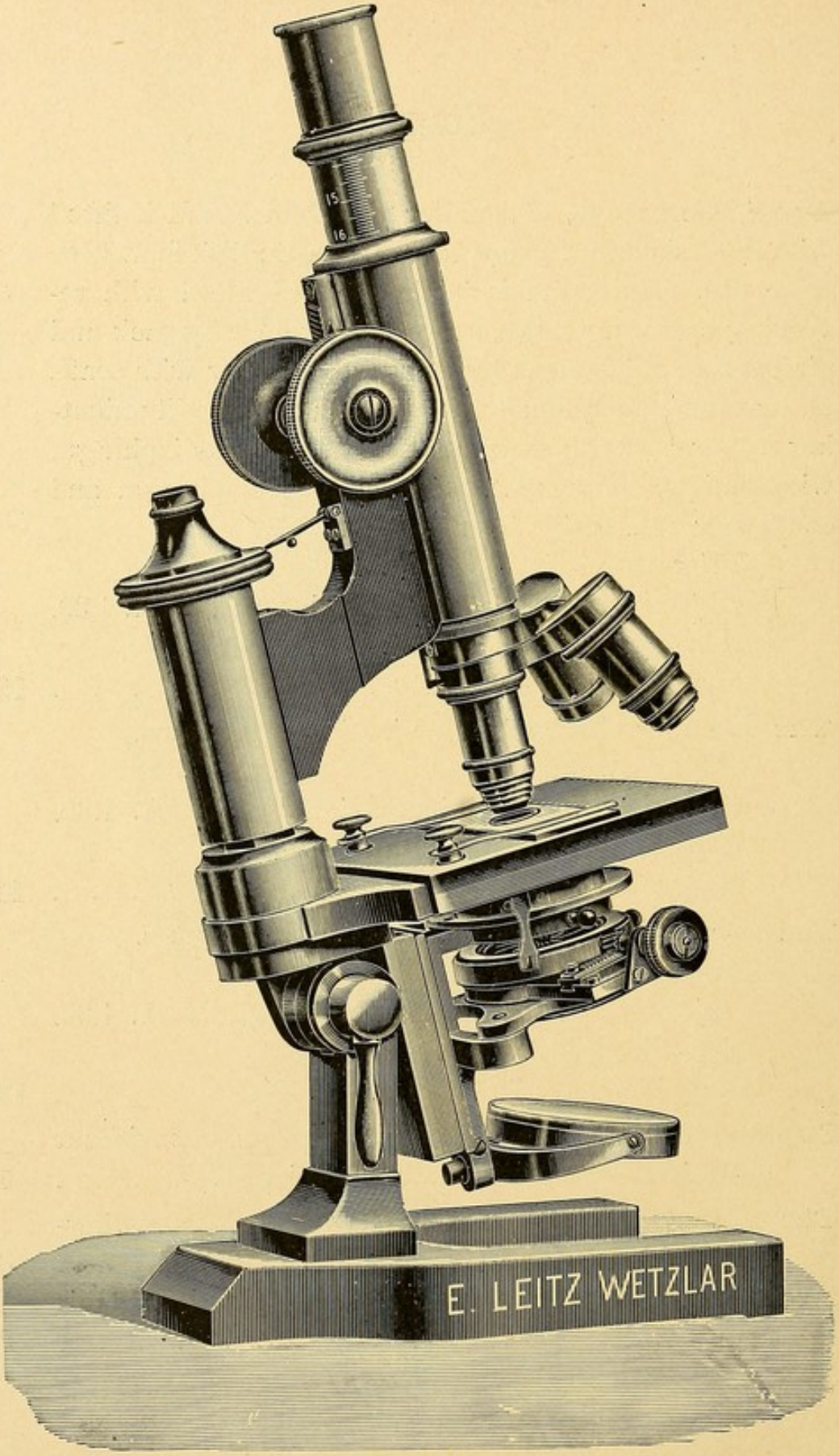
4b. **The same** with Abbe's Illuminating Apparatus.
Triple nose-piece.
Objectives 3, 6, Oil-immersion $^1/_{12}$, N. A. 1.30.
Eye-pieces I, III, IV.
Magnifications 60—1000 . . . . . **148.—.**

4c. **The same** with Abbe's Illuminating Apparatus.
Triple nose-piece.
Objectives 3, 6, Oil-immersion $^1/_{10}$, N. A. 1.30.
Eye-pieces II and IV.
Magnifications 70—730 . . . . . **136.—.**

Stand with Abbe's Illuminating Apparatus, but without objectives, eye-pieces and nose-piece . . . . . **76.—.**

The same with Abbe's Illuminating Apparatus, Swing-out Condenser and Cylinder Iris-diaphragm . . **82.—.**

Mechanical Stage No. 100 can be fitted to this stand at . . . . . **28.—.**



Stand Ib.

Stand Ib.

No. $

5. **Large Microscope**, which differs from Ia by having a fixed stage. The stage is firm and square. The stand is inclinable and has a hinged joint and clamping lever. Draw-tube with millimetre scale. Coarse adjustment by rack and pinion, fine adjustment by micrometer screw with divided head. Abbe's Illuminating Apparatus, same as Ia. Triple nose-piece. Objectives 3, 6, Oil-immersion $^1/_{12}$, N. A. 1.30. Eye-pieces I, III, IV. Magnifications 60—1000 . . . . . **142.—.**

6. **The same** with simplified Illuminating Apparatus No. 32. Triple nose-piece. Objectives 3, 6, Oil-immersion $^1/_{10}$, N. A. 1.30. Eye-pieces I, III, IV. Magnifications 60—730 . . . . . **120.—.**

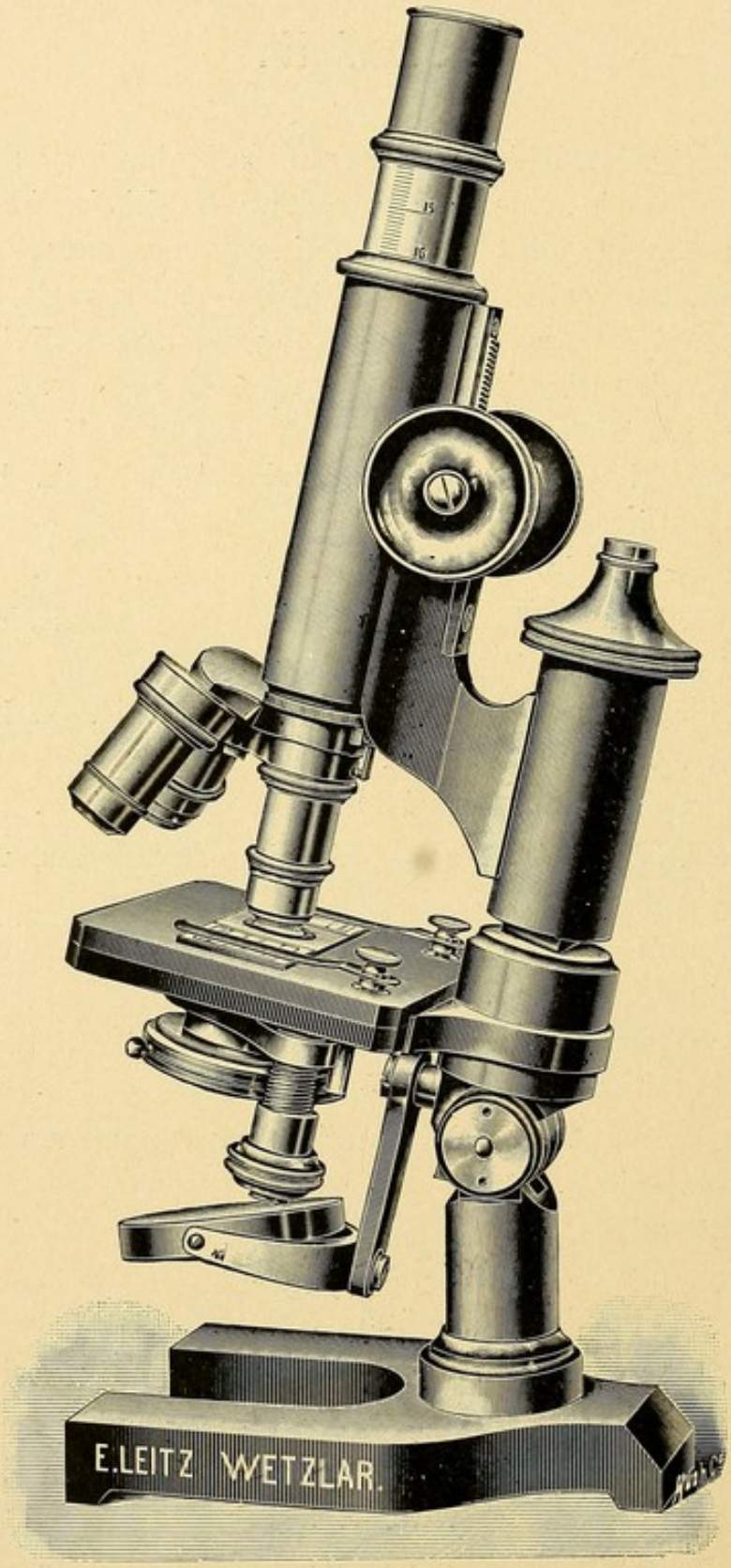
7. **The same** without Abbe's Illuminating Apparatus, with Cylinder-diaphragm. Double nose-piece. Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525 . . . . . **72.—.**

8. **The same** without Abbe's Illuminating Apparatus and without Nose-piece. Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525 . . . . . **66.—.**

Stand without objectives and eye-pieces, without illuminating apparatus and without nose-piece . . . **46.—.**

Stand without objectives and eye-pieces, with illuminating apparatus, without nose-piece . . . . **70.—.**

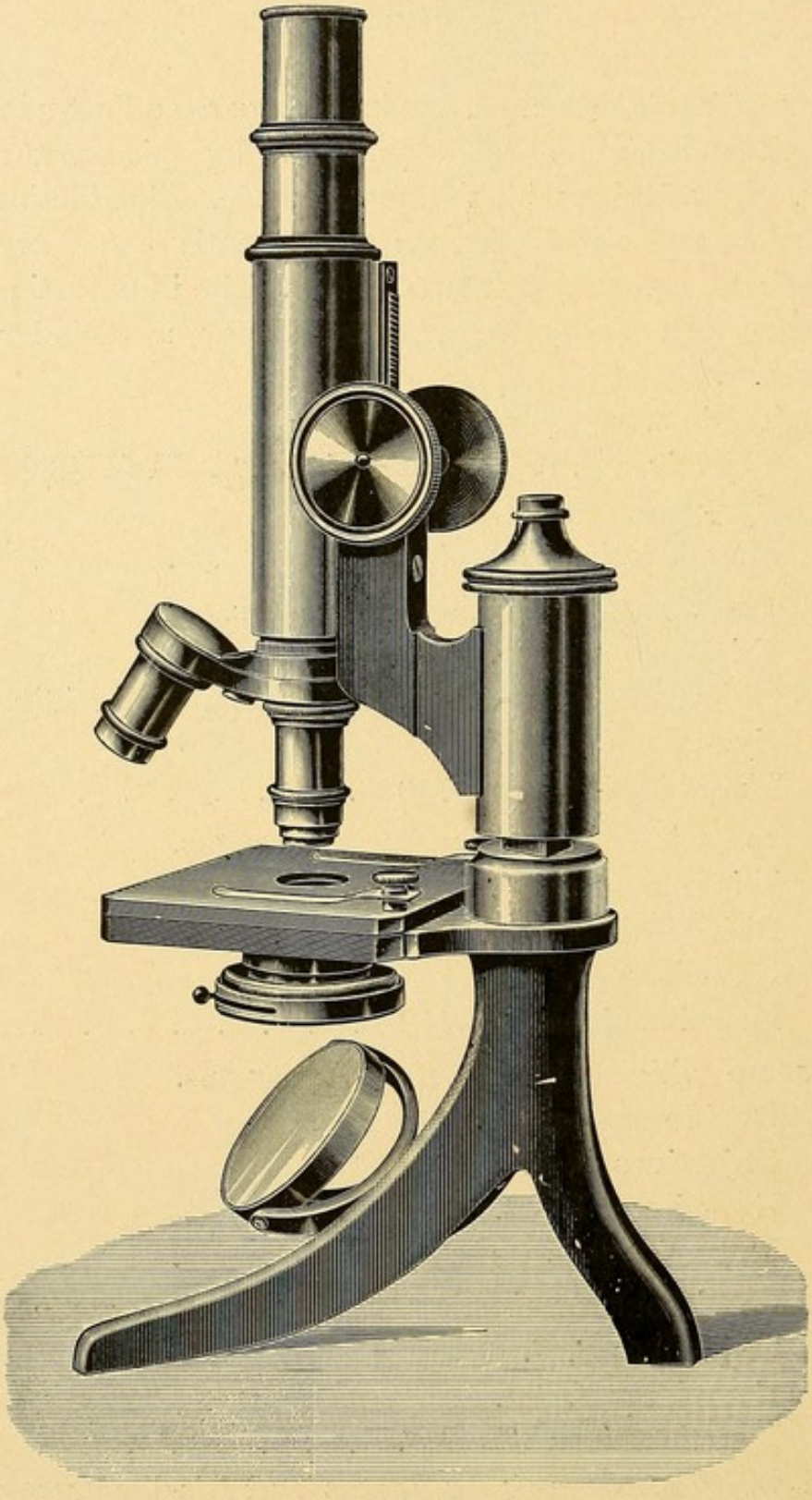
The same with illuminating apparatus, condenser with hinged joint and cylinder iris-diaphragm . . . . **76.—.**



Stand IIa.

Stand IIa.

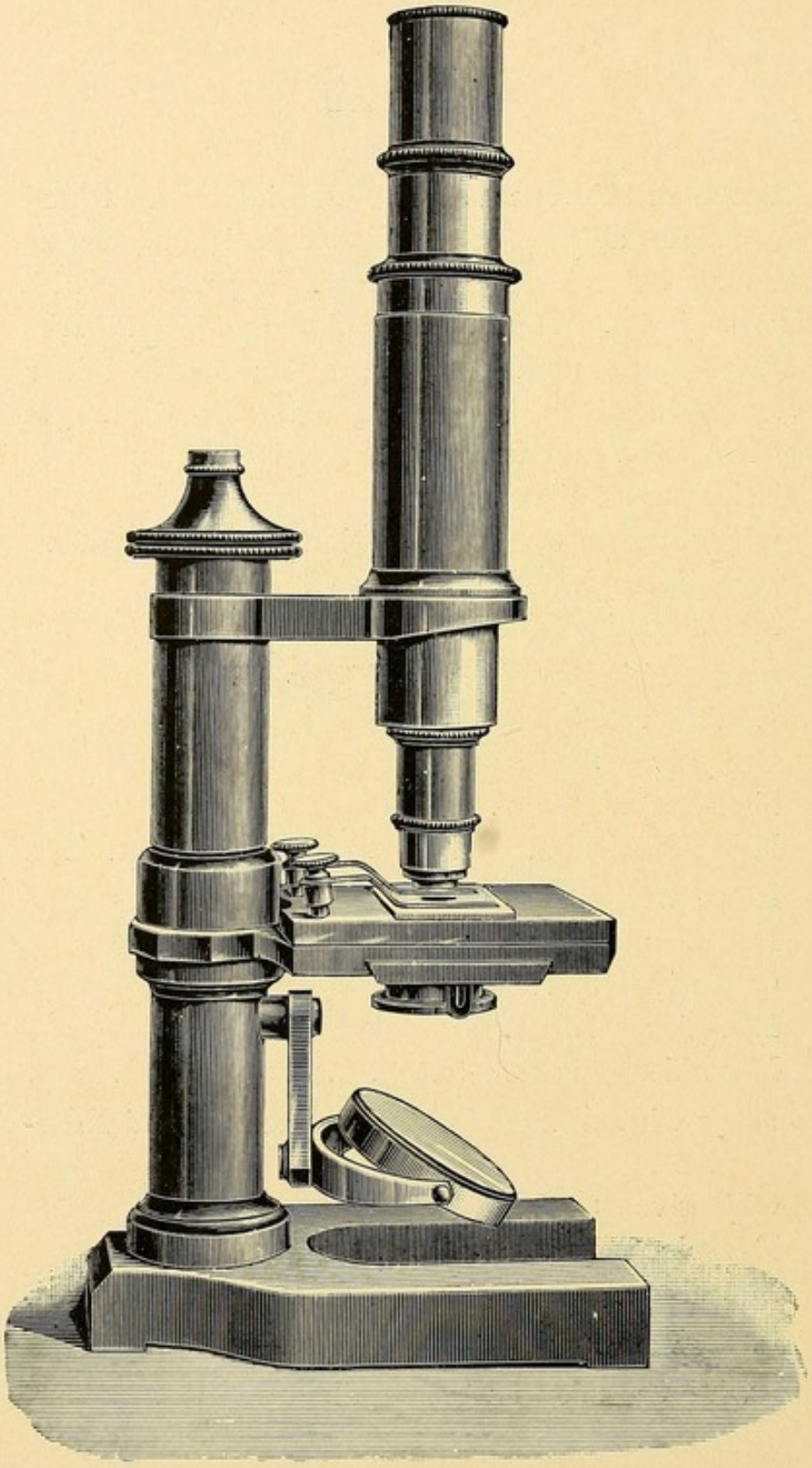
No.		$
9.	**Medium Size Microscope,** inclinable, coarse adjustment by rack and pinion, fine adjustment by micrometer-screw. Draw-tube with millimetre scale. Illuminating Apparatus and Iris-diaphragm permanently connected, to raise and lower by a lateral screw. The illuminating apparatus can easily be exchanged for a cylinder-diaphragm. Triple nose-piece. Objectives 3, 6, Oil-immersion $^1/_{12}$, N. A. 1.30. Eye-pieces I, III, IV. Magnifications 60—1000	**120.—.**
10.	**The same** with Illuminating Apparatus. Triple nose-piece. Objectives 3, 6, Oil-immersion $^1/_{10}$, N. A. 1.30. Eye-pieces II, IV. Magnifications 70—730	**108.—.**
11.	**The same** without Illuminating Apparatus. Triple nose-piece. Objectives 3, 6, 8 Eye-pieces I, III. Magnifications 50—650	**82.—.**
12.	**The same** without Illuminating Apparatus. Double nose-piece. Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525	**64.—.**
13.	**The same** without Illuminating Apparatus and Nose-piece. Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525	**58.—.**
	Stand with Illuminating Apparatus and Iris-diaphragm, without objectives, eye-pieces and nose-piece . .	**48.—.**
	The same stand with Cylinder Diaphragm	**36.—.**



Stand IIb.

Stand IIb.

No.		$
14a.	**Medium Size Microscope**, with non-inclinable tripod stand, coarse adjustment by rack and pinion, fine adjustment by micrometer screw. Draw-tube with millimetre scale. Illuminating Apparatus and Iris-diaphragm permanently connected and sliding in a sleeve underneath the stage. The cylinder-diaphragm is used in the same manner. Triple nose-piece. Objectives 3, 6, Oil-immersion $^1/_{10}$, N. A. 1.30. Eye-pieces I, III, IV. Magnifications 60—730	**92.—.**
14b.	**The same** with Illuminating Apparatus. Double nose-piece. Objectives 3, 6. Eye-pieces II, IV. Magnifications 70—480	**58.—.**
15a.	**The same** without Illuminating Apparatus. Double nose-piece. Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525	**48.—.**
15b.	**The same** without Illuminating Apparatus and Nose-piece. Objectives 3, 7. Eye-piece III. Magnifications 85—525	**40.—.**
	Stand with Illuminating Apparatus and Iris-diaphragm	**30.—.**
	Stand with Cylinder or Wheel-diaphragm	**20.—.**

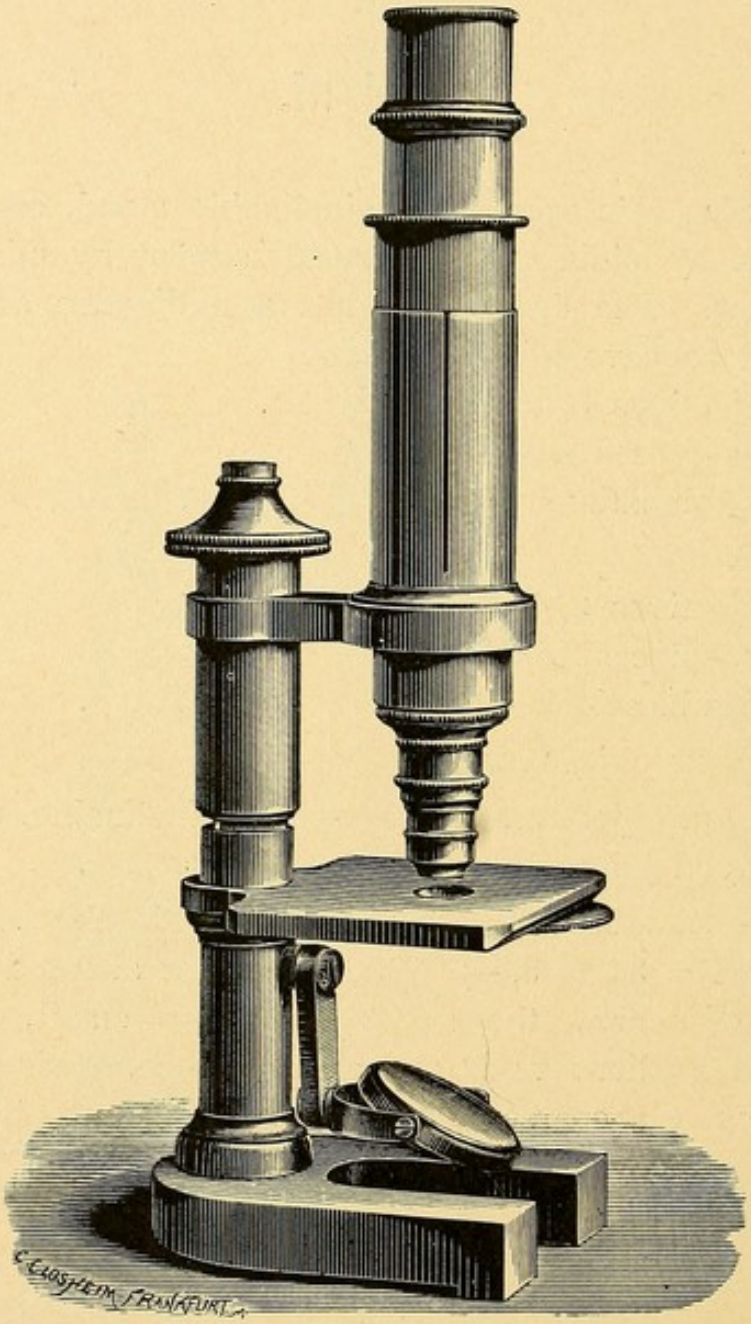


Stand III.

Stand III.

No.		$
16.	**Medium Size Microscope**, non-inclinable stand, coarse adjustment by sliding tube, fine adjustment by micrometer-screw. The draw-tube has a millimetre scale. Plane and concave mirrors. Objectives 3, 6, 8. Eye-pieces I, III. Magnifications 60–650	**60.—.**
17.	**The same.** Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525	**44.—.**
	Stand without objectives and eye-pieces	**22.—.**
	Stand without objectives and eye-pieces, inclinable, with hinged joint	**26.—.**

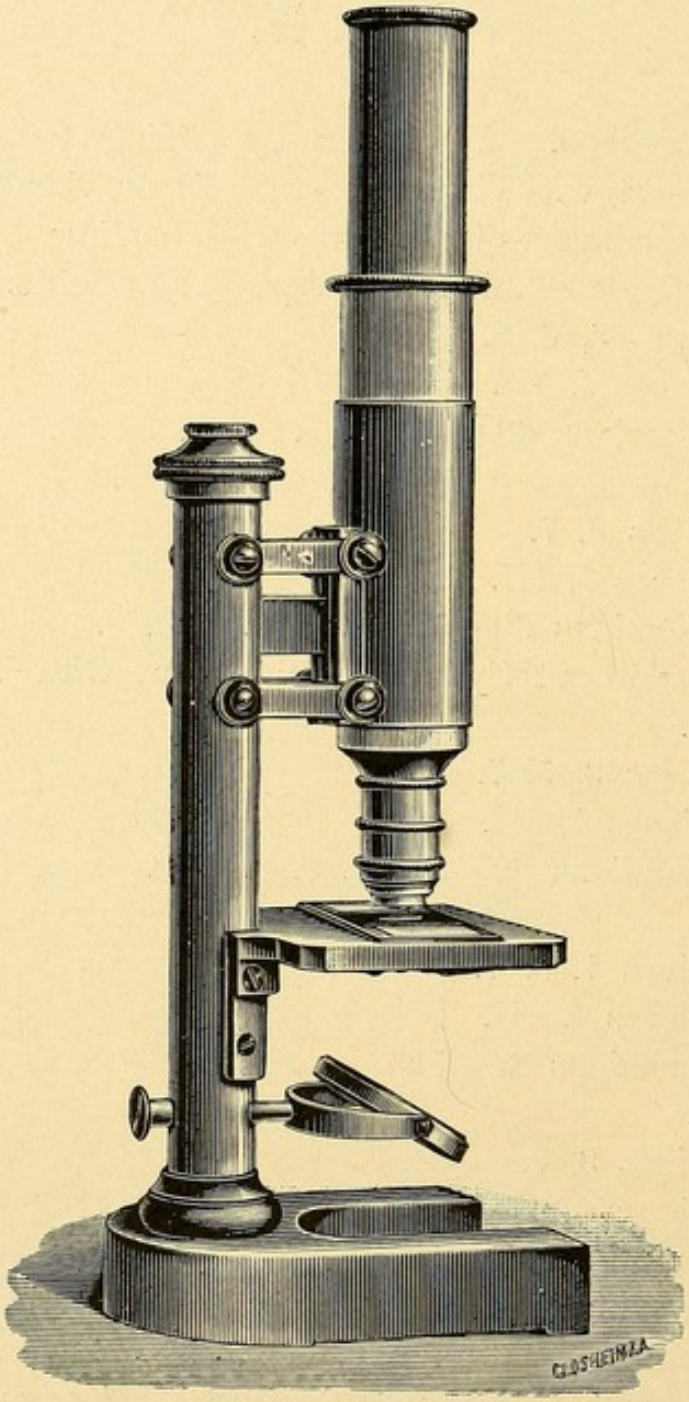
These Stands can be provided with the small condenser No. 34 ($ 8.—). They are not adapted for all kind of work, the stage being too small, and it is not expedient to attach a nose-piece, owing to the absence of a coarse adjustment by rack and pinion.



Stand IV.

Stand IV.

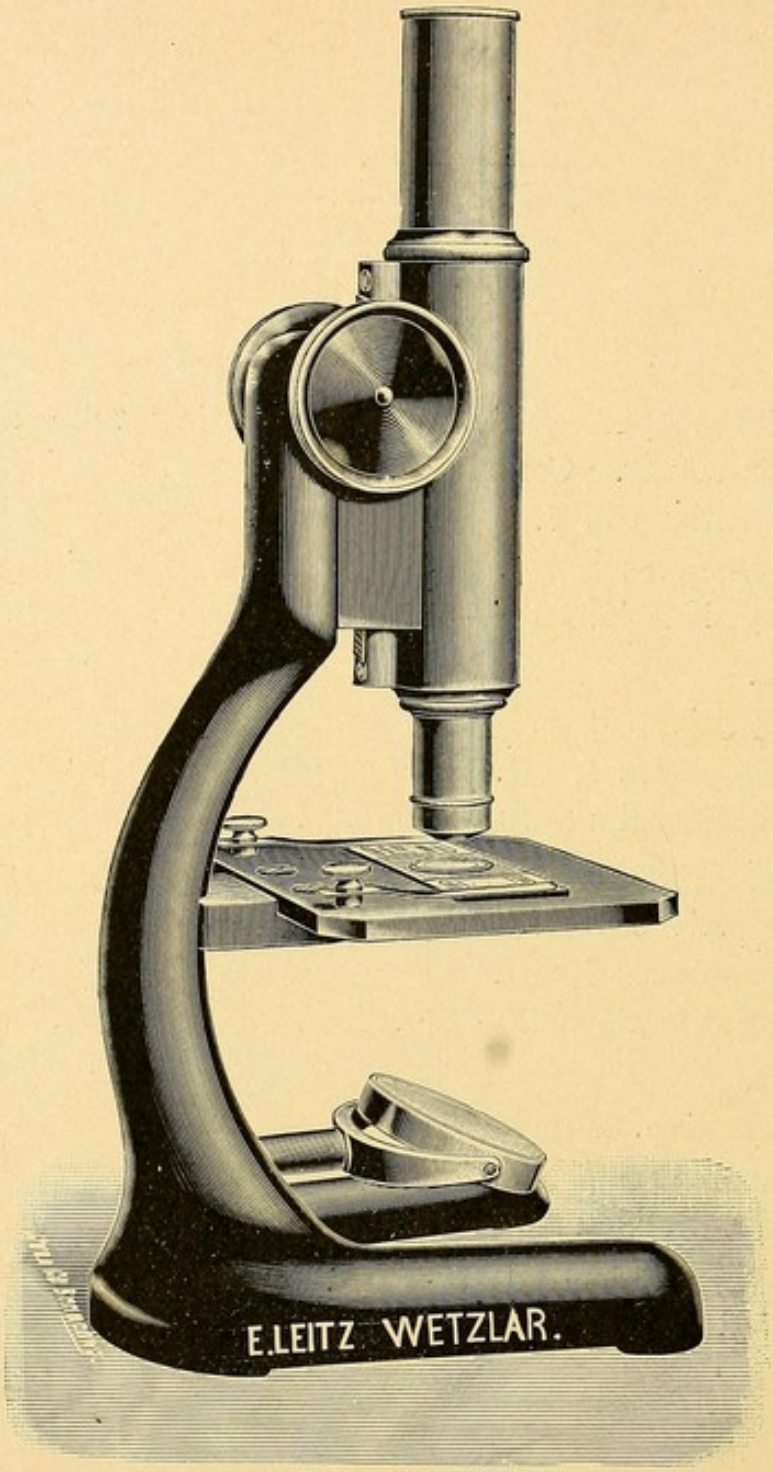
No.		$
18.	**Small Microscope.** Adjustable by sliding tube and micrometer-screw. The draw-tube is provided with a scale. Cylinder-diaphragm with sliding sleeve. Concave and plane mirrors, obliquely adjustable. Objectives 3, 6, 8. Eye-pieces I, III. Magnifications 60—650	**50.—.**
19.	**The same.** Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525	**36.—.**
20.	**The same** without Cylinder Diaphragm, with Wheel Diaphragm. Objectives 3, 5, 7. Eye-pieces I, III. Magnifications 60—525	**42.—.**
21.	**The same.** Objectives 1, 3, 7. Eye-pieces I, III. Magnifications 20—525	**40.—.**
22.	**The same.** Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525	**34.—.**
	Stand with cylinder-diaphragm, without objectives and eye-pieces	**14.—.**
	Stand with wheel-diaphragm, without objectives and eye-pieces	**12.—.**



Stand V.

Stand V.

No.		$
23.	**Small Microscope.** Adjustable by sliding tube and micrometer-screw. Concave mirror. Objectives 3, 7. Eye-pieces I, III. Magnifications 60—525	**28.—.**
24.	**The same.** Objectives 3, 5. Eye-pieces I, III. Magnifications 60—280	**26.—.**
25.	**The same.** Plane mirror. Objectives 1, 3. Eye-pieces I, III. Magnifications 20—85	**24.—.**
26.	**The same.** Objective 3. Eye-pieces I, IV. Magnifications 60—105	**18.—.**
27.	**Stand** without objectives and eye-pieces	**8.—.**



Stand VI.

No. $

28. **Auxiliary Laboratory Stand,** for the examination of trichinae. Very large stage ($3^1/_2 \times 4$ in.). Adjustable by means of a carefully constructed rack and pinion, rendering it possible to focus objectives of fairly high power.

Stand without eye-pieces, objectives and case . . **8.—.**

29. This stand fitted with objective 3, eye-pieces I and IV. Magnifications 60 to 105, in mahogany case fitted with lock . . . . . **18.—.**

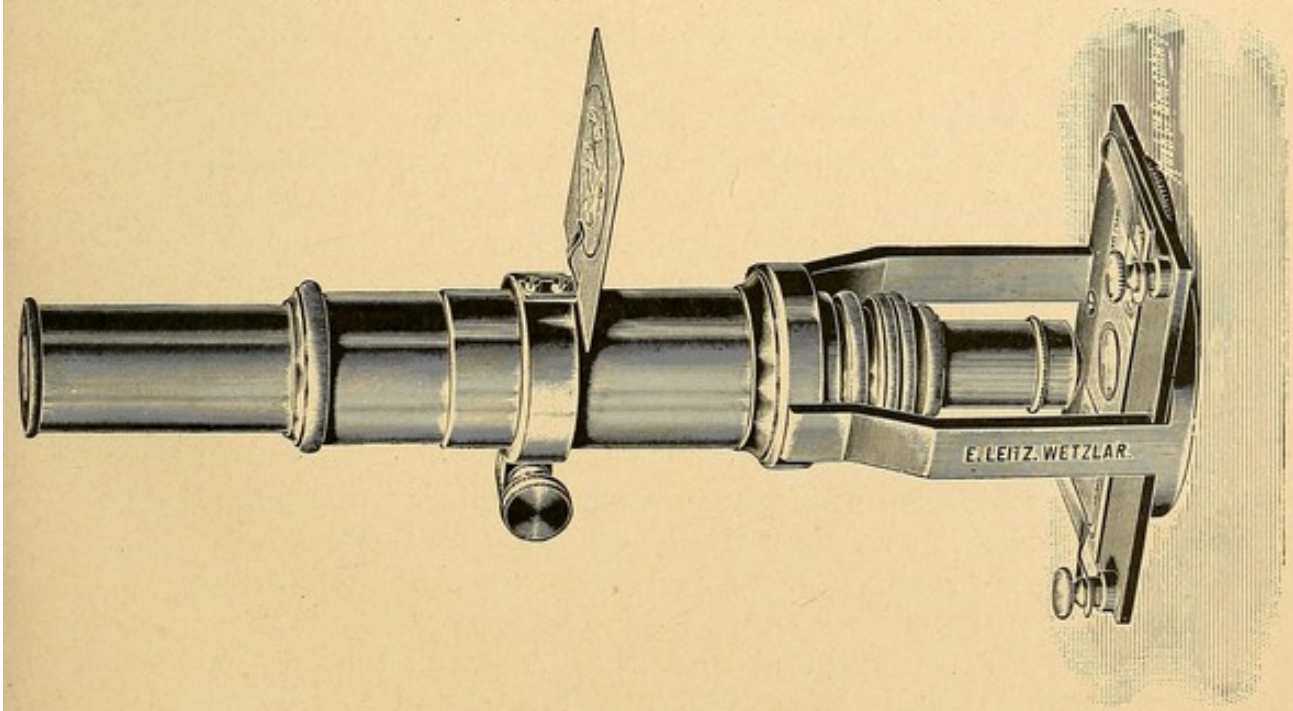
Glass compressor with graduation . . . . . **—.80.**

Glass compressor without graduation, per pair . . . **—.40.**

Demonstration microscope.

No.		$
30 a)	Adapted for low and medium power. Square stage with wheel-diaphragm. Adjustment by sliding tube; after being adjusted the tube is fixed by a ring clamp. With clip to hold a sketch or label, etc. Stand without objective and eye-piece	**6.—.**
b)	**The same** with objective 3 and eye-piece I, magnifing 60 times	**14.—.**
c)	**The same** with adjusting screw for focussing high power objectives, with condenser and iris-diaphragm, without objectives and eye-pieces	**18.—.**
d)	**The same** with objectives 3 and 6 and eye-piece I. Magnification 60 and 275	**38.—.**

The demonstration microscope 30d) will be found to be a useful travelling microscope.



C. Illuminating Apparatus.

No. $

31. **The large Abbe Illuminating Apparatus** consists of three parts:

a) The Condenser proper, of high power.
b) The diaphragm-carrier with the iris-diaphragm.
c) The plane and concave mirror.

After turning aside the middle part, i. e. the diaphragm carrier, the Abbe condenser may be substituted for the ordinary cylinder-diaphragm. The diaphragm is opened and closed by a small button projecting from its collar. The iris-diaphragm can be completely closed. Excentric adjustment of the iris-diaphragm is obtained by rack and pinion, oblique illumination being possible in any direction.

The rack and pinion adjustment of the apparatus serves to raise and lower it to any required degree, thus permitting of the most advantageous concentration of light upon the object.

This apparatus is designed for Stands Ia and Ib. **24.—.**

In the stands I the condenser can be removed by pressing on a button and turning it aside; the cylinder iris-diaphragm can then be brought into action. The latter is opened and closed by a lateral lever. (See Fig 16.). . . . . **30.—.**

This condenser can also be adapted to Stands Ia and Ib.

32. **The Simplified Abbe Illuminating Apparatus** has the same combination of lenses as the large apparatus, the iris-diaphragm, however, is fixed and cannot therefore be adjusted for oblique illumination. This apparatus is raised and lowered by means of a screw. The cylinder-diaphragm can be substituted for the condenser. This condenser is designed for Stands Ib, IIa, IIb . . . **12.—.**

33. **The same Abbe Illuminating Apparatus** without screw for raising and lowering, for Stand IIb. . . . . **10.—.**

34. **The small Illuminating Apparatus (Bacteria condenser)** has a longer focus than the foregoing and is fitted with a small iris-diaphragm, the condenser and iris-diaphragm being permanently connected. The apparatus is substituted for the cylinder-diaphragm. It can be adapted to Stands III and IV, provided the latter have a cylinder-diaphragm . . . . . **8.—**

D. Microscopes
for Mineralogical Research.

We construct three Microscopes for mineralogical investigations. All three are adapted for determining the axes of elasticity and for the differentiation of isotropic and anisotropic bodies. Stands I and II are alone adapted for determining the optical axes and their angles.

Only those lenses, condensers and eye-pieces may be used which have by careful examination been found in polarized light to be free from polarizing effects.

Mineralogical Stand I.

No.		$
35.	This microscope corresponds in its dimensions to Stand I as described on page 15. Coarse adjustment by rack and pinion, fine adjustment by micrometer-screw, the milled head of which has 50 divisions, each representing an elevation of $^1/_{100}$ mm. The condenser, iris-diaphragm and polarizer can be raised and lowered by rack and pinion. A triple condenser facilitates the observation of the axial lines in the microscope. It is so arranged as to be easily replaced by a simple diaphragm-carrier, as it can be easily withdrawn from under the object stage. By means of a collar attached to the end of the tube the objective is brought into coincidence with the centre of the revolving stage.	

No. §

This revolving stage is divided into 360 degrees and fitted with a vernier and index. The Nicol prism, which serves as a polarizer, can, after turning the iris-diaphragm aside, be drawn out from under the latter. The zero position of the Nicol prism is indicated by a line, as well as the angles 90, 180, 270°. The analyser is mounted in metal and is firmly fixed above the eye-piece. The analyser rotates on a disc graduated to 360 deg. The front of the tube has a movable window which provides access to the inner tube. In the latter is an opening for the introduction of a Bertrand lens. This lens serves the purpose of magnifying the interference figures produced by the converging rays of polarized light. The lens and the eye-piece can be raised or lowered by rack and pinion. In the analyzer is a slide for the insertion of gypsum and quartz plates. The zero point corresponds to a position at 45° of the analyzer.

In many investigations it is advisable to employ an analyzer introduced laterally into the tube, instead of the one mentioned above.

The following are supplied to complete the stand:
Triple nose-piece.

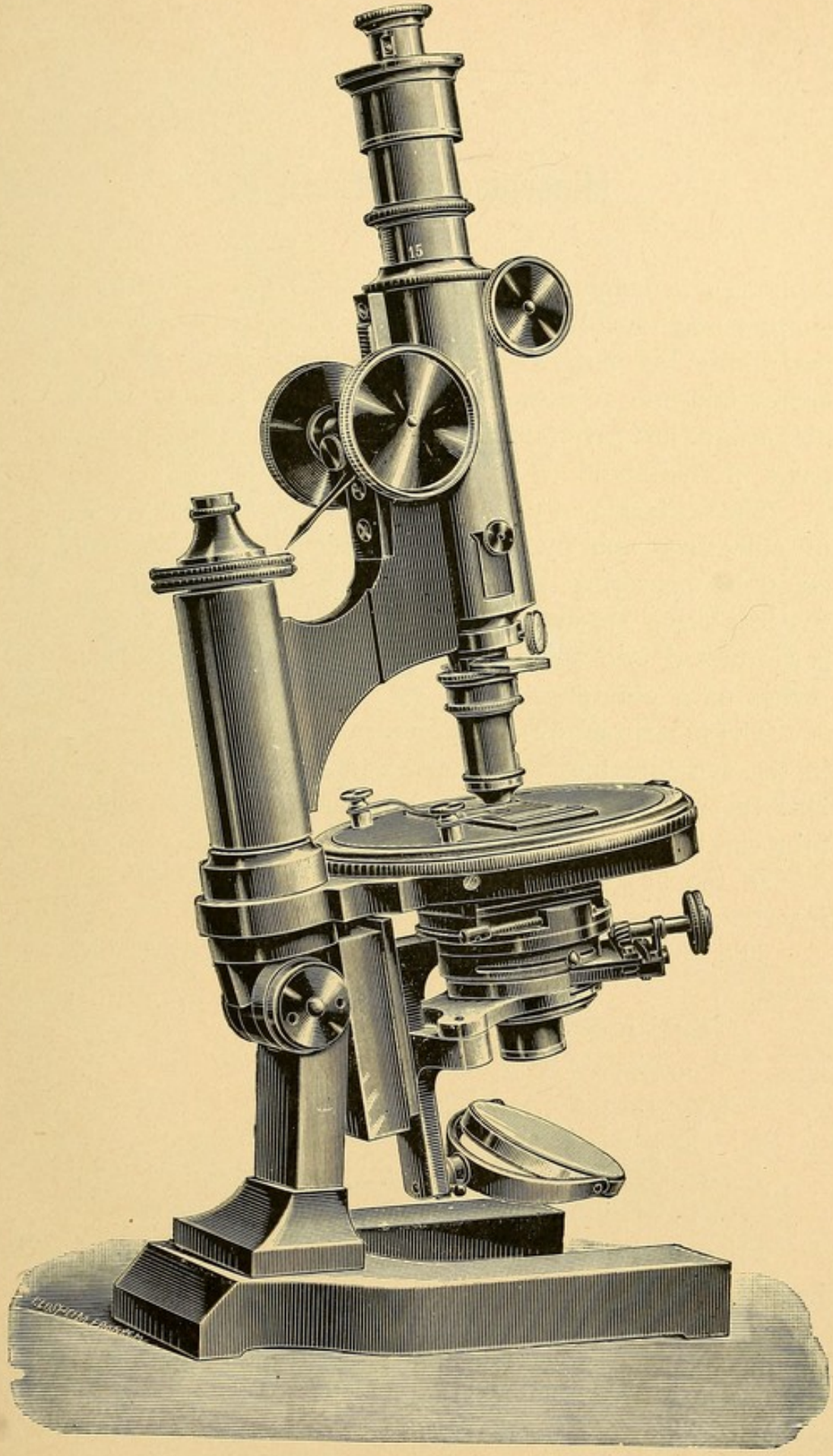
Eye-piece 0, with Bertrand's quartered quartz plate. Eye-piece I with cross-lines, Brezina's Calcspar-plate, cleft perpendicularly to its axis, made to fit over eye-piece I, Klein's gypsum and quartz plates for insertion in the opening over the objective.

Price of the stand with these accessories . . . . **184.—.**

The same with eye-piece III, objectives 1, 3, 5, 7. $^1/_{12}$ Oil-immersion, magnifications 15—800 . . . . . **260.—.**

The new mechanical stage No. 100 (See page 58) can be fitted to the stand for the purpose of investigating large preparations and serial sections.

Price . . . . . **28.—.**



Mineralogical Stand I.

Mineralogical Stand II.

No. $

36. Although in some particulars this stand is somewhat simpler and smaller in size than Stand I it serves essentially the same purposes. The description of the coarse and fine adjustments, of the condenser and iris-diaphragm just given apply equally to the corresponding parts of this stand. (Cfr. Ia pp. 18 and 19.)

The centering of the object for various combinations of objectives and eye-pieces is accomplished in this stand by centering the stage, which is controlled by two centering screws at the side. This revolving stage is graduated into 360 deg. And an index on the stage serves as a pointer.

The polarizer and analyzer are fitted and arranged in the same manner as those of Stand I. The Bertrand lens fits into the tube like an ordinary eye-piece. The tube can be drawn out and raised and lowered at will.

In the analyzer (Zero at 45 deg.) is a slide for the insertion of gypsum and mica plates.

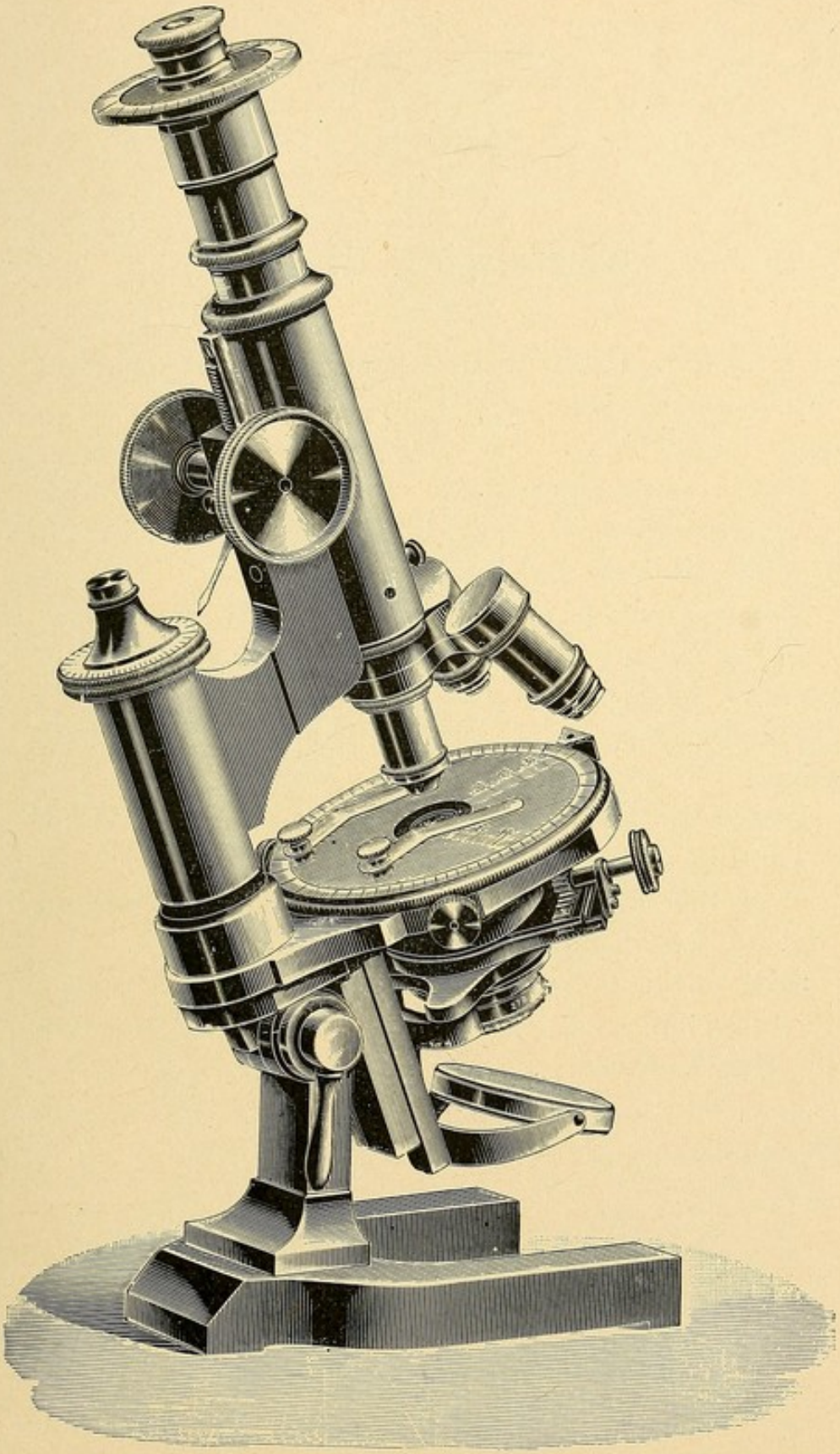
The following accessories are supplied with this stand:

Triple nose-piece.
Eye-piece I with cross-lines.
Gypsum plate red I. order, Klein's quartz plates for insertion over the objective.
Brezina's calcspar-plate, cleft perpendicularly to the axis, fitting over eye-piece I.

Price of the stand with the above accessories . . **120.—.**

The same with eye-piece III, objectives 3 and 7, magnifications 60—525 . . . . . **140.—.**

The mechanical stage No. 100 (See p. 58) is readily adaptable to this stand.



Mineralogical Stand II.

Mineralogical Stand III.

No. $

37. The tube is mounted upon an upright iron foot and is movable by rack and pinion, the accurate construction of which admits of focussing high powers.

The stage revolves and is capable of being centred. It is graduated on the edge into 360 deg. The amount of rotation is indicated by a pointer.

The polarizer is inserted in the diaphragm-holder; it can be swung out and when replaced is firmly held by a spring.

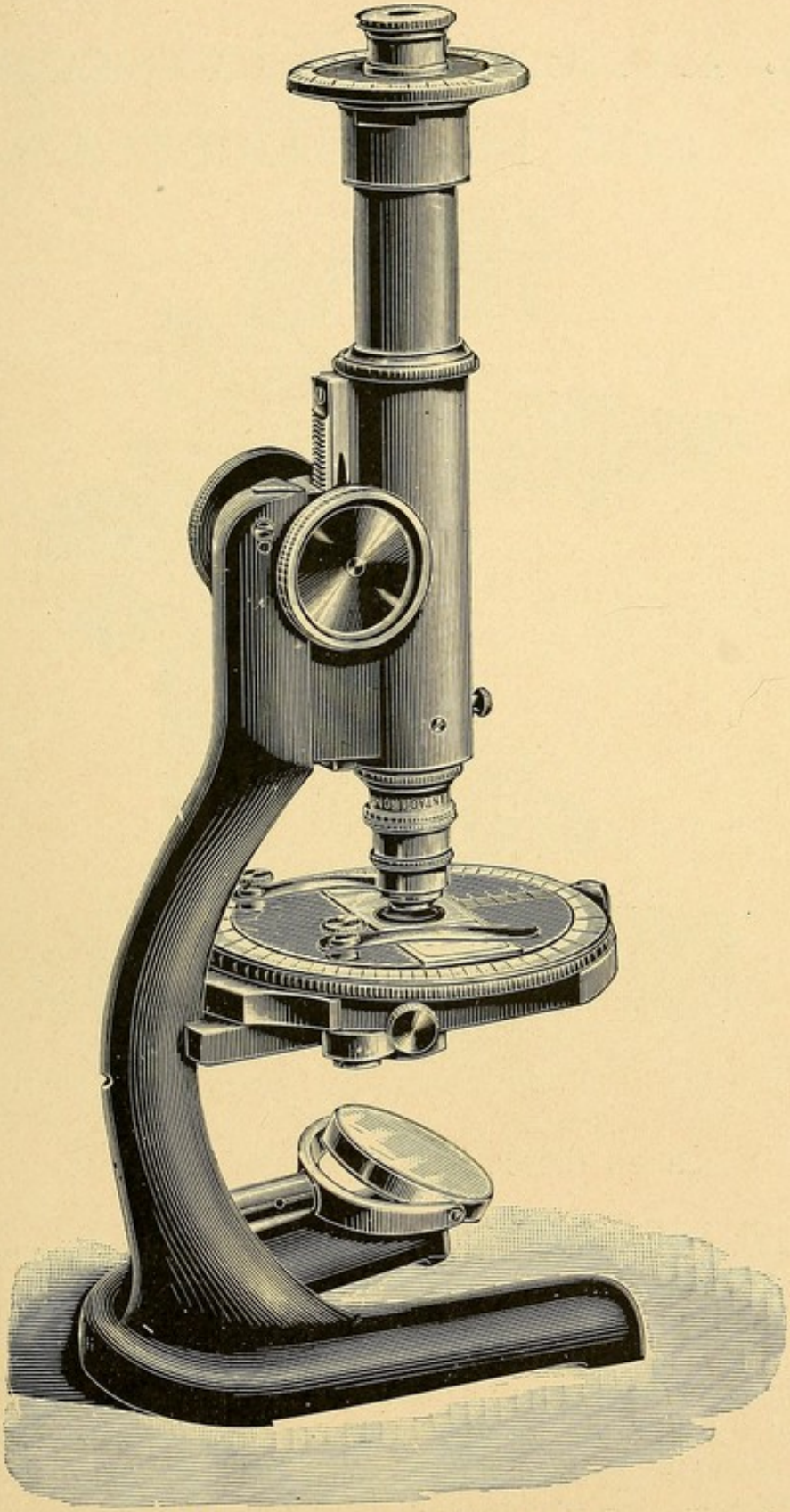
The analyzer is the same as that of the other two stands.

Under the analyzer is a slit for the introduction of the gypsum and mica plates.

Over the objective is an opening for the insertion of quartz, gypsum plates, etc.

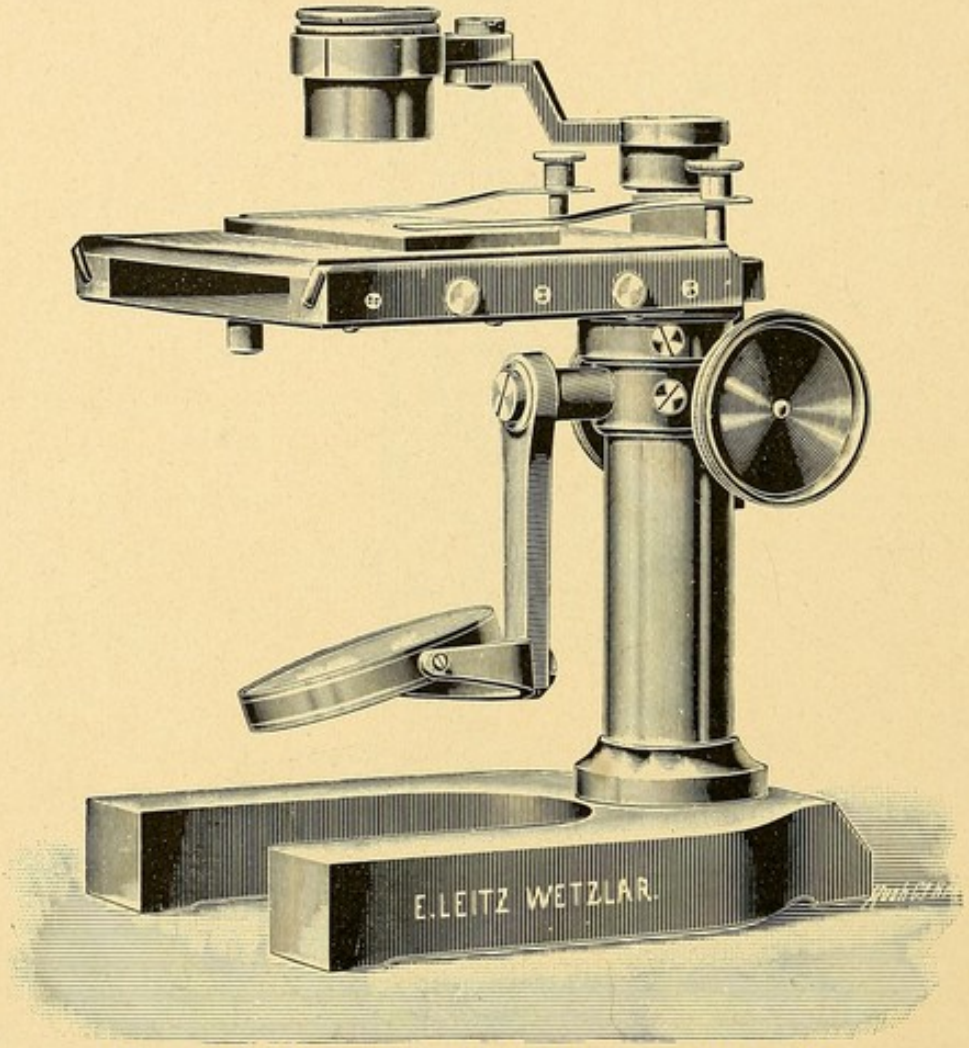
Price of this polarizing microscope with eye-piece I with cross-lines, Klein's quartz plate and gypsum plate, red, I. order . . . . . **40.—.**

The same with eye-piece III and objectives 3 and 6. Magnifications 60—390 . . . . . **60.—.**



Mineralogical Stand III.

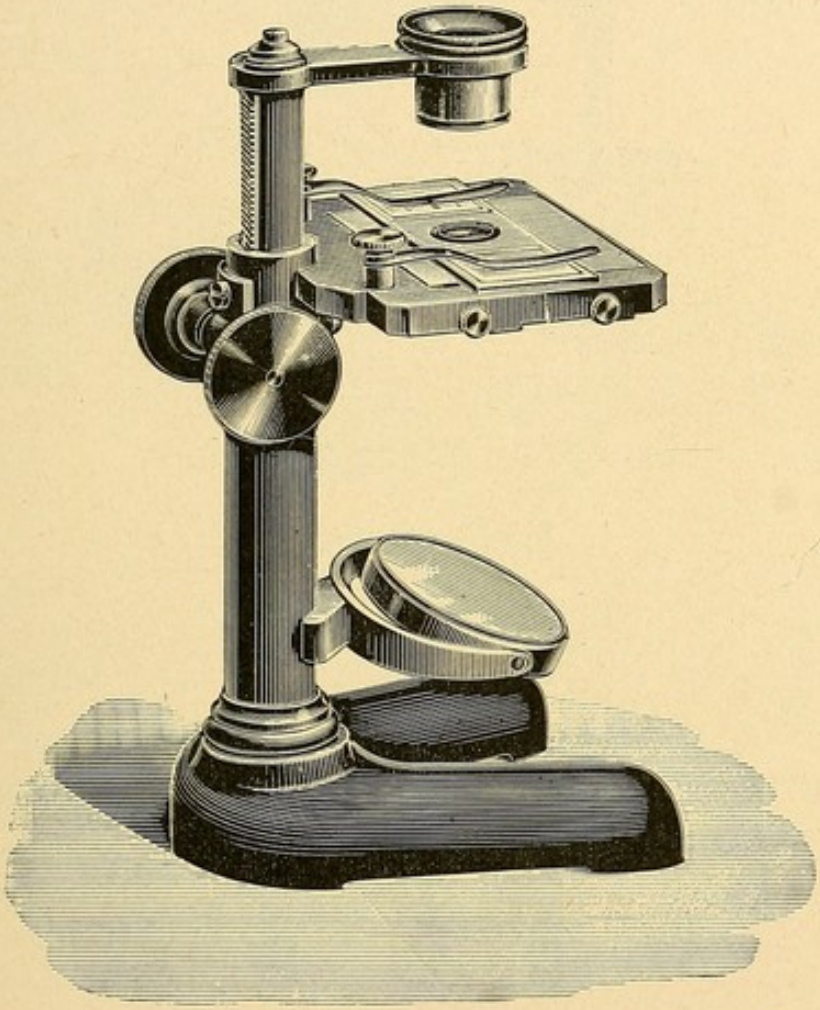
E. Dissecting Microscopes and Hand Lenses.



Large Dissecting Microscope No. 38.

No.		$
38.	**Large Dissecting Microscope** for biological and bacteriological purposes. Stand on heavy horse-shoe base, large stage with glass plate, adjustment by rack and pinion. The lens-carrier is movable for examining large plates. Illumination by movable plane mirror and glass plate. The metal plate under the stage is for this purpose made to draw out. Three aplanatic lenses magnifying 8, 16, and 20 diameters. Hand-rests hooked to the sides of the stage	**28.—.**
39.	**The same** with Abbe's drawing apparatus	**40.—.**

No.		$
40.	**The same stand** with dissecting lens No. 58 magnifying 10, 20, 30 and 100 diameters	**26.—.**
41.	**Stand alone** without lenses	**16.—.**

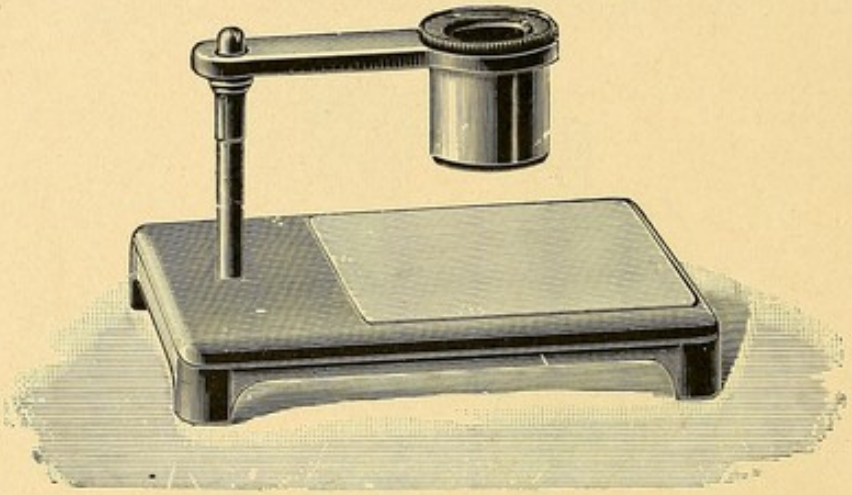


Simple Dissecting Microscope No. 42.

42.	**Simple Dissecting Microscope**, with adjustment by rack and pinion, movable plane mirror and milk glass plate, glass stage in metal frame, two aplanatic lenses magnifying 10 and 20 diameters, with hand-rests	**15.50.**
43.	**The same stand** with dissecting lens magnifying 10, 20, 30 and 100 diameters	**17.25.**
44.	**Stand** without lenses	**7.25.**
45.	**Lens-holder** on heavy iron foot, with movable arms, adjustable by screws and rack and pinion, without lenses	**5.—.**
46.	**Lens-holder** on heavy iron foot with arm attached by ball and socket joint, adjustable in any position, without lenses	**3.25.**

No. $

47. **Dissecting stage,** with milk glass plate, sliding lens-holder and simple lens magnifying 6 diameters . . . **2.50.**



Dissecting Stage with Lens.

Aplanatic Lenses.

(Steinheil Lenses)

remarkable for their flat field and sharp definition.

	Diameter	Magnification	
48.	24 mm	8 diameters	**4.—.**
49.	15 „	10 „	**4.—.**
50.	15 „	16 „	**4.—.**
51.	6 „	20 „	**4.—.**
52.	5 „	30 „	**4.—.**
53.	4 „	40 „	**4.—.**

Achromatic Doublets.

54.	20 „	8 „	**3.25.**
55.	12 „	10 „	**2.50.**

Simple Lens.

56.	15 „	6 „	**1.25.**

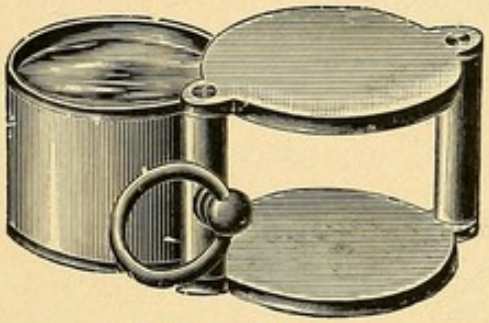
57. **Brücke Lens,** magnifying 5—10 times . . . . . **12.—.**

58. **Dissecting Lenses,** consisting of two achromatic double lenses with withdrawable negative eye-piece **10.—.**

	Back lens	without	eye-piece:	10	diameters,	working	distance	20	mm
Back and front	„	„	„	20	„	„	„	6	„
	Back „	with	„	30	„	„	„	40	„
Back and front	„	„	„	100	„	„	„	10	„

These lenses are constructed so as to fit all stands, but the higher power Steinheil lenses (Nos. 50, 51, 52, 53) and lens No. 58 can be used with stands provided with rack and pinion adjustment only.

The Brücke Lens is specially provided with ring and pin for adaptation to Lens-holder No. 46.



Pocket Lens.

No.		$
	The Steinheil lenses Nos. 48, 49, 50 are also mounted as **Pocket Lenses.** Each	**4.75.**
59.	**Handle with ring** for holding the lenses	**1.25.**
60.	**Pocket Microscope,** in case. A fine achromatic doublet lens of 50 diameters, with focussing screw. The object to be examined is placed on a small glass slide and clamped in a spring slot	**3.25.**
61.	**Microscope for examining Algae,** consisting of two small tubes (length 30 mm), one containing a high power lens, the other serving as object holder. Useful as a Pocket magnifier	**1.25.**

F. Apparatus for Measuring and Drawing.

No. $

62. **Micrometer eye-piece** with unscrewing mount containing the micrometer. The eye-lens is movable and can be accurately adjusted to the eye . . . . . **4.—.**

63. **Eye-piece Micrometer with screw** for the exact measurement of large objects. Between the eye-lens and collecting lens of a Huyghenian eye-piece there is a millimetre scale etched on glass. Above this is placed an index which is moved by means of a revolving drum. The value of each interval of the divided drum for any pair of objective and eye-piece can be ascertained by the stage-micrometer. The lens of the eye-piece can be accurately adjusted to the eye. The instrument is placed on the tube of the microscope like any ordinary eye-piece and is firmly fixed by a thumb-screw . . **20.—.**

64. **Glass-Micrometer for the eye-piece,** to drop on the diaphragm of the eye-piece. Scale of 5 mm divided into 100 parts . . . . . **2.50.**

65. **The same,** 5 mm divided into 50 parts . . . . . **2.—.**

66. **Stage-Micrometer,** 1 mm divided into 100 parts, scale on glass . . . . . **3.75.**

67. **Stage-Micrometer,** photographed on glass, 2 mm divided into 200 parts . . . . . **1.40.**

68. **Eye-piece Micrometer,** divided into squares for counting scattered objects in the field. Mounted. Distance between the lines 0.5 mm . . . . . **2.—.**

69. **Haemacytometer,** Thoma-Zeiss's, consisting of a glass plate with ruled counting-cell, plano-parallel cover-glass and two mixing and calibrating pipettes:
1. for red corpuscles, diluting the blood to $^1/_{100}$ and $^1/_{200}$
2. for white corpuscles, diluting the blood to $^1/_{10}$ and $^1/_{20}$ **15.—.**

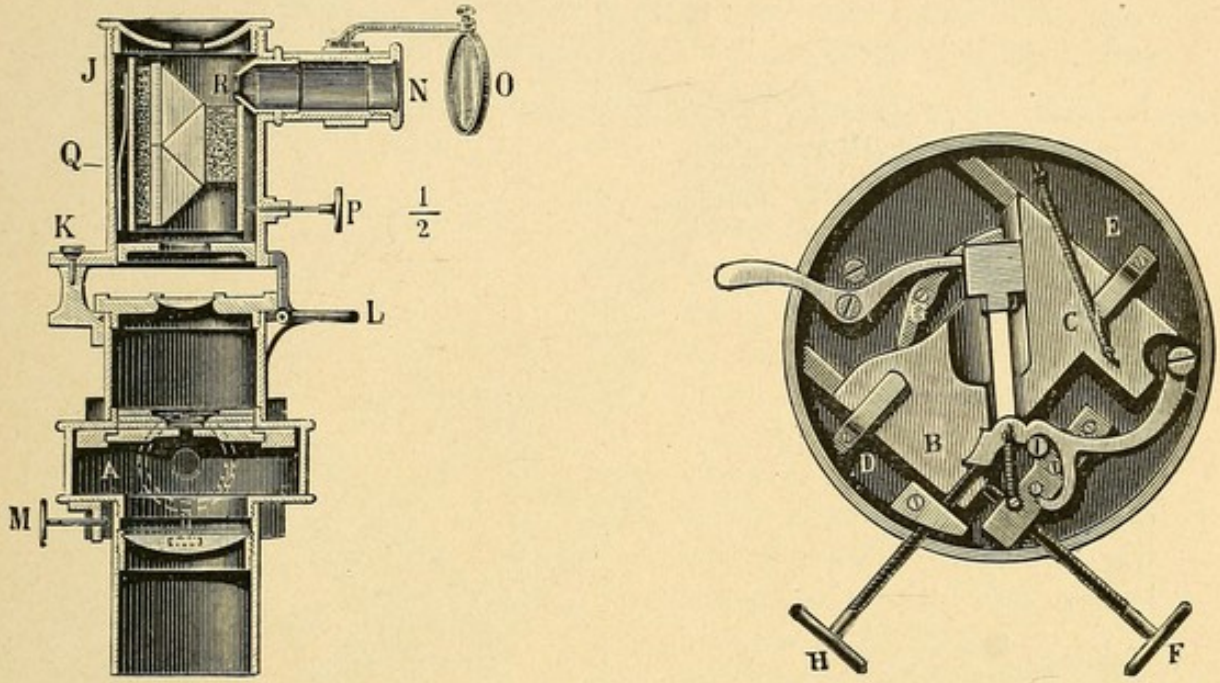
70. **The same Apparatus** with mixing pipette for red corpuscles only . . . . . **11.—.**

Directions accompany each apparatus. —

71. **Counting-Chamber with cell,** $^2/_{10}$ mm deep, with eye-piece micrometer No. 68, divided into squares, with two ground-edged cover-glasses, in case . . . . . **3.25.**

72. **Counting-Chamber with cell,** the bottom of which is divided into squares of $^1/_{20}$ mm side, with two polished cover-glasses, in case . . . . . **4.—.**

73. **Hand-Spectroscope,** Browning's, for spectroscopic examination of blood . . . . . **12.—.**



Micro-Spectroscope.

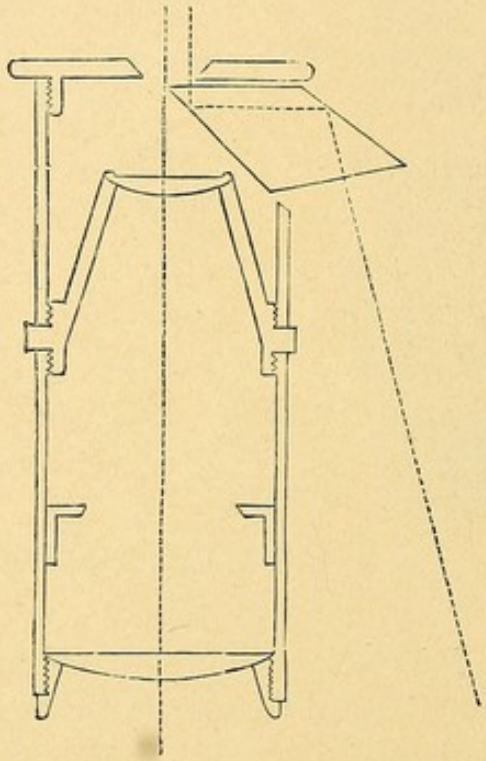
No. $

73a. The Micro-Spectroscope fits into the tube of the microscope like any ordinary eye-piece and may be fixed in. any desired position by means of the thumb-screw M. The position of the bright and dark lines of the spectrum and their respective wave lengths are ascertained by means of the scale. The flat drum A, the interior of which is shown in section, contains the slit and the comparison prism. The slit is regulated by the screws F and H. The lever T moves the comparison prism across one half of the slit. The cylinder Q above the eye-piece contains the Amici prism. At the point N of the horizontal tube RN is the micrometer scale, illuminated by the mirror O. After raising the spring-catch L the upper part of the spectroscope may be turned round the pivot K, thus allowing of the adjustment of the eye-piece . . **66.—.**

No. $

74. **Erecting prism** for the compound microscope. It fits over the eye-piece and greatly facilitates the manipulation of objects under the microscope . . . . . **7.25.**

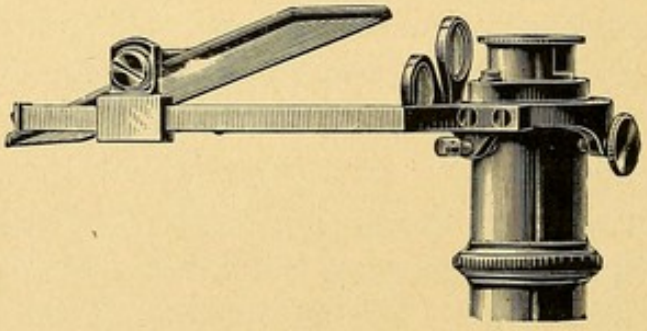
75. **Drawing eye-piece.** It fits into the tube of the microscope like an ordinary eye-piece and is firmly held in place by a thumb-screw; it is really an eye-piece with a prism attached. The drawing surface is seen in the eye-piece as soon as it is placed in the tube of the microscope. It is seen distinctly and sharply since the rays pass through the lower and upper surfaces of the prism at right angles, whereby total reflexion is obtained without loss of light. The light may be regulated by the interposition of two smoked glasses placed just below the lower surface of the prism . . . . . **8.—.**



76. **Drawing stage** for this drawing eye-piece, the drawing plate inclined at an angle of 12 deg. . . . . **2.—.**

77. **Drawing table** with rising drawing surface . . . . **4.—.**

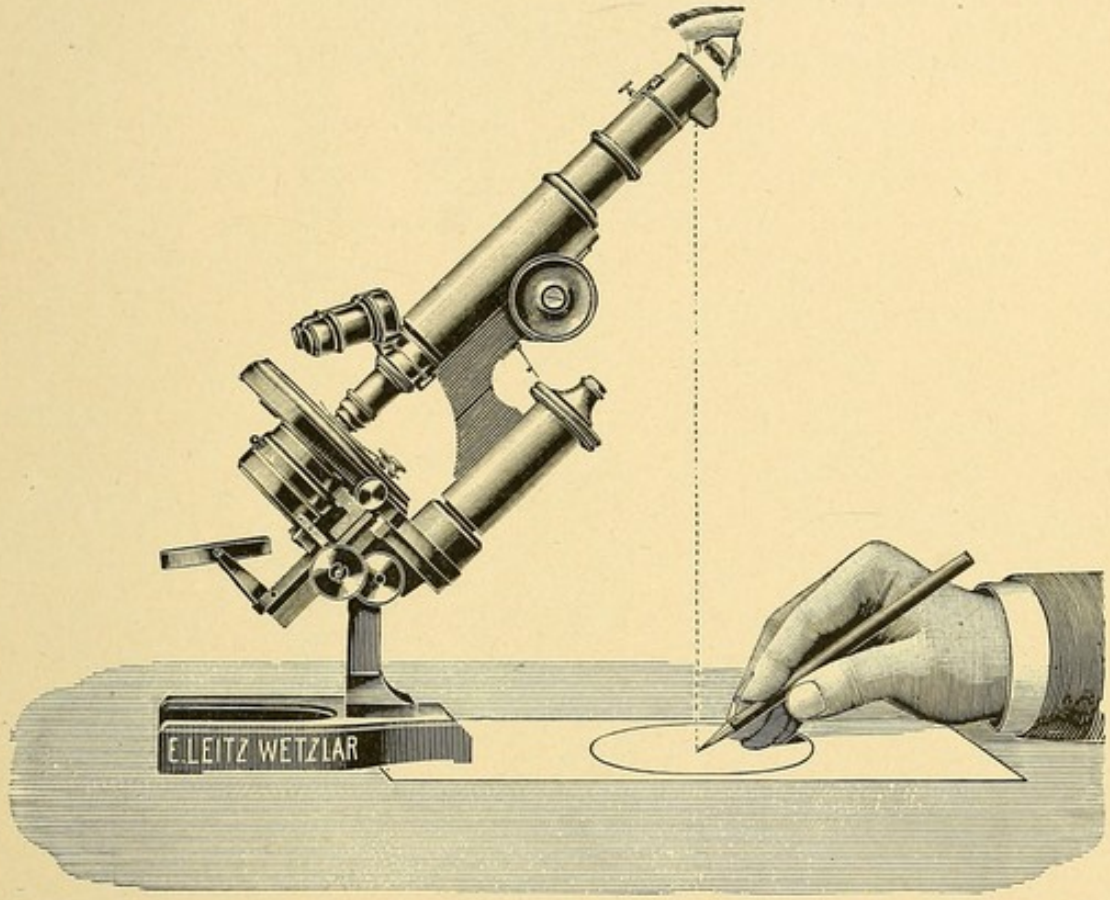
78. **Abbe's Drawing Camera.** The drawing surface is reflected by a mirror and double prism situated above the eye-piece. The image formed by the objective is seen through an aperture in the silvering of the prism. The double prism is so arranged that it may be turned aside so as to liberate the eye-piece . . . . . **12.—.**



Abbe's Drawing Camera.

No. $

79. **The same** rigidly attached to eye-piece I. The drawing prism is thus permanently fixed in the optical axis, being firmly clamped to the tube by means of a thumb-screw **14.—.**



Drawing eye-piece for drawing with inclined stand.

80. This drawing eye-piece is a prism rigidly attached to an eye-piece fitting as usual into the tube. The prism is directed by the inclination of the microscope. The apparatus is firmly clamped to the tube by means of a screw opposite the prism. By inclining the upper part of the microscope 45 deg. the surface of the table behind the microscope is reflected to the eye by two total reflections at the surfaces of the prism. The point of the drawing-pencil appears sharply reflected without any shadow whatever, which in mirror reflection is unavoidable. The surface of the table has the correct inclination, which renders a special drawing-table and board unnecessary. The light is regulated by smoked glass plates . . . . . **10.—.**

81. **Drawing stage** for this eye-piece, with horizontal drawing plate . . . . . **2.—.**

82. **Drawing stage** with rising drawing surface . . . . **4.—.**

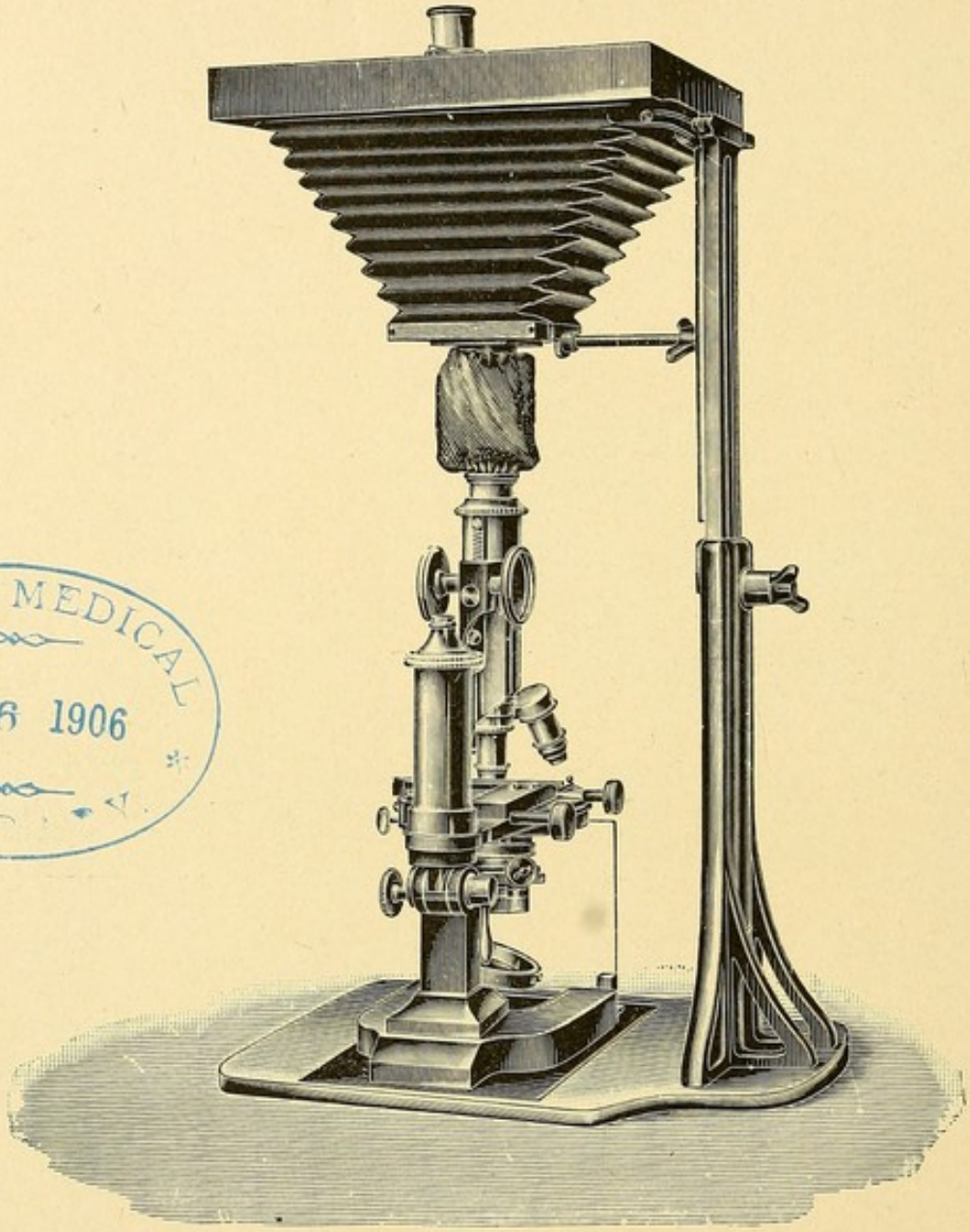


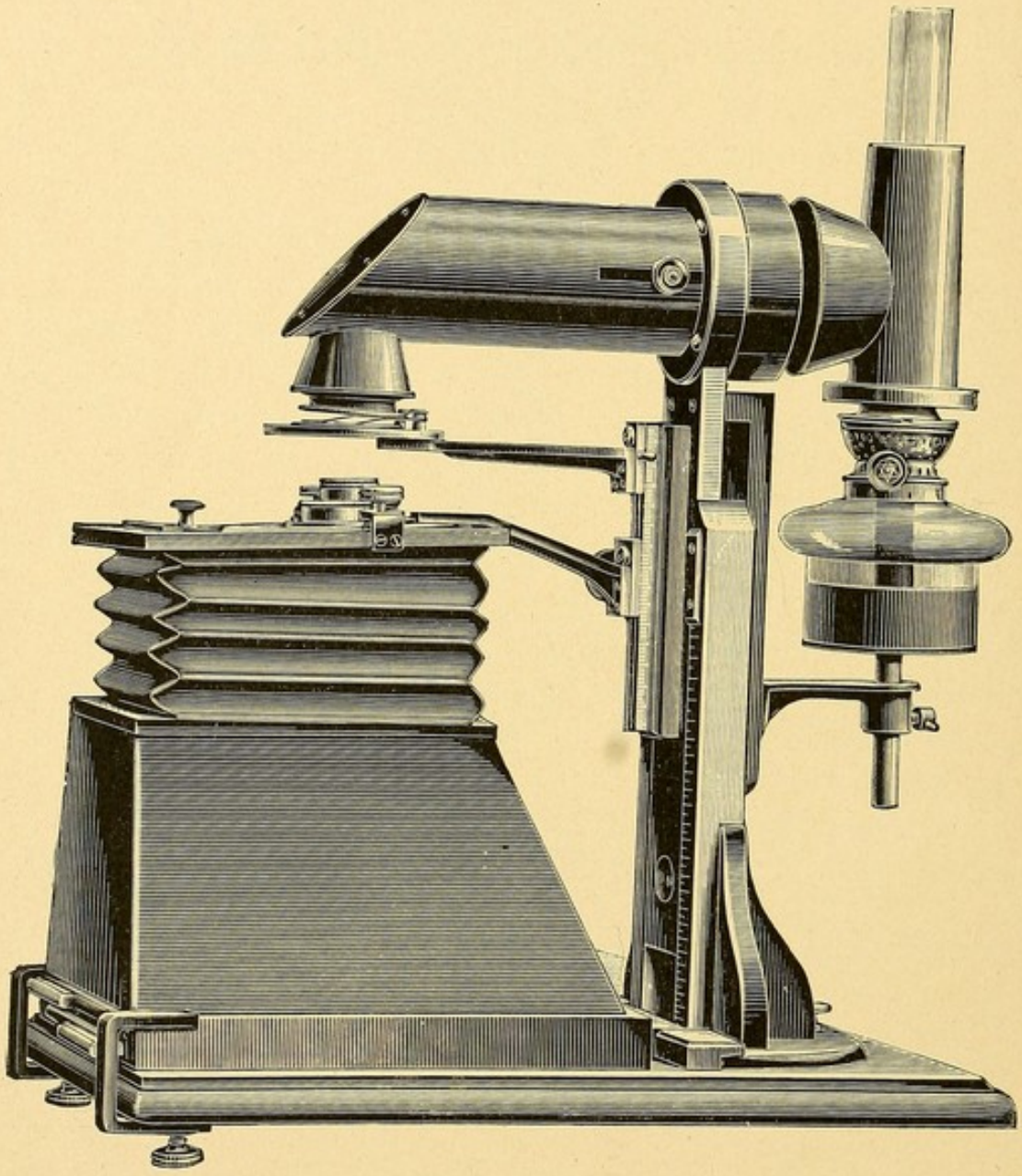
Photo-micrographic Apparatus, No. 83.

The method of employing this apparatus and the general technique of photo-micrography are treated of in a separate pamphlet, containing also four photo-micrographs taken with this apparatus.

This little work is sent free on application to all interested in photo-micrography.

Photo-micrographic Apparatus No. 83.

No.		$
83.	The camera is securely mounted on an iron base and supported by means of a solid iron rail. A second rail slides in the latter and supports the camera. The camera can be adjusted to any desired height and kept firmly in its place by means of a screw-clamp. The bellows can also be drawn out at will and fixed by a screw. A wheel-diaphragm with five different apertures fitted to the camera front regulates the diameter of the field. Two dark-slides for plates $4^1/_4 \times 3^1/_4$" and $7^1/_2 \times 5$" are supplied with the apparatus, also a ground glass and a transparent focussing screen. A ground glass plate on a stand serves to diffuse direct sunlight. Two glass plates render it possible to make use of yellow and blue light in illuminating, by placing these plates on the iris-diaphragm holder.	
	Price of the complete apparatus without microscope stand	**40.—.**



Edinger's Projection Apparatus, No. 84,
with Photographic Camera, No. 86.

No. $

84. **Edinger's Projection Apparatus,** for projection and for drawing large preparations with low magnifications.

Polished wooden base clamped with lime wood, so as to serve at the same time as a drawing-table. This is surmounted by a movable and adjustable wooden stand with collective lens and mirror firmly mounted in metal, with movable object-stage and lens-holder fitted with rack and pinion. A reflector lamp is fixed to the wooden stand. The light of this lamp is projected upon the mirror by means of the collective lens. The mirror reflects the light upon the preparation underneath and an image is formed by the lens on the drawing-table. The wooden stand being movable a great variety of magnifications can be obtained with the same lens. The positions are marked by a centimetre scale.

Apparatus with lamp . . . . . **18.—.**

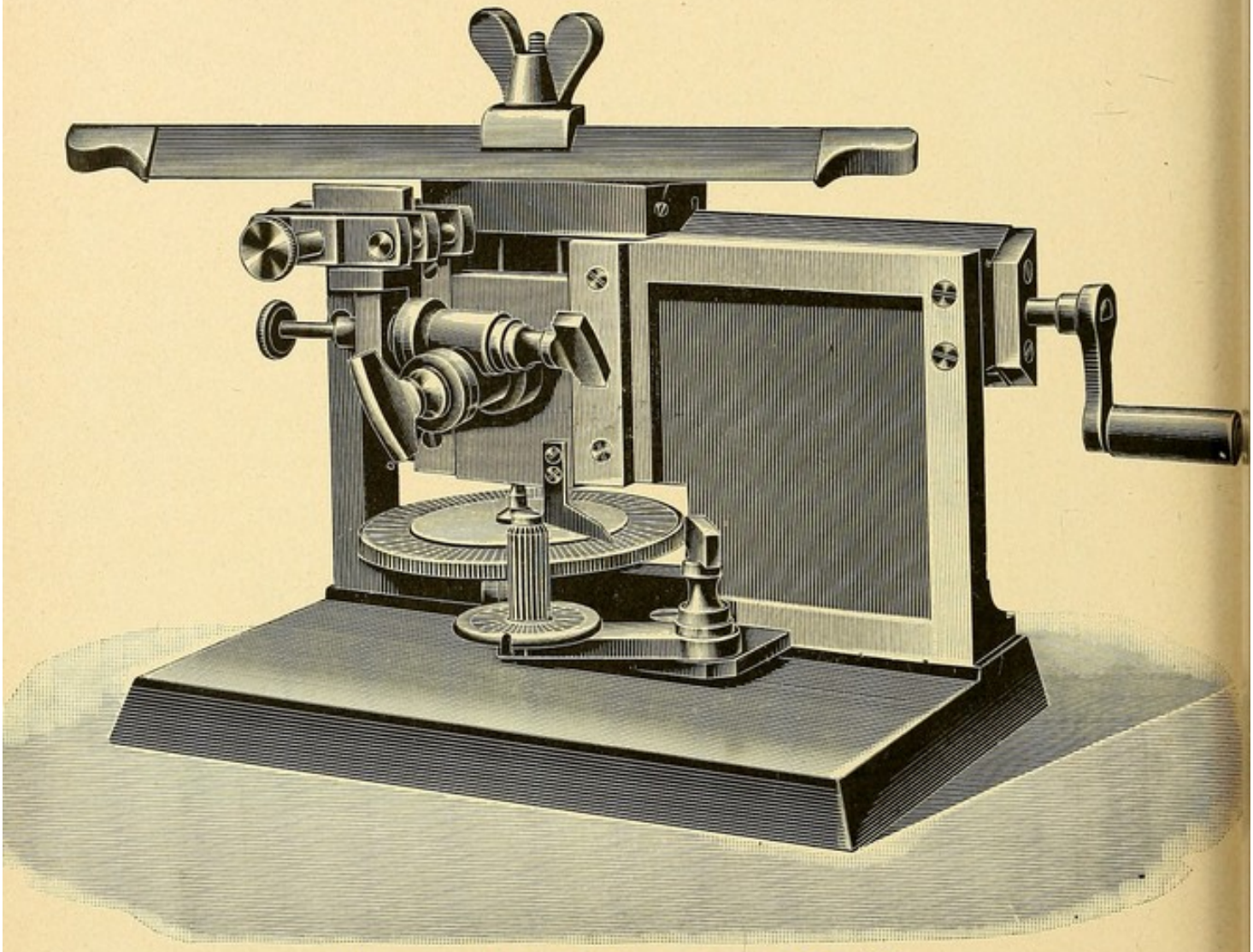
85. Two aplanatic lenses, each 10 s, magnifying 5—15 diameters . . . . . **8.—.**

86. For photographic purposes the apparatus can be fitted with an adjustable camera, double dark-slides and focussing plate . . . . . **20.—.**

87. Photographic objective with iris-diaphragm, magnifying 8 diameters . . . . . **12.—.**

88. Photographic objective with iris-diaphragm, magnifying 16 diameters . . . . . **10.—.**

G. Microtomes.



Large Sliding Microtome, No. 89.

Length of knife-slide 21 cm ($8^1/_2$ in.).

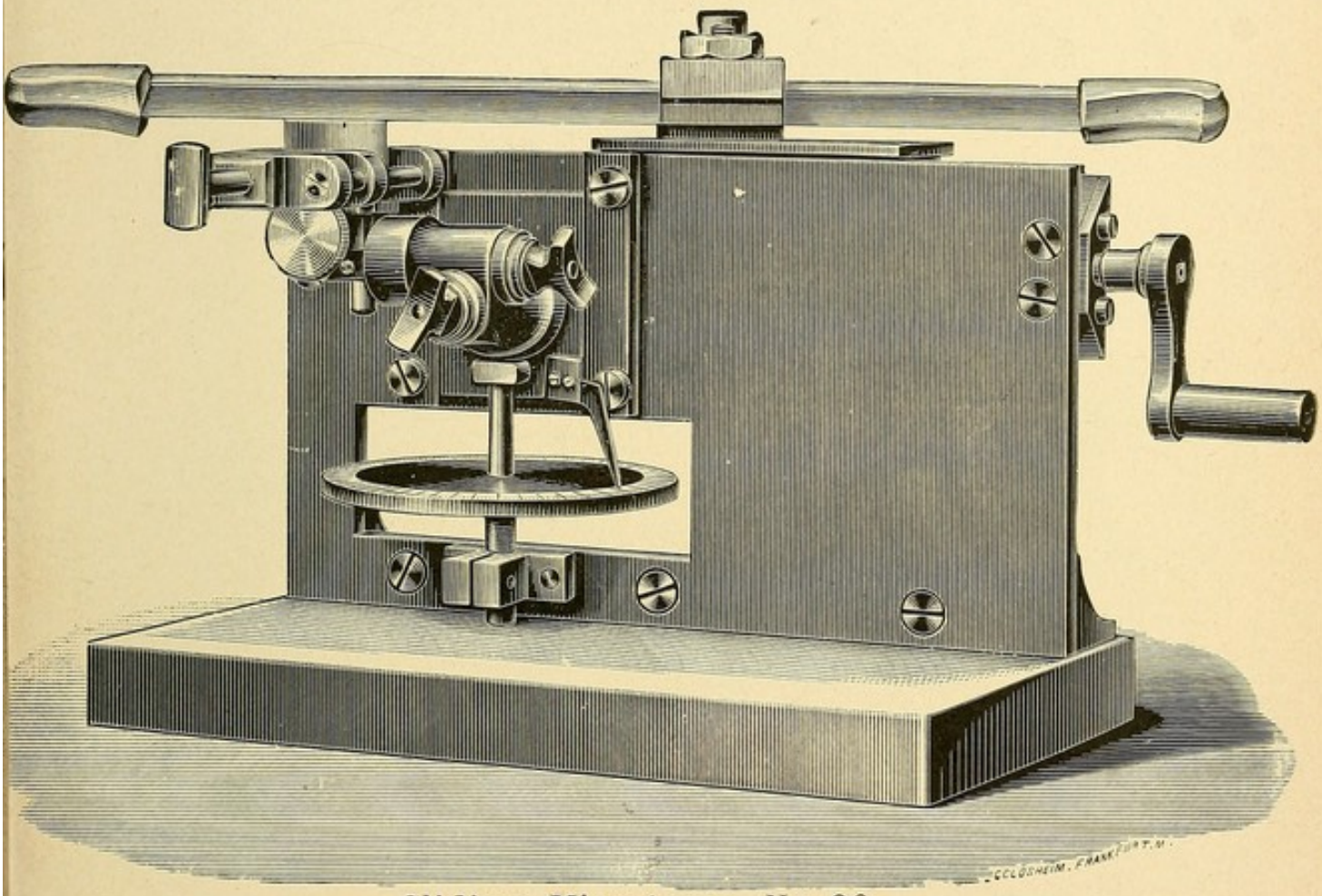
No. $

89. The vertical sliding carriage of the microtome supports the object clamp, which by means of two intersecting screws can be clamped at any inclination. A large micrometer disc divided into 50 parts raises the carriage and the preparation. The object is raised 0,01 mm by turning the disc through 1 division. To make very thin sections the toothed cylinder of a smaller disc can be inserted into the toothed edge of the large disc. This disc is divided into 50 parts each representing an elevation of the object of 0.001 mm. This second

No. $

micrometer-disc can be appended and removed at will. The crank actuates a worm-screw, thereby drawing the knife, which is firmly screwed to the knife-block, quickly and surely through the surface of the preparation to be cut. Two small paraffine discs may be substituted for the object clamp.

Price of microtome, without knife, in polished mahogany case . . . . . **64.—.**



Sliding Microtome, No. 90.

Length of knife-slide 18,5 cm ($7^1/_2$ in.).

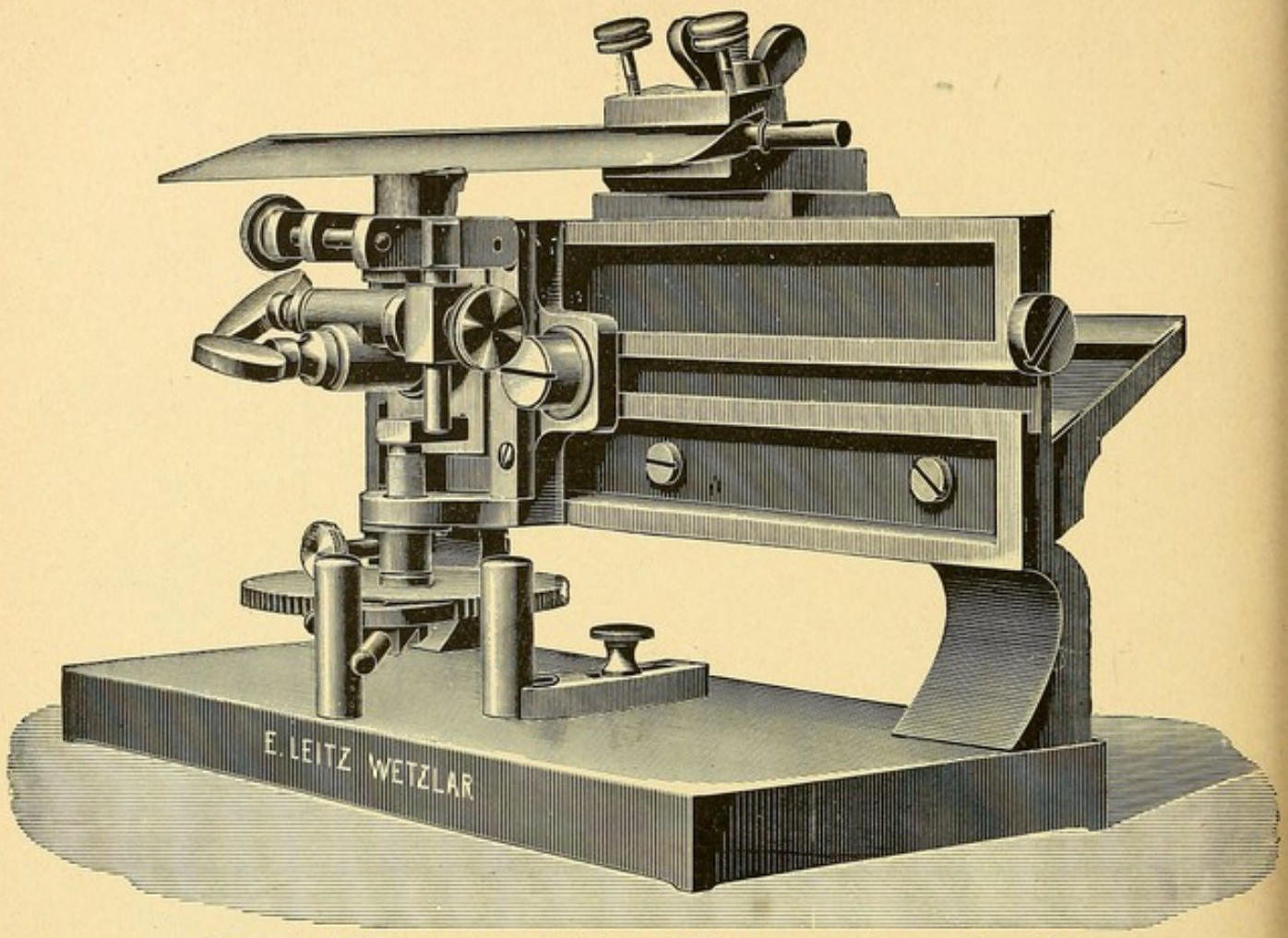
90. The preparation is raised by means of a large micrometer-disc, divided into 100 parts producing each an elevation of 0.005 mm.

Two clamps intersecting at right angles admit of the preparation being fixed at any desired inclination.

The crank actuates a worm-screw, thereby drawing the knife, which is firmly screwed to the knife-block, quickly and surely through the surface to be cut.

Two small paraffine discs may be substituted for the object clamp.

Microtome in mahogany case, without knife. . . **48.—.**



Large Microtome with sliding carriage, No. 91.

No. $

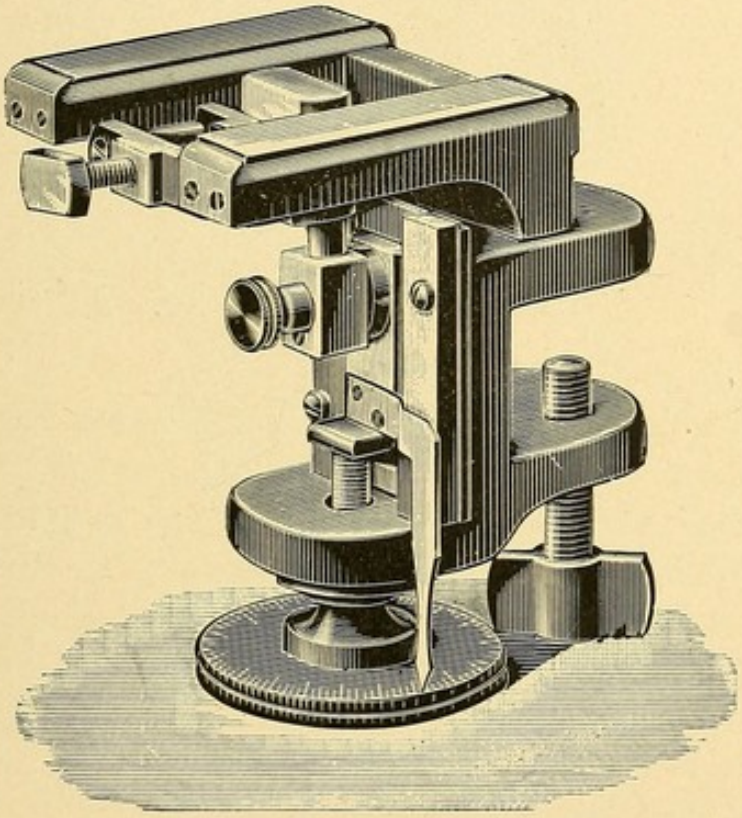
91. This instrument is designed to cut sections with the greatest possible speed. It is for this reason made without a crank. The carriage with the knife glides in its slide with the least possible friction, so that it requires no great practice to guide the knife quickly and surely. The length of the slide is 24 cm ($9^1/_2$ in.).

The object-clamp with its preparation can be adjusted to any inclination by means of two clamping-screws intersecting each other at right angles.

There are 100 teeth cut into the periphery of the microtome disc, a turn of one tooth being equal to an elevation of 0.005 mm ($^1/_{200}$ mm). This micrometer disc can be moved by means of an adjustable stop and can be set to turn 1 to 5 teeth. Sections may, therefore, be cut varying from 0.005 to 0.025 and more. This arrangement serves to relieve the eye and at the same

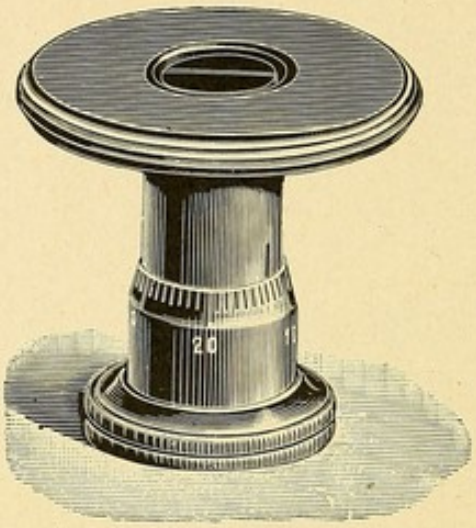
No. $

time, by the rapid movement, greatly expediates the process of section cutting. Care must be taken in working with this lever to tighten the nut of the micrometer-disc so as to prevent the lever, during the backward movement, from taking the disc with it. It is supplied with two knife-clamps for fixing all kinds of knives and with two paraffine discs. Without knife **52.—.**



Small Microtome, No. 92.

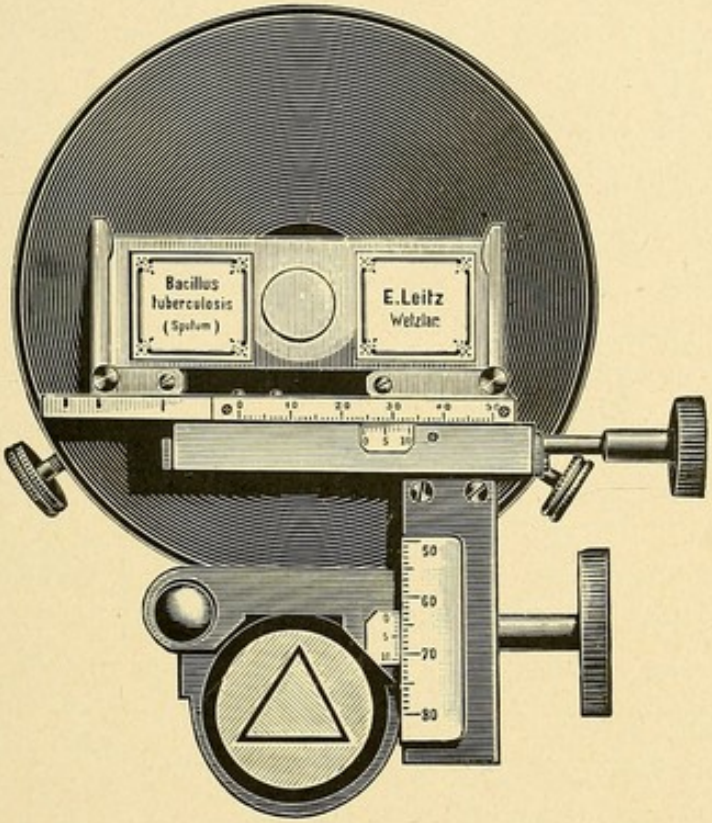
92. This microtome screws to the table. The object is held in a movable clamp (25×30 mm) raised by means of a micrometer-screw. The movement is regulated by a micrometer-disc divided into 50 parts representing each 0.01 mm. The position of this disc is marked by a pointer. The knife is guided freely by hand and in cutting is supported by two narrow glass slides placed on either side of the preparation. These slides are 7 cm ($2^3/_4$ in.) in length. Height of the microtome 13 cm ($5^1/_4$ in.) . . . . . **12.—.**



Cylinder Microtome, No. 93.

No.		$
93.	The preparation is fixed in a cylinder which can be screwed 25 mm below the surface of the stage. This cylinder has a diameter of 22 mm. The cylinder is raised by means of a micrometer-screw with divided head accurately indicating 0.01 mm. In cutting, the blade of the knife is guided over the glass stage, the diameter of which is 7 cm ($2^3/_4$ in.). The height of the instrument is 8.5 cm ($3^1/_2$ in.)	**4.—.**
94.	**Knife**, Katsch's, concave on both sides; length of blade 20 cm (8 cm), in case.	**8.—.**
	Heidelberg knife, plane and concave, in case.	
95.	Length of blade 24 cm ($9^1/_2$ in.)	**12.—.**
96.	Length of blade 16 cm ($6^1/_2$ in.)	**8.—.**
97.	Length of blade 12 cm ($4^3/_4$ in.)	**4.75.**
97a.	Length of blade 8 cm ($3^1/_4$ in.)	**3.60.**
98.	**Knife** for microtomes Nos. 92 and 93, plane and concave (razor)	**1.25.**
99.	**Freezing Apparatus**	**8.—.**

H. Miscellaneous Appliances.



Mechanical Stage, No. 100.

No.		$
100.	**New mechanical stage** adaptable to Stands I, Ia, Ib and to the Mineralogical Stands I and II. It is attached to the stand of the microscope by means of the screw C and a cross-bar, and may be easily removed by simply loosening the screw. The stage has two movements actuated by two milled heads placed close together. One movement extends through 50 mm, the other trough 30 mm. Both movements are provided with scales and verniers. The lateral movement is made by the milled head A, the perpendicular movement by the screw B. This stage serves for systematically searching very large preparations and for registering and refinding certain elements, notwithstanding the removal and readaptation of the stage. These advantages are secured by the unerring arrangement of the fixing-screws	**28.—.**

No.		$
101.	**Polarizing Apparatus** for food analysis. The analyser forms part of an eye-piece fitting into the tube of the microscope and has a graduated disc with pointer. In ordering, it is necessary to state whether the microscope to which the polariser is to be fitted is provided with Abbe's Illuminating Apparatus or with a cylinder-diaphragm and sliding carrier	**20.—.**
102.	**Simplified Polariscope** without eye-piece	**12.—.**
103.	**Gypsum and mica plates**, set of eight.	**3.75.**
104.	**Heating-stage**, *M. Schultze's*, for high temperature .	**12.—.**
105.	**Warming-stage**, Dr. *L. Pfeiffer's*, being a glass cell, which is filled with water, for temperatures up to 44° C.	**6.—.**
106.	**Warming-stage**, *Stricker's*, with warm water chamber and condensing lens	**14.—.**
107.	**Cover-glass Gauge** for measuring the thickness of cover-glasses	**3.75.**
108.	**Double nose-piece**	**6.—.**
109.	**Triple nose-piece**	**8.—.**
110.	**Quadruple nose-piece**	**10.—.**
111.	**Iris-diaphragm**	**6.—.**
112.	**Illuminating Lens on stand**, diameter 80 mm . . .	**12.—.**
113.	**Illuminating Lens on stand**, diameter 60 mm . . .	**8.—.**
114.	**Glass slides**, hollow, per doz	**2.—.**
115.	**Glass slides**, English form 3×1", of plate-glass with polished edges, per gross.	**1.25.**
116.	**Glass slides**, with well, for moist chambers	**—.40.**
117.	**Cover-glasses**, squares, 15×15 mm, per 100	**—.60.**
118.	**Cover-glasses**, squares, 20×20 mm, per 100	**—.85.**
119.	**Cover-glasses**, circles, 15 mm diameter, per 100 . .	**—.85.**
120.	**Cover-glasses**, circles, 20 mm diameter, per 100 . .	**1.—.**
121.	**Turn-table**, for ringing, with movable slide-clip . . .	**4.—.**
122.	**Thickened Cedar-Oil** for Oil-immersion lenses, 50 grammes	**—.50.**

No. $

123. **Saccharimeter**, *Mitscherlich's*, improved, for determining the amount of sugar contained in liquids, glucose etc., by measuring the angle of rotation. Tube with concave mirror on stand, graduated scale with vernier and lens for reading one-tenth of a degree of rotation. The rotation of the Nicol prism with the vernier is performed by means of an endless screw. The adjustment is accomplished as soon as the two squares of the divided quartz-plate show the same colour. Should the rotation of the substance examined be excessive the resulting deviation of the colours renders an exact adjustment of a sensitive colour impossible. For this reason sodium light must be used for the illumination. This, however, does not hold good in the examination of urine glucose. Two tubes, 100 and 200 mm in length, for the liquid to be examined are supplied with the apparatus . . . . . **40.—.**

124. **Opaque illuminator**, for illuminating polished pieces of metal, the microscopic structure of which is to be examined by high power magnification. A collar screwed to the tube of the microscope supports a prism by means of which light is conducted through the objective on to the otherwise opaque object. This illumination admits of magnification up to 1000. An inclinable stand (IIa, Ia or Ib) must be used with this apparatus, in order to obtain an intense light upon the prism.

Price of the opaque illuminator . . . . . **6.—.**

Microscopical cases.

125. **Case** containing a razor, spatula, two small knives, straight and curved scissors, forceps, two needles, two lancet-shaped needles . . . . . **8.—.**

126. **Case**, containing a razor, spatula, a small knife, two needles, small scissors, and forceps . . . . . **6.—.**

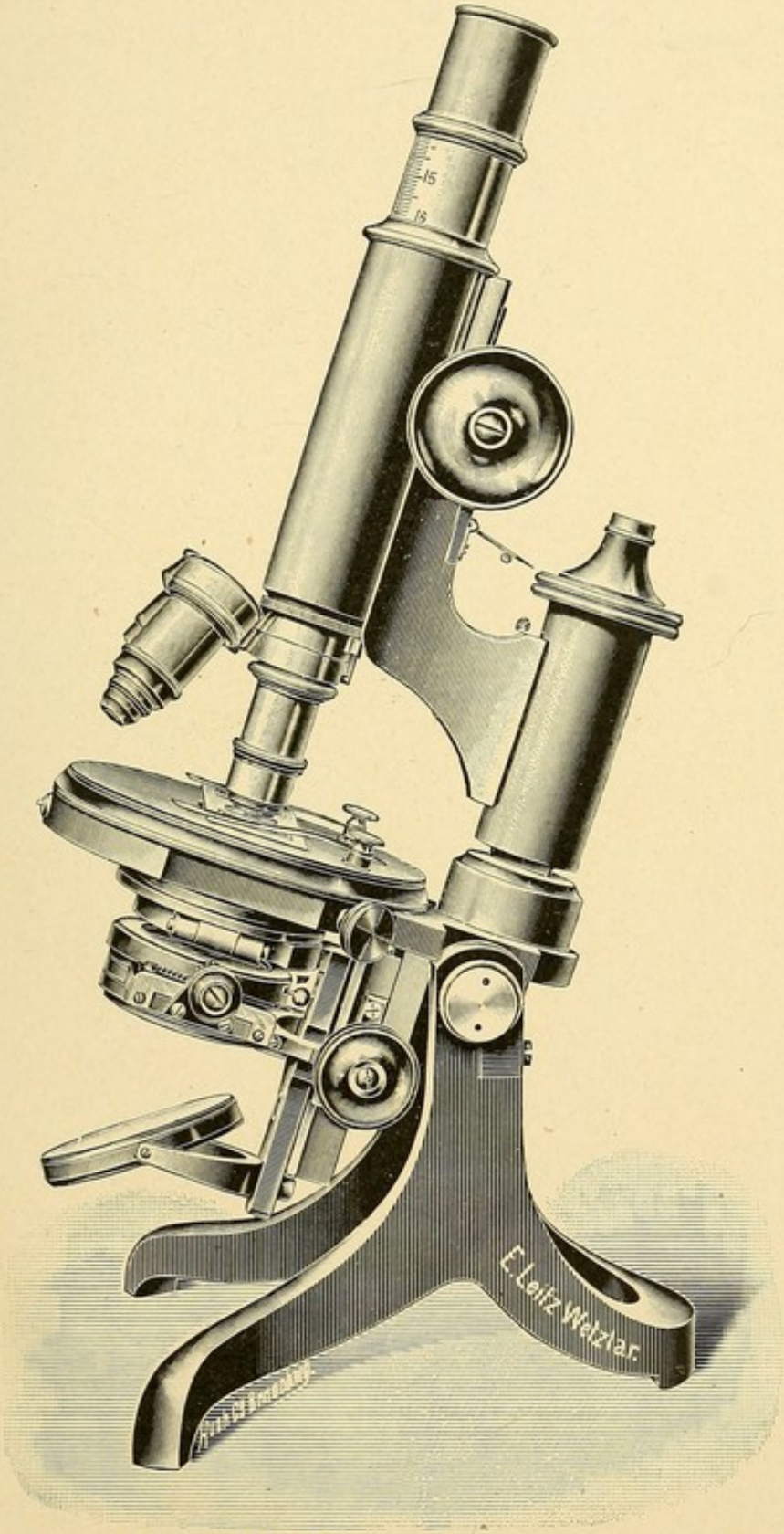
127. **Case**, containing a small knife, small scissors, forceps and two needles . . . . . **3.25.**

128. **Botanical Outfit** in case, containing a small knife, forceps, self-closing forceps with horn handle, two scissors, two needles and two lenses . . . . . **8.—.**

129. **Leather travelling cases**, for protecting the mahogany cases, according to size . . . . . from $ **4** to **8.—.**

Any of the following publications will be sent free on application:

1. Catalogue of microscopes etc., which has been issued in three editions, viz. in
   a) English,
   b) German and
   c) French.
2. Anleitung zum Gebrauch des Microscops.
3. Instructions pour l'emploi des microscopes.
4. Directions for using the Microscope.
5. On the method of counting red and white corpuscles with Thoma's Apparatus.
6. Instructions pour l'emploi de l'hématimètre de Thoma.
7. Anleitung zur Mikrophotographie, mit vier Mikrophotogrammen.



Stand Ia with English foot (See p. 19).

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