Bausch & Lomb Optical Co.

MICROSCOPES

Microscopes and Accessories

Bausch & Lomb Optical Co.

ROCHESTER, N. Y.

New York — London — Chicago

Washington — Frankfort — San Francisco

A-22, IV-11

Works of the Bausch & Lomb Optical Co. Rochester, N. Y.

Branches and Foreign Agencies

We maintain branch offices in New York, Chicago, Washington and San Francisco, where sample lines of our products are carried for the inspection of our customers. Our representatives will be found well versed in all the phases of our business, glad to extend every courtesy and to give any desired information.

Our products are supplied also by dealers in the United States and Canada and by agents in foreign countries.

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BAUSCH & LOMB OPTICAL CO.

EXECUTIVE OFFICE AND MANUFACTORY

ROCHESTER, N. Y.

Terms

WHEN ordering from this catalog please give catalog number, the name of article and size (when necessary). For telegraph orders use code words.

Our prices are f. o. b. Rochester, N. Y. Transportation on goods sent on memorandum, or for examination, is at the expense of the customer.

Satisfactory references are required to open accounts, otherwise remittances in cash, postal orders, or New York or Chicago current funds should accompany the order. If local check is more convenient, 1/8 of 1% (on amounts less than $100.00, 10c) should be added to cover bank exchange.

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Goods ordered to be sent by mail are at purchaser's risk and expense. Postage should be forwarded with cash orders, otherwise we shall ship express collect.

No charge is made for packing. Unless otherwise specified we shall use our best judgment in the mode of shipping, prepaying transportation if desired. Our responsibility ceases when we have delivered the package to the common carriers and have received their receipt. All claims for breakage should be reported to the transportation companies at once. Please examine all packing minutely for small items.

We exercise the utmost care in manufacturing and packing; in case faulty goods inadvertently reach our customers, we shall feel under obligation if our attention is called thereto.

The prices in this catalog are subject to change without notice.

BAUSCH & LOMB OPTICAL CO.

Preface

EVOLUTION, with perfection the goal, is the underlying principle of any successful industry. Particularly is this true of the optical industry, where scientific endeavor plays so important a role. This is the 22nd edition of our microscope catalog. While its publication renders preceding editions obsolete, the years of study and labor behind those editions are not obsolete. They are no less behind the products presented in the following pages and help to give them the high position which they occupy in the optical world.

We began making microscopes in 1874. Our aim then—to make instruments of the highest grade and to make them for a reasonable cost—is our aim to-day. To those years of scientific and productive experience we have added the experience of the Carl Zeiss Optical Works, of Jena, our corporate associates. The ideas and experiments of the two companies are interchangeable, and the user of one of our optical instruments to-day is the beneficiary of that powerful affiliation.

Two branches of science are involved in the production of high grade microscopes—optics and mechanics—both essential to the result desired. Our present optical systems for the microscope are original with us, having been designed by our scientific bureau and worked out by our experts. We believe that they embody every known principle required for optical efficiency in a microscope.

The mechanical design and execution of our stands have also been perfected. In accordance with our progressive policy, improvements have been instituted in several models to keep them in the van of microscope construction. As to the character of these improvements, the descriptions which follow will speak for themselves.

In addition to our regular line of compound microscopes, we present to the public in this catalog our simple microscopes in all forms and a full line of accessories. We enjoy the advantage of making every part of our instruments and all accessories from raw material in our own factory and thus can give them our unqualified guarantee.

Our chemical and petrographical microscopes are not listed herein. As they are designed to meet the requirements of special fields of microscopy, we list them, together with their accessories, in a separate publication. Other of our products of interest to the microscopist and scientists at large will be found enumerated on the following page.

BAUSCH & LOMB OPTICAL CO.

Other Products and Publications

We append a partial list of our other products of possible interest to the reader of this catalog. We shall be glad to furnish literature or information on any of the same upon request.

Astronomical Instruments

Bacteriological Apparatus

Centrifuges

Chemicals

Engineering Instruments

Electric Incubators

Laboratory Apparatus

Microscopic Objects

Microtomes

Opera and Field Glasses

Photographic Lenses and Shutters

Photomicrographic Apparatus

Projection Apparatus
(Lanterns and Accessories)

Reading Glasses

The following publications are also of particular value to the microscopist:

BOOKLET—"**Use and Care of the Microscope.**"

BOOKLET—"**Use and Care of the Microtome.**"

BOOK—"**Manipulation of the Microscope**", by Edward Bausch. Cloth bound; price, $1.00.

The first two will be furnished upon request; the last upon receipt of price.

Compound Microscopes

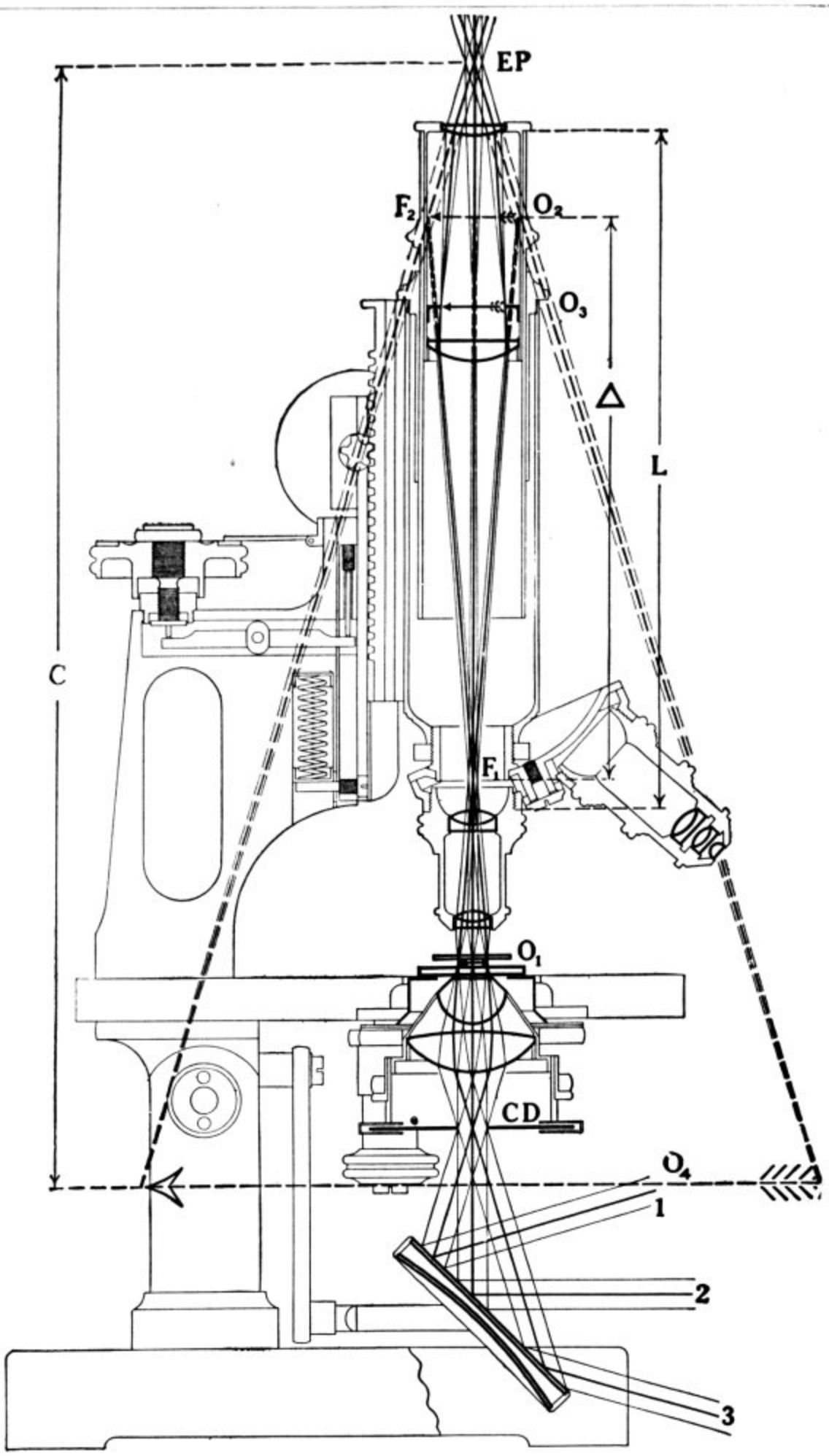


Diagram Showing Path of Light Rays.

F_1 Upper focal plane of objective.
F_2 Lower focal plane of eyepiece.
Δ Optical tube length=distance between F_1 and F_2.
O_1 Object.
O_2 Real image in F_2, transposed by the collective lens, to
O_3 Real image in eyepiece diaphragm.
O_4 Virtual image formed at the projection distance C, 250 mm from
EP Eyepoint.
CD Condenser diaphragm.
L Mechanical tube length (160 mm).
1, 2, 3 Three pencils of parallel light coming from different points of a distant illuminant, for instance, a white cloud, which illuminate three different points of the object.

Optical Systems for the Microscope

In our present optical systems for the microscope we have found it more advantageous to obtain the wide range of magnifications essential to thorough microscopical work by means of judicious eyepiecing of a comparatively small number of objectives. In this way we have provided for a wider range of applicability than hitherto was attained by ordinary eyepiecing of a large number of objectives.

The simplified series of objectives which we introduced five years ago, has given such thorough satisfaction that we have retained it. Experience inspires the belief that it will prove entirely adequate for every field of regular microscopy.

Optical Construction

Respecting the optical qualities of our objectives, we wish to point out that their formulæ are based upon rigorous and elucidatory computations, all the elements of construction (radii, thicknesses of component lenses, etc.) being determined in advance, wholly without recourse to experiments of any kind. This method of construction is the only one insuring exact uniformity in optical systems of such intricacy as microscope objectives; in employing this method the designer has it in his power to survey completely the effect of each element on the image-making qualities of the whole system, and is able to apply his resources systematically to the best advantage.

As always we have made the technical equipment for producing high grade optical work the object of our constant care; and as a final guarantee of unvarying excellence, each objective, before leaving our works, is subjected to a most severe test conducted on a scientific basis. We do not hesitate to say that our objectives are the best that can be made for the various kinds of work for which they are intended. The data given in the tables hence may be implicitly relied upon; the focal lengths are accurate to within 2%; the apertures are as given.

Numerical Aperture

Resolving power is the property by which an objective shows distinctly separated two small elements in the structure of an object, which are only a short distance apart. The measure for the resolving power is the numerical aperture (N. A.). The higher the N. A. the greater the resolving power of the objective and the finer the detail it can reveal. N. A. is given by the formula

$$\text{N. A.} = n \cdot \sin u$$

wherein

n = the lowest refractive index that appears between the object and the front lens of the objective, and

u = half the angular aperture of the objective.

Importance of N. A.

If a very narrow central pencil is used for illumination, the finest detail that can be shown by a microscope, with high enough magnification, is equal to $\frac{\lambda}{\text{N. A.}}$, where λ is the wave length of the light used for illumination. The wider the pencil used for illumination the greater the resolving power, until a maximum is reached, when the

width of the pencil is sufficient to fill the whole aperture of the objective. In this case the resolving power is twice as great, the finest detail that the objective can show being now equal to $\frac{\lambda}{2\,\text{N. A.}}$. This same limit is reached when a narrow pencil of greatest possible obliquity is used. For example, the wave length of the brightest part of the spectrum may be assumed to equal 0.00053 mm. Consequently an objective of N. A. equal to 1.00 will resolve two lines separated by a distance of $\frac{0.00053}{1.00} = 0.00053$, with a narrow central illuminating cone, and $\frac{0.00053}{2 \times 1.00} = 0.000265$, with a cone filling the whole aperture, or with a narrow oblique cone.

Our 4 mm, 0.85 N. A. objective will resolve lines separated by distances ranging between 0.00062 and 0.00031, dependent upon the aperture employed. For the 4 mm, 0.65 N. A. objective the limiting values are 0.00081 and 0.000405.

The N. A. can also be expressed by the equation

$$\text{N. A.} = \frac{\text{d}}{2\ \text{f}} = \frac{\text{effective aperture of back lens}}{2 \times \text{equivalent focus}}$$

Two objectives of the same equivalent focal length (E. F.) and the same N. A. should show the same illuminated area in the back lens, when viewed without an eyepiece and illuminated with the widest cone of light they can take in.

The foregoing explanation shows the importance of the N. A. to the efficiency of an objective. The N. A. of our objectives is therefore kept strictly up to the value engraved on the mounting.

It also is evident that an objective cannot show its full efficiency if it is not used with a condenser of an N. A. large enough to fill the back of the objective with light.

Depth of Focus Depth of focus (known also as depth of sharpness or penetration) is another important factor which is often not clearly understood. It depends on the N. A. and the magnification and is inversely proportional to both. The higher the N. A. and the higher the magnification, the less the depth of focus. It is beyond the power of the optician to change these conditions. Every effort aiming at an increase of the depth of focus, for instance, by inserting diaphragms above the back lens of the objective must necessarily decrease the effective diameter of the back lens and thus decrease the N. A., thereby lowering the efficiency of the objective.

To comply with different requirements in this respect we offer two 4 mm objectives, whose depths of focus, when used with the same magnification, are in the ratio of 3 : 4.

It should be born in mind that the finer the definition of an objective the more sensitive it is to incorrect focusing and to slight changes of the fine adjustment screw. This means less depth of focus. **Objectives that show greater depth of focus than others of the same N. A. cannot be well corrected.**

Objectives

The tube length for which all of our objectives are computed is 160 mm (about 6½ in.), reckoned from the upper end of the draw tube to the shoulder of the objective screw. The tube length may be accurately adjusted by means of the draw tube, which is graduated in single millimeters.

Cover-Glass Thickness

All of our dry objectives are corrected for a cover-glass thickness of 0.18 mm, the mean thickness of No. 2 cover-glass, which we have found most practical for general use. For critical work, where an objective is expected to show all its efficiency, measured cover-glasses of 0.18 mm thickness should always be employed. This is very important as a variation of 0.03 mm in the thickness of the cover-glass may destroy the spherical correction, and with it the definition of the object.

The influence of slight differences in the thickness of the cover-glass may be compensated for by increasing the tube length in case of too thin a cover-glass, and shortening it for one too thick. The amount of compensation thus obtainable varies with the E. F. and the N. A. of the objective. In a 4 mm objective of 0.85 N. A., for instance, an increase in tube length of 30 mm will balance a decrease in cover-glass thickness of 0.03 mm.

The performance of homogeneous immersion objectives is quite independent of variations in the thickness of cover-glass, as the refractive index of our immersion liquid (cedar oil) is practically the same as that of the cover-glass. On the other hand, the correct tube length (160 mm) must be very strictly adhered to, a variation of 5 mm being sufficient to destroy the perfection of the image. Only the specially prepared immersion oil furnished by us should be employed.

Test of High Power Objectives

Unless higher power objectives (from 8 mm up) are tested under the circumstances for which they are corrected—160 mm tube length and 0.18 mm cover-glass—the best results cannot be expected. This should be born in mind especially when comparisons are made with objectives of other makes on slides with unknown cover-glass thickness. The finer the corrections and the adjustment of an objective, the more sensitive it is to any change in the conditions mentioned above.

It may be mentioned here that the better the correction, of an objective, the larger a cone of illumination it will stand.

In the low power objectives particular attention has been paid to securing a large, flat and brilliant field. In the higher powers, while the field is necessarily more restricted, the corrections outside of the optical axis have been carried to a high order. The working distance (measured from the front mount of the objective to the upper surface of the cover-glass) has been kept, in every instance, as long as possible without sacrificing the perfection of the corrections.

List of Objectives

The **48** and **32 mm** objectives are single achromatic lenses, well corrected and giving good illumination.

The **16 mm** objective of **0.25 N. A.** is composed of two doublets. The high character of its correction in the center of the field, as well as near the margin, makes this lens of great service in low power work.

In the higher power dry objectives of 8, 4 and 3 mm focus we use a non-achromatic front lens of nearly hemispherical form in combination with two doublets. In the oil immersion the so-called duplex front is employed, consisting of a hemisphere and a meniscus lens, in combination with two correcting doublets.

The **8 mm** (⅓ in.) objective of **0.50 N. A.** has found great favor in histological investigations, where a high order of correction and great brilliancy, with relatively high magnification, are desirable. Because of its long working distance, it also is eminently useful in blood counting and micro projection work.

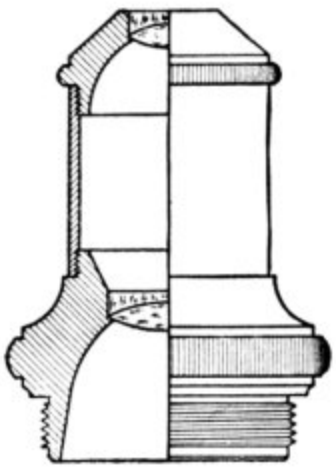
The **4 mm** (⅙ in.) objective is supplied in two types of different N. A. The **0.65 N. A.** is distinguished by an extraordinarily long working distance, which enables the objective to focus easily through the thickest cover-glass of the Thoma-Zeiss haemacytometer.

The **4 mm** objective of **0.85 N. A.**, with less working distance and less depth of focus than the 0.65 N. A. type, has as a compensatory advantage the greater resolving power. It is in every sense an optical instrument of the highest quality and is regularly supplied with our outfits.

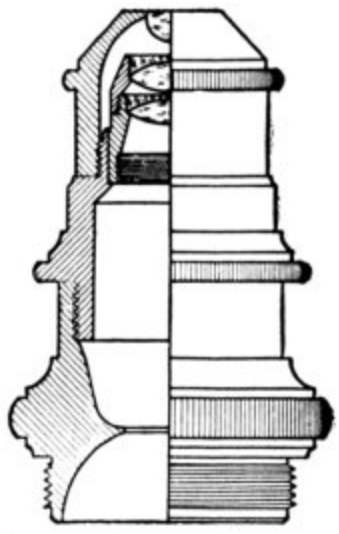
Some microscopists prefer to obtain a given magnification with a higher power objective and relatively low power eyepieces, rather than with a low power objective and high power eyepieces. To this end, we furnish a **3 mm** (⅛ in.) objective of **0.85 N. A.**, which gives with low power eyepieces the magnifications otherwise obtainable with the 4 mm, 0.85 N. A.

The two immersion objectives now furnished, the **1.9 mm** (1/12 in.) and the **1.5 mm** (1/16 in.), both of **1.30 N. A.**, are intended for microscope work of the highest character. Indeed, their superior chromatic and spherical corrections entitle them to the appellation of true semi-apochromats, while their free working distance is longer than is usually the case in objectives of this power.

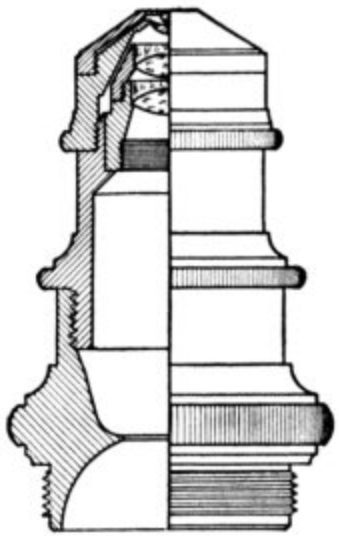
The full efficiency of an oil immersion objective is only utilized when the substage condenser is also immersed. (See "Substage Condensers".)



16 mm Objective



4 mm Objective



1.9 mm Objective

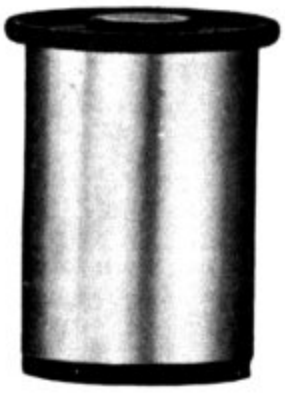
Code Word	Cat. No.	E. F. mm	E. F. in.	N. A.	Working Distance	Micrometer values with 6.4× Eyepiece	Price
Atypic	**1005**	**48**	2	**0.08**	53	0.087 =87 μ	**$4.00**
Aubade	**1009**	**32**	1⅓	**0.10**	38	0.044 =44 μ	**4.00**
Aubin	**1021**	**16**	⅔	**0.25**	7.0	0.018 =18 μ	**5.00**
Auctary	**1027**	**8**	⅓	**0.50**	1.6	0.0085= 8.5μ	**8.00**
Audit	**1029**	**4L**	⅙	**0.65**	0.6	0.0040= 4.0μ	**8.00**
Augean	**1031**	**4S**	⅙	**0.85**	0.3	0.0040= 4.0μ	**8.00**
Augite	**1035**	**3**	⅛	**0.85**	0.2	0.0029= 2.9μ	**8.00**
Augur	**1041**	**1.9**	1/12	**1.30**	0.15	0.0018= 1.8μ	**27.00**
Auk	**1045**	**1.5**	1/16	**1.30**	0.10	0.0013= 1.3μ	**40.00**

E. F. = Equivalent focal length.

Huyghenian Eyepieces

The eyepieces in this series are marked according to their magnification when used as magnifiers. This is equal to the distance of distinct vision for a normal eye (250 mm or 10 in.), divided by the focus of the eyepiece.

The lower focal point in this series of eyepieces is situated somewhat higher than usual, thereby increasing the optical tube length—the distance between the upper focus of the objective and the lower focus of the eyepiece (see △ in chart, page 8). The magnifications obtainable with these eyepieces are therefore greater than those obtained with the usual eyepieces of the same equivalent focal length, as may be seen in the magnification table below. The whole series of eyepieces is par-focal, that is the lower focal planes of all lie at the same distance below the eye-lens, so that in interchanging them only a very slight change of the fine adjustment is necessary.



The eyepieces, unless otherwise ordered, measure 23 mm, outside diameter, and conform to the European standard size. If desired, the older size (25 mm) will be furnished, the diameter of the draw tube being increased accordingly.

When one eyepiece only is purchased with an outfit, we recommend the 6.4× or the 7.5×, believing these magnifications to be most serviceable for general work. In case two eyepieces are to be used, we recommend the 5× and 10×, or the 6.4× and 10×. Higher powers can be furnished if desired.

Code Word	Cat. No.	Magnifying Power	Approx. E. F.		Price
			mm	in.	
Atticize	**1100**	**5 ×**	50	2	**$1.50**
Attabal	**1101**	**6.4×**	40	1⅗	**1.50**
Attinge	**1102**	**7.5×**	33	1⅓	**1.50**
Attorn	**1104**	**10 ×**	25	1	**1.50**
Attrap	**1106**	**12.5×**	20	⅘	**1.50**

E. F. = Equivalent focal length.

Table of Magnifications and Real Fields

Tube length =160 mm. Projection distance =250 mm

Objectives		Eyepieces				
E. F. in millimeters	Initial Magnification	5×	6.4×	7.5×	10×	12.5×
48	2	10× 10.5mm	13× 9.0mm	15× 8.5mm	20× 8.5mm	25× 6.8mm
32	4	20× 5.5mm	26× 4.8mm	30× 4.3mm	40× 4.4mm	50× 3.5mm
16	10	50× 2.10mm	64× 1.85mm	75× 1.70mm	100× 1.74mm	125× 1.38mm
8	20	100× 1.02mm	130× 0.90mm	150× 0.83mm	200× 0.85mm	260× 0.67mm
4	43	215× 0.48mm	275× 0.43mm	320× 0.39mm	430× 0.40mm	560× 0.32mm
3	57	285× 0.36mm	365× 0.32mm	420× 0.29mm	570× 0.30mm	740× 0.24mm
1.9	95	475× 0.22mm	610× 0.19mm	720× 0.17mm	950× 0.18mm	1260× 0.14mm
1.5	128	640× 0.17mm	802× 0.15mm	960× 0.14mm	1280× 0.14mm	1650× 0.11mm

Substage Condensers

The usual **Abbe condensers** are neither chromatically nor spherically corrected, but for all ordinary work serve their purpose very well. Their function is to send light through the object under an angle sufficiently large to fill the aperture of the objective with light. They are furnished in two numerical apertures: 1.20 N. A., containing two lenses, and 1.40 N. A., containing three lenses.

The condenser mounts fit into the substage from below and are provided with an iris diaphragm, which controls the amount of light entering the condenser and the angle of the emitted cone. They are also provided with a swing-out carrier for holding a blue glass disc or a dark ground stop.

The **aplanatic condenser** 1.40 N. A., listed here for the first time, consists of three lenses — an over hemispherical, a meniscus and a double convex, which has a **spheroidal surface** for correcting the spherical aberration. The **spherical correction** obtained in this way is of the **highest degree** and perfect for all zones of the condenser, a result that has not been reached by any other construction. The lenses are separable, and the condenser, with the upper lens removed, gives a numerical aperture of 0.60; with both lenses removed, one of 0.40. The quality of correction in each case is of the same high order as that of the complete combination.

The illumination given by this condenser is excellent on account of the perfect union of the rays in the focus, the small number of lenses and the fact that these lenses are of very transparent glass. No flint glass is used in this construction.

The condenser is furnished regularly with a sleeve to fit the substage ring of the complete substage from below. If an iris diaphragm is desired, $3.75 should be added to the listed price.

Our **achromatic condensers** are corrected for two colors and spherically corrected for two zones. They are recommended for work where it is essential that a sharp image of the light source, free from color fringes, be projected into the plane of the object. The iris diaphragm is located between the lenses.

When the numerical aperture of an objective is greater than 1.00, a drop of cedar oil should be placed between the upper lens surface of the condenser and the under surface of the slide. Otherwise the useful numerical aperture of the condenser will be limited to 1.00, and only a part of the full aperture of the objective will be utilized. An oil immersion of 1.30 N. A. will lose more than 10% of its efficiency, if the condenser is not immersed.

The following table gives, besides the price list, the numerical aperture, equivalent focal length and the maximum thickness of slide, through which the different condensers will focus.

Code Word	Cat. No.	Designation	N. A.	E. F.		Slide Thickness	Price
				mm	in.		
Auld	**1740**	Abbe Condenser	**1.20**	**12.0**	½	1.80	**$7.50**
Aulic	**1742**	Abbe Condenser	**1.40**	**8.7**	⅓	0.90	**9.00**
Aurum	**1743**	Aplanatic Condenser	**1.40**	**12.0**	½	2.00	**22.50**
Cacolet	**4535**	Achromatic Condenser	**1.00**	**12.0**	½	1.90	**25.00**
Callot	**4537**	Achromatic Condenser	**1.40**	**13.0**	½	0.90	**30.00**

Dark-Ground Illuminator

This is a new type of illuminator invaluable for the examination of objects invisible with ordinary means of illumination. It furnishes a reliable and rapid method for examining unstained and living micro-organisms, hence its great value in medical and biological research.

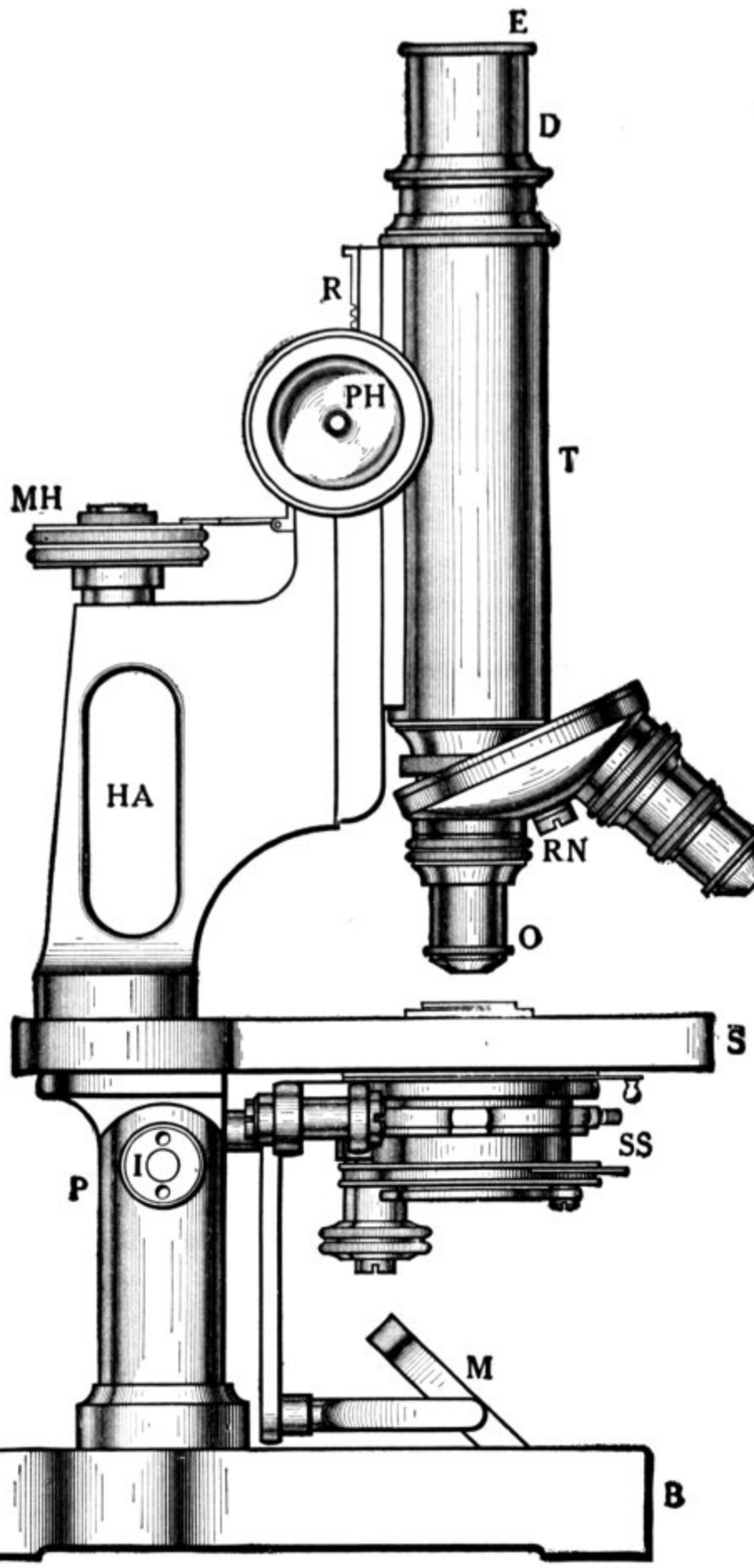
It consists of a reflector so constructed that the rays are made to strike the object at oblique angles, corresponding to numerical apertures between 1.00 and 1.40, allowing only those rays to reach the eye which are diffracted by the object. The result is that a dark field is produced in which objects appear brilliantly illuminated.

Objectives having numerical apertures between 1.00 and 1.40, such as the oil immersion 1.30 N. A., must be provided with a funnel stop, when used with this illuminator, in order to reduce the numerical aperture to less than 1.00.

This illuminator is interchangeable with the Abbe condenser, and can be applied to any of our microscopes which are fitted with either the screw or the complete substage.

For successful operation a powerful light source is required, such as direct sunlight, the electric arc, the Nernst, acetylene, calcium, or inverted incandescent gas lamps. Printed directions are enclosed with each illuminator.

Code Word	Cat. No.		Price
Aumbry	**1744**	**Dark-Ground Illuminator** in centering mount with iris diaphragm - - - - -	**$11.00**
Auncel	**1754**	**Special Hand-Feed Arc Lamp** mounted on adjustable support with bulls-eye condenser adjustable in tube - - - - - - -	**14.50**
Decore	**4452**	**Rheostat**, fixed form, for 110 volts, 5 amperes -	**7.50**
Aunter	**1755**	**Nernst Electric Lamp** on stand adjustable for height, including cord and plug - - - (when ordering specify voltage and kind of current used, i. e. direct or alternating)	**9.00**
Aural	**15262**	**Incandescent Gas Lamp** with metal chimney on stand - - - - - -	**6.50**
Auricle	**1752**	**Globe Condenser** on stand to be used with Nernst or gas lamps - - - - -	**2.25**
Auriga	**1775**	**Funnel Stop** for oil immersion objective - -	**.40**



Elevation of Handle Arm Microscope.

E	Eyepiece.	S	Stage.
D	Draw tube.	SS	Substage.
T	Body tube.	M	Mirror.
RN	Revolving Nosepiece.	B	Base.
O	Objective.	R	Rack.
PH	Pinion Head.	P	Pillar.
MH	Micrometer Head.	I	Inclination Joint.
HA	Handle Arm.		

Mechanical Construction

In the body of this catalog we have given, under the descriptions of the various instruments, the specifications of each stand. That these specifications may be easily understood by the reader we propose in these pages to give details of the mechanical construction.

All parts of the stands are made from the best of materials, each selected with reference to the purpose for which it is used and for its wearing qualities. The bearings are made from two metals of unequal hardness to insure smoothness of action, even after long service.

Bases The horse-shoe form, by reason of its convenient shape and three-point support, is used on all stands. The area of support and weight of base are selected so that in those instruments, which are fitted with inclination joint, the stand remains stable, even when inclined 90 degrees from the vertical for drawing and photomicrography.

Pillars These are both round and square, but in all cases large enough in cross section to insure firmness and **high enough to give ample room for manipulating substage apparatus** and to avoid shading of the mirror by forward edge of the stage. The inclination joints are fitted with ground axles of taper form and permit in all instruments a movement of 90 degrees, with stops for both the vertical and horizontal positions.

Arms Two forms are offered, the handle type with lever fine adjustment, originated by us several years ago, and the regulation continental type with prism fine adjustment. The handle arm with lever fine adjustment has received such loyal support from the scientific world that we have adopted it on all instruments excepting the BA and BB. In designing this arm, the practical use of the stand has been carefully considered. The fine adjustment screw heads are so placed as to allow freedom of fore finger in manipulation; the handle openings are large and all portions of the arm are strong enough to withstand hard usage. Ample room is provided below the front of the arm for the manipulation of specimens under examination and mechanical stages. All parts are well rounded for the protection of the hand when carrying the instrument. See "focusing adjustments" for further description.

The continental arm is so well known as to need no further description. For description of the prism fine adjustment see "focusing adjustments".

Body Tubes and Draw Tubes The body tubes are carefully machined, insuring exact optical alignment of the optical parts. The A, AH, BA and BB have tubes of 32 millimeters, outside diameter; the BH and BBH, 35 millimeters; the CAH, CCH and CDH, 39 millimeters, and the DDH, 50 millimeters. The sizes are proportionate to the instruments. The tubes of larger diameter are especially designed for photomicrography and drawing with objectives used without oculars. All tubes are arranged to take the standard size draw tube and eyepieces of 23 millimeters, outside diameter. The draw tubes are graduated to indicate the mechanical tube length from shoulder of ocular to

shoulder of objective. When nosepieces are added, the tube length may be compensated for by adjusting the draw tube. The draw tubes are furnished in adapters, with or without cloth lining as ordered. **We supply cloth lining, unless metal fitting is specified.**

Nosepieces

A nosepiece is an almost necessary part of every equipment. Its full value cannot be realized unless it is fitted to the stand, while all optical parts are in our possession, that they may be adjusted par-focally and centrally to each other.

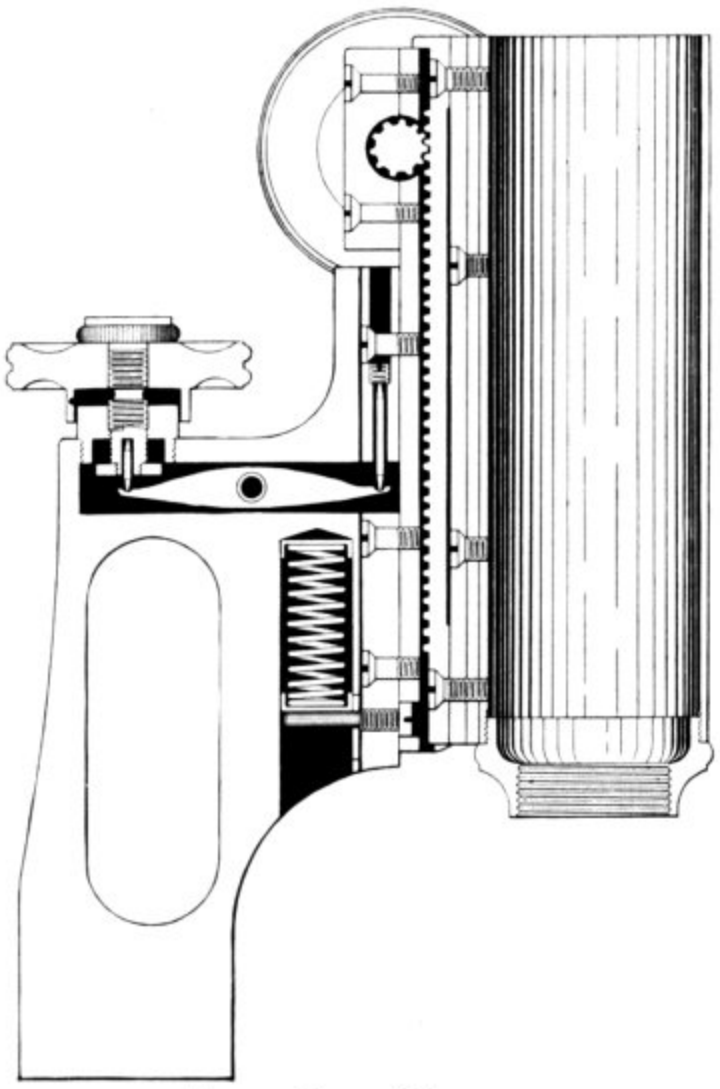
Our dust-proof nosepieces, which we have supplied for several years, have almost entirely supplanted the earlier forms. These nosepieces are light but strong, and arranged to hold objectives, not in use, at such an angle as not to interfere with manipulation of the specimen. We also offer the older form for those who desire to keep their equipment uniform.

Focusing Adjustments

Our racks and pinions for coarse adjustment have diagonally cut teeth. By careful gauging, defective parts are eliminated before assembling the instrument, thereby guaranteeing a smooth and perfect adjustment. Pinion heads of large size afford ease of adjustment.

The slides are large and heavy enough to insure long service. Provision is made for adjusting pinions after long service.

The lever type of fine adjustment, combined with the handle arm, was **designed by us** several years ago and has fully met the demand for a delicate adjustment which can be handled by students without derangement. It has been adopted on all instruments fitted with fine adjustment, excepting the BA and BB.



Lever Fine Adjustment
(Section)

The construction is shown in the cross section illustration. When the fine adjustment screw head is rotated, its movement is imparted to the lever, which in turn imparts the motion to the body tube. By means of a left-handed thread the clock-wise movement of head imparts a downward motion to the tube. No force can be placed upon the specimen other than the weight of the tube as the adjustment ceases to act the moment the objective touches the specimen. This prevents the injury of ordinary specimens and objectives, as only a light spring is required.

The micrometer screw has threads of 0.5 millimeter pitch, and with lever arms of equal length the movement of the screw-head one revolution moves the body tube 0.5 millimeter. By changing the location of the fulcrum, as we have done in the larger stands, so that

the lever arm is twice as long on the side toward the screw as on the other side, one revolution of the screw-head moves the body tube 0.25 millimeter. When the fine adjustment head is graduated into one hundred parts, each division represents a movement of .0025 millimeter. This we have found to be as slow a movement as can be used without tiring the eyes. With slower adjustments the eye attempts to accommodate while the object is passing in and out of focus. This adjustment is delicate enough for photomicrographic work.

The **large broad bearings** are placed very near the optical axis, and the screw is called upon to carry only the body tube and rack adjustment, no matter how great the distance from the arm to the optical axis.

All parts of the mechanism are encased in the arm, thereby protecting them from dust and injury. The micrometer screw head is locked, so that it cannot be removed without the use of special tools.

The prism fine adjustment has been retained upon the BA and BB instruments for those who, having installed this type, desire to keep their equipment uniform.

The adjustment is accurately constructed and is very precise. The micrometer screw acts directly on the fixed triangular portion of the arm, the weight of the microscope body being counter balanced by a spiral steel spring. The screw is thus subjected to minimum wear.

Stages

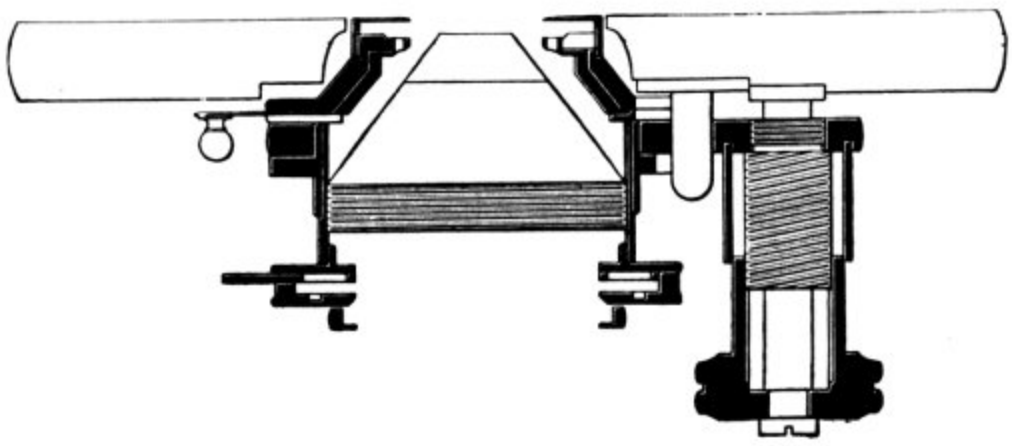
All stages are amply large for the convenient manipulation of large specimens, petri dishes, etc., below the objective. Exact measurements of the various stages are given under the respective instruments. All stages of compound microscopes are rubber covered, excepting those of the A, AH and O, and the mechanical stages of the CDH and DDH. Great care is exercised in the application of the rubber, and we can guarantee the surfaces to remain flat indefinitely.

The method of attaching our stages and the material used in their construction insure rigidity and freedom from spring, so annoying when using high power objectives.

Substages

We offer three forms of substage, the plain tube, quick acting screw and complete.

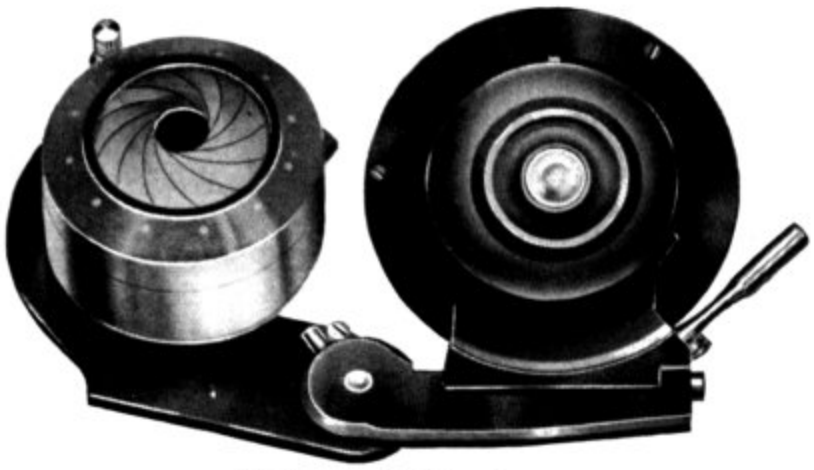
The plain tube substage consists of a tube rigidly attached to the under side of the stage, into which substage condensers, polarizers, etc. may be placed. It offers no means of adjustment and is recommended only for the most elementary work.



Screw Substage with Abbe Condenser.

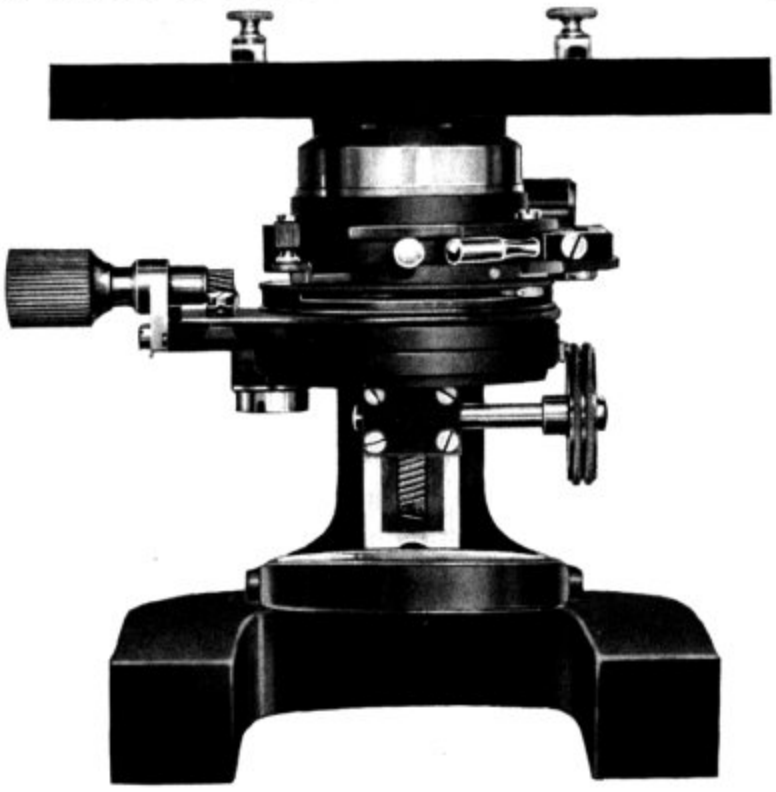
The quick acting screw substage consists of an arm with tube of standard size, into which a substage condenser, or other substage accessory, may be clamped and

focused by means of a six-threaded screw. This gives a delicate and yet quick method of focusing. When the end of the thread has been reached, the arm with the condenser, diaphragm, etc., may be swung to one side, leaving the lower side of the stage entirely free. Ample means are provided for accurate centering, and the thread is protected from dust and injury.



Swing-out Condenser.

A swing-out condenser complete with upper and lower iris diaphragms is offered for the first time and may be fitted to any of our substages upon the instruments offered in this catalog and upon most of the instruments with substage heretofore supplied by us. By means of a mechanism the condenser and lower iris may be swung down and to one side so as to facilitate the use of illumination by mirror and upper iris alone. This is one of the improvements we are able to offer our patrons by reason of our affiliation with the Zeiss Optical Works.



Complete Substage Closed

The new complete substage offers advantages in simplicity of construction and convenience of manipulation over others of similar type. A heavy bar, rigidly attached to the stand, serves as a slide, upon which the substage proper is moved by means of a rack and pinion adjustment, and as a holder for the mirror and fork, which remain in a fixed position during the adjustment of the substage. Thus, when the illumination has once been centered by means of the mirror, no change is experienced when focusing the condenser, etc.

Complete Substage with Condenser and Lower Iris Diaphragm
Thrown Out of Optical Axis

The upper arm carries a ring of standard substage size, and this in turn will carry any of our condensers, dark-ground illuminator or the swing-out condenser with upper iris, as shown in illustration, a clamp being provided to hold them. The advantage of this stage arrangement will be appreciated by those who are called upon to do a wide variety of work with frequent changes in accessories.

The lower arm supports the condenser diaphragm. This mounting is so arranged that the diaphragm may be decentered for oblique illumination, may be oriented to bring the oblique pencil at any relation to the object or may be swung entirely out of the optical axis.

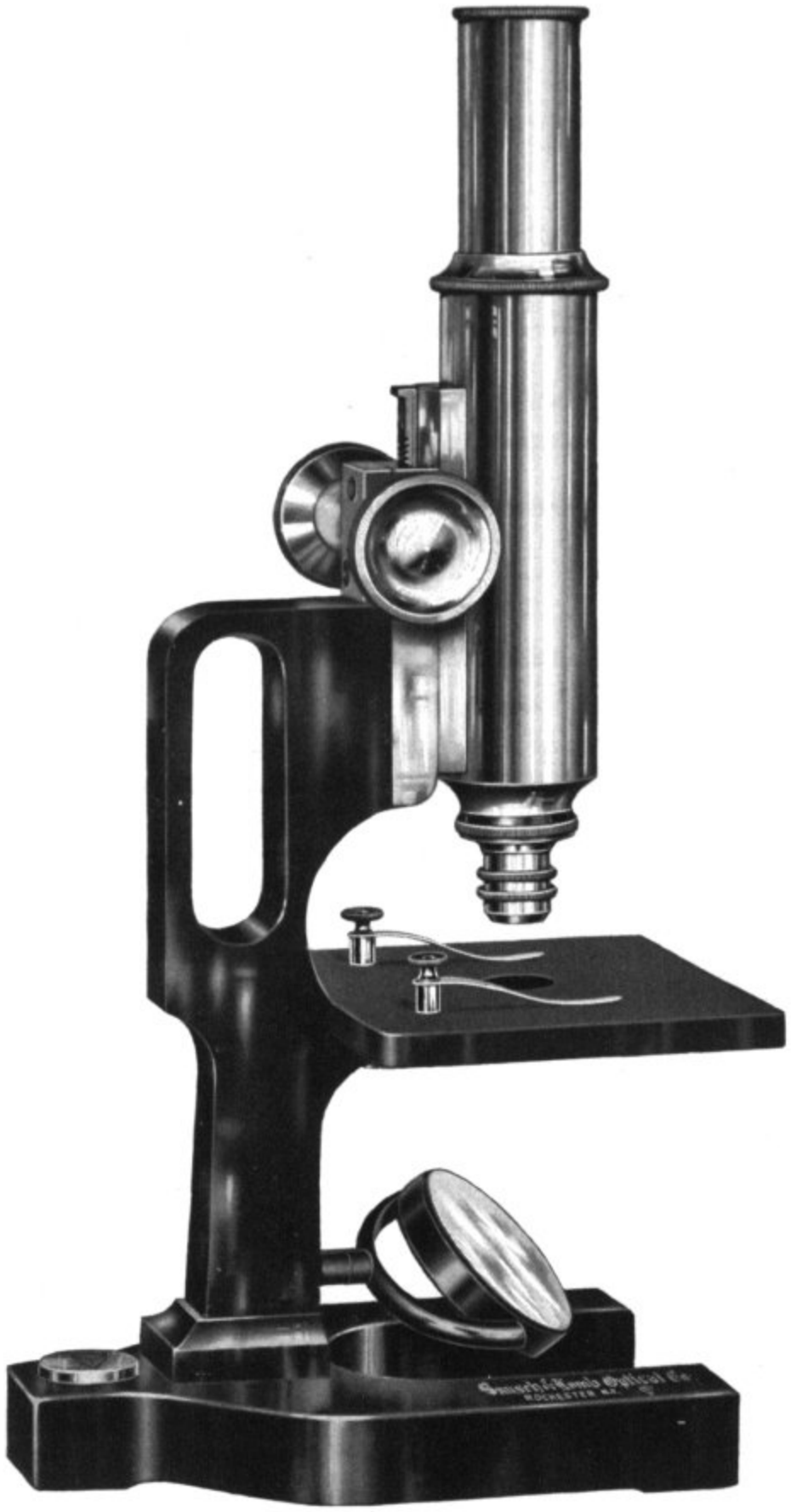
Finish The greatest amount of care is exercised in preparing the metal surfaces for finishing. The grinding and polishing are done by experts trained for this work. The result is a very beautiful finish, combining durability with pleasing appearance.

The bases, pillars, arms and draw-tubes are regularly finished in alcohol proof black, with body tubes and adjusting heads in yellow. **Body tubes also will be finished in black when so ordered.**

Cases Our cases are prepared at considerable expense from the best woods, well finished and trimmed. When not desired, on large college equipments, they will be omitted and suitable allowance made. For single instruments it is always desirable to have the carrying case.

The following features in this catalog are of special interest:

Large stages of compound microscopes
Large body tubes of compound microscopes
Removable swing-out condenser, adaptable to various stands
New complete substage
Perfect finish of all instruments
Hand rests of dissecting microscope W
Attachable mechanical stage, clamping to microscope stage
Optional black body tubes and metal fitted draw tubes.



Microscope A

(.5 Actual Size)

Microscope A

Base—Horse-shoe form.

Pillar—Rectangular; of one piece with arm.

Arm—Of handle type.

Body Tube—Outside diameter, 32 mm; fixed length, 160 mm; standard size eyepieces are used (see page 13).

Focusing Adjustment—By standard rack and pinion, coarse adjustment only; not recommended for objectives of shorter focus than 8 mm.

Stage—Of blackened metal, 100 x 83 mm, with a distance of 42 mm from center to base of arm; provided with spring clips and a revolving diaphragm, containing four apertures of different sizes.

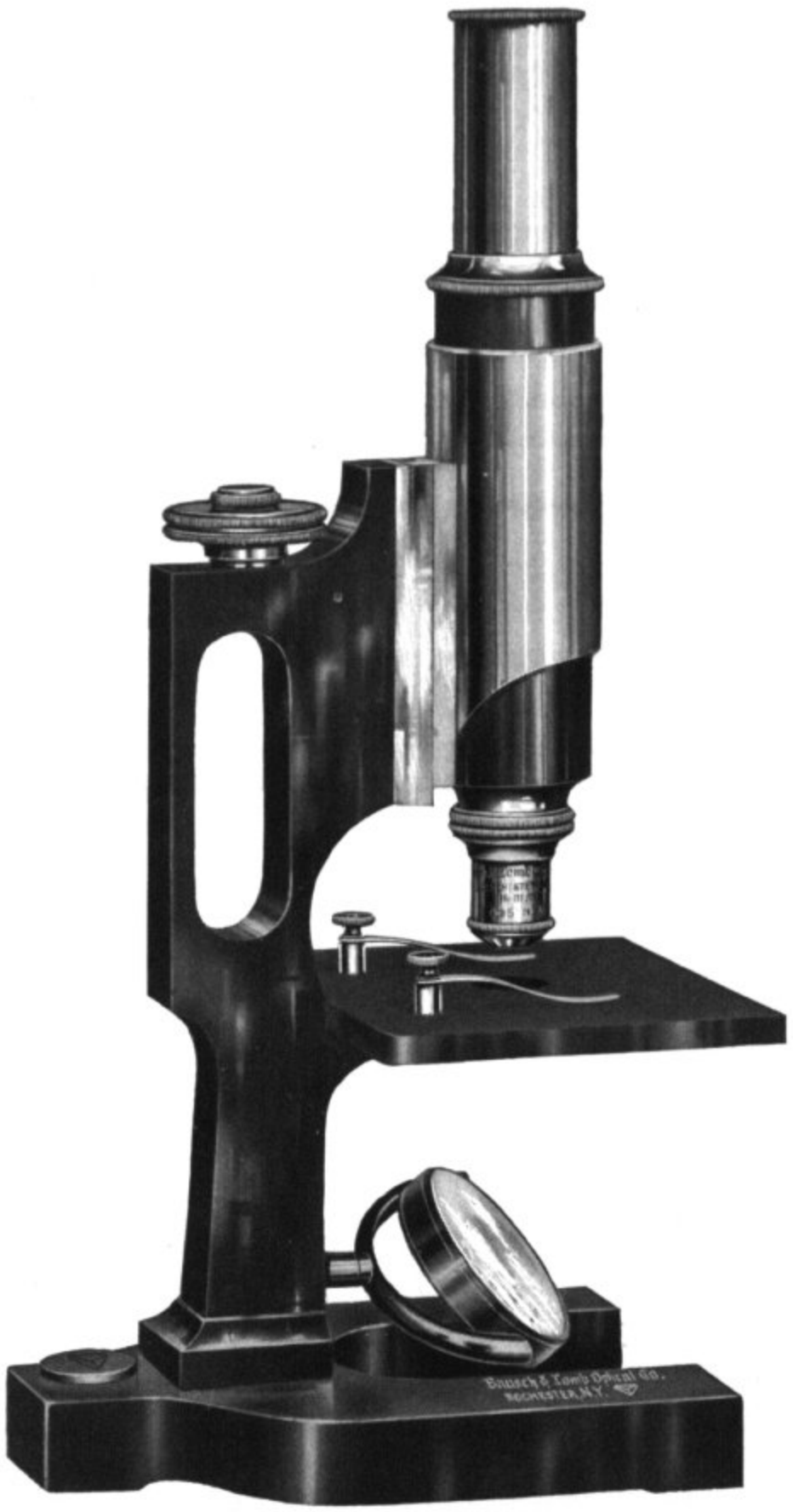
Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork mounting, attached to the microscope pillar.

Finish—Body tube, with connections, and pinion buttons in yellow; other parts in black.

Case—Of wood, neatly finished and fitted with catch. If lock is desired, $1.00 should be added to list price.

Code Word	Cat. No.	Objectives	Eyepiece	Price
		Dry		
Amphipod	**A**	Divisible 16 + 32	7.5×	**$18.00**

For general optical and mechanical description see pages 8-21.



Microscope AH

(.5 Actual Size)

Microscope AH

This instrument is similar to microscope A, except in its focusing adjustment.

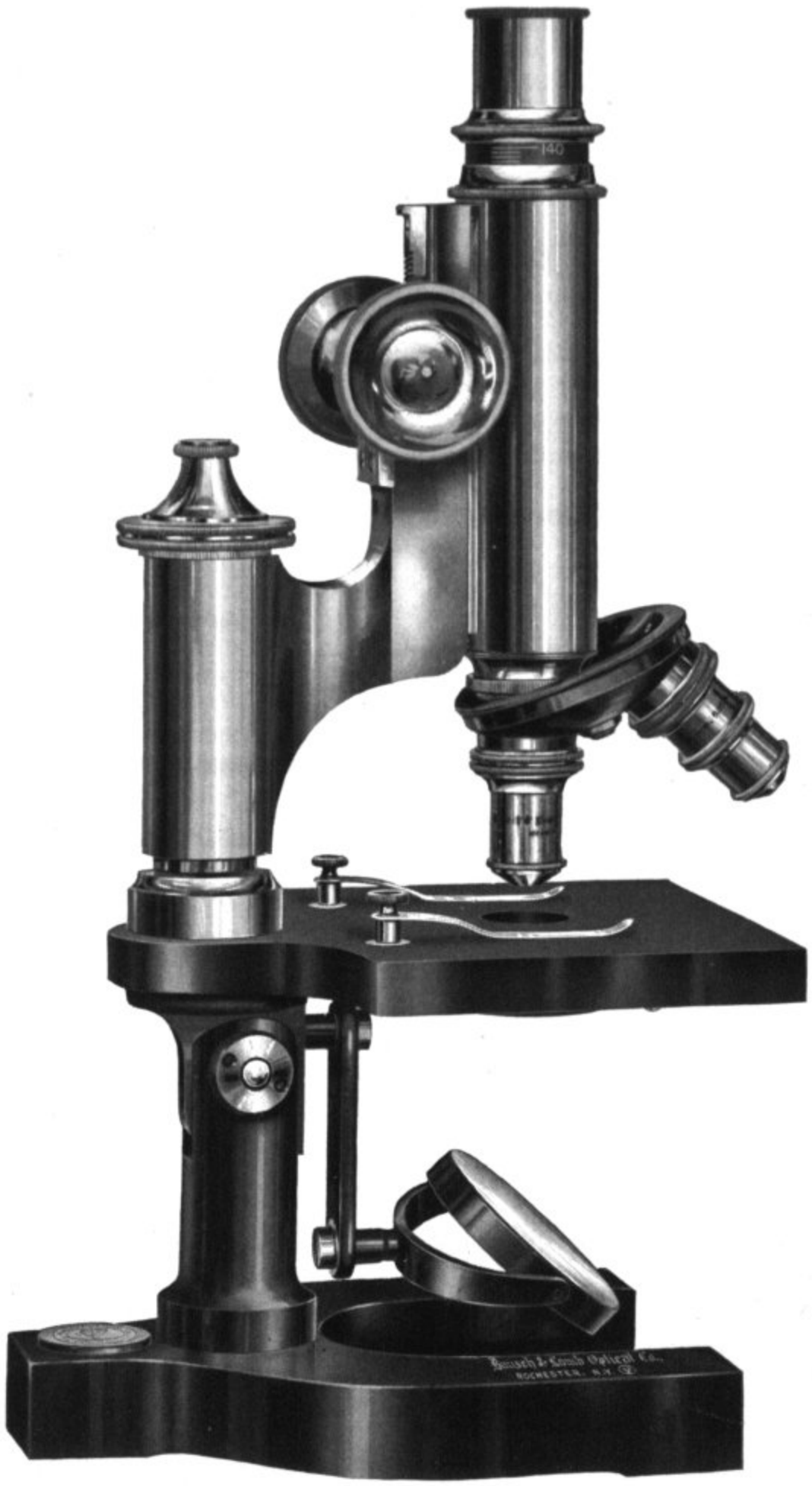
The coarse adjustment is by means of a sliding tube in a cloth-lined sleeve, to which is attached the bearing surface of the fine adjustment.

The fine adjustment is of our lever type, permitting high power dry objectives to be used.

The micrometer screw head is locked to prevent its removal by beginners.

Code Word	Cat. No.	Objectives	Eyepieces	Price
		Dry		
Amplify	**AH 1**	16 mm 4 mm	7.5×	**$23.50**
Ampulla	**AH 3**	16 mm 4 mm	5× 10×	**25.00**

For general optical and mechanical description see pages 8-21.



Microscope BA

(.5 Actual Size)

Microscope BA

Base—Horse-shoe form.

Pillar—Round; provided with inclination joint, having vertical and horizontal stops.

Arm—Round, of standard design; base grooved for attachment of mechanical stage A; provides ample space for manipulation of object.

Body Tube—Outside diameter, 32 mm; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified**, and provided with society screw thread for the use of low power objectives.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of prism form with two-sized knurled head for slow and rapid movement.

Stage—Of metal, covered with vulcanized rubber; measures 101 x 101 mm, with a distance of 57 mm from center to base of arm; provided with spring clips, an iris diaphragm and screw threads for attaching a substage ring to hold an Abbe condenser.

Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, mounted on a swinging arm for oblique illumination.

Finish—Body tube, arm and pinion buttons in yellow; other parts, including draw tube unless metal fitted, in black.

Case—Of hard wood with polished finish; fitted with brass lock and key.

Code Word	Cat. No.	Objectives Dry	Eyepieces	Nosepieces	Price
Anachoret	**BA 1**	16 mm 4 mm	7.5×		**$27.50**
Anaclastic	**BA 2**	16 mm 4 mm	7.5×	Circular Double	**31.50**
Anadrom	**BA 3**	16 mm 4 mm	5× 10×		**29.00**
Anagoge	**BA 4**	16 mm 4 mm	5× 10×	Circular Double	**33.00**

For general optical and mechanical description see pages 8-21.

Microscope BH

(.5 Actual Size)

Microscope BH

Base—Horse-shoe form.

Pillar—Round; provided with inclination joint, having vertical and horizontal stops.

Arm—Handle type; grooved at base for attachment of mechanical stage A; provides ample space for manipulation of object.

Body Tube—Outside diameter, 35 mm; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified** and provided with society screw thread for the use of low power objectives.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of our lever type with two-sized knurled head for slow and rapid movement.

Stage—Of metal, covered with vulcanized rubber; measures 103 x 101 mm, with a distance of 59 mm from center to base of arm; provided with spring clips, an iris diaphragm so mounted as to be readily detached if desired and screw threads for attaching a substage ring to hold an Abbe condenser.

Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, mounted on a swinging arm for oblique illumination.

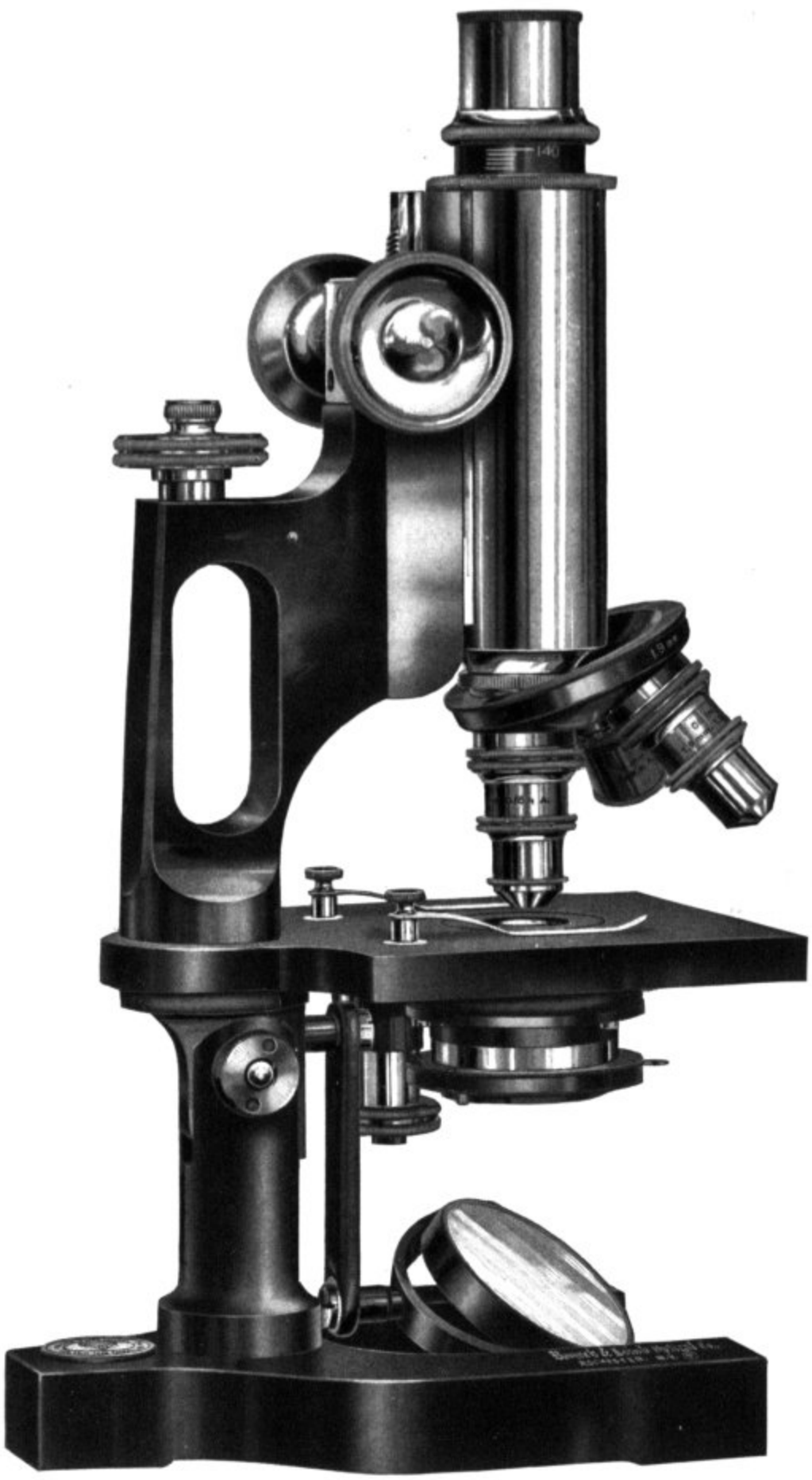
Finish—Body tube, with connections, and pinion buttons in yellow; other parts, including draw tube unless metal fitted, in black. **Black body tubes will be furnished in place of yellow, if so specified, at no additional cost.**

Case—Of hard wood with polished finish; fitted with brass lock and key.

Code Word	Cat. No.	Objectives Dry	Eyepieces	Nosepieces	Price
Amyl	**BH 1**	16 mm 4 mm	7.5×		**$27.50**
Amyloid	**BH 2**	16 mm 4 mm	7.5×	Circular Double	**31.50**
Anabatic	**BH 3**	16 mm 4 mm	5× 10×		**29.00**
Anacardic	**BH 4**	16 mm 4 mm	5× 10×	Circular Double	**33.00**

Microscope BH will be furnished with a substage ring and Abbe condenser, 1.20 N. A., at an additional cost of $7.50. When so ordering, add "Condenser" to code word.

For general optical and mechanical description see pages 8-21.



Microscope BH8

(.5 Actual Size)

Microscope BH8

This instrument is the same as our regular microscope BH with the addition of a substage, adjustable for focus by a quick acting screw.

The substage consists of a mounting for the Abbe condenser and an iris diaphragm, which comes into the plane of the stage when the screw is turned up as far as possible, allowing the condenser to be used in immersion contact with the objective, if desired.

The substage is swung to the left of the optical axis when the screw reaches the limit of motion downward.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepiece	Abbe Condenser	Price
		Dry	Oil Immersion				
Amphigen	**BH 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**$70.00**

For general optical and mechanical description see pages 8-21.

Microscope BB

(.5 Actual Size)

Microscope BB

Base—Horse-shoe form.

Pillar—Round; provided with inclination joint, having vertical and horizontal stops.

Arm—Round, of standard design; base grooved for attachment of mechanical stage A; provides ample space for manipulation of object.

Body Tube—Outside diameter, 32 mm; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified,** and provided with society screw thread for the use of low power objectives.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of prism form with two-sized knurled head for slow and rapid movement, the larger part graduated into 100 divisions, each equal to .005 mm in vertical movement, and provided with an indicator.

Stage—Of metal, covered with vulcanized rubber; measures 101 x 101 mm, with a distance of 57 mm from its center to base of arm; provided with spring clips.

Substage—Adjustable for focus by a quick acting screw; consists of a mounting for the Abbe condenser and an iris diaphragm, which comes into the plane of the stage when the screw is turned up as far as possible, allowing the condenser to be used in immersion contact with the objective, if desired; substage is swung to the left of the optical axis when screw reaches the limit of motion downward.

Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, which is mounted on a swinging arm for oblique illumination and provided with a spring click in central position.

Finish—Body tube, arm and pinion buttons in yellow; other parts, including draw tube unless metal fitted, in black.

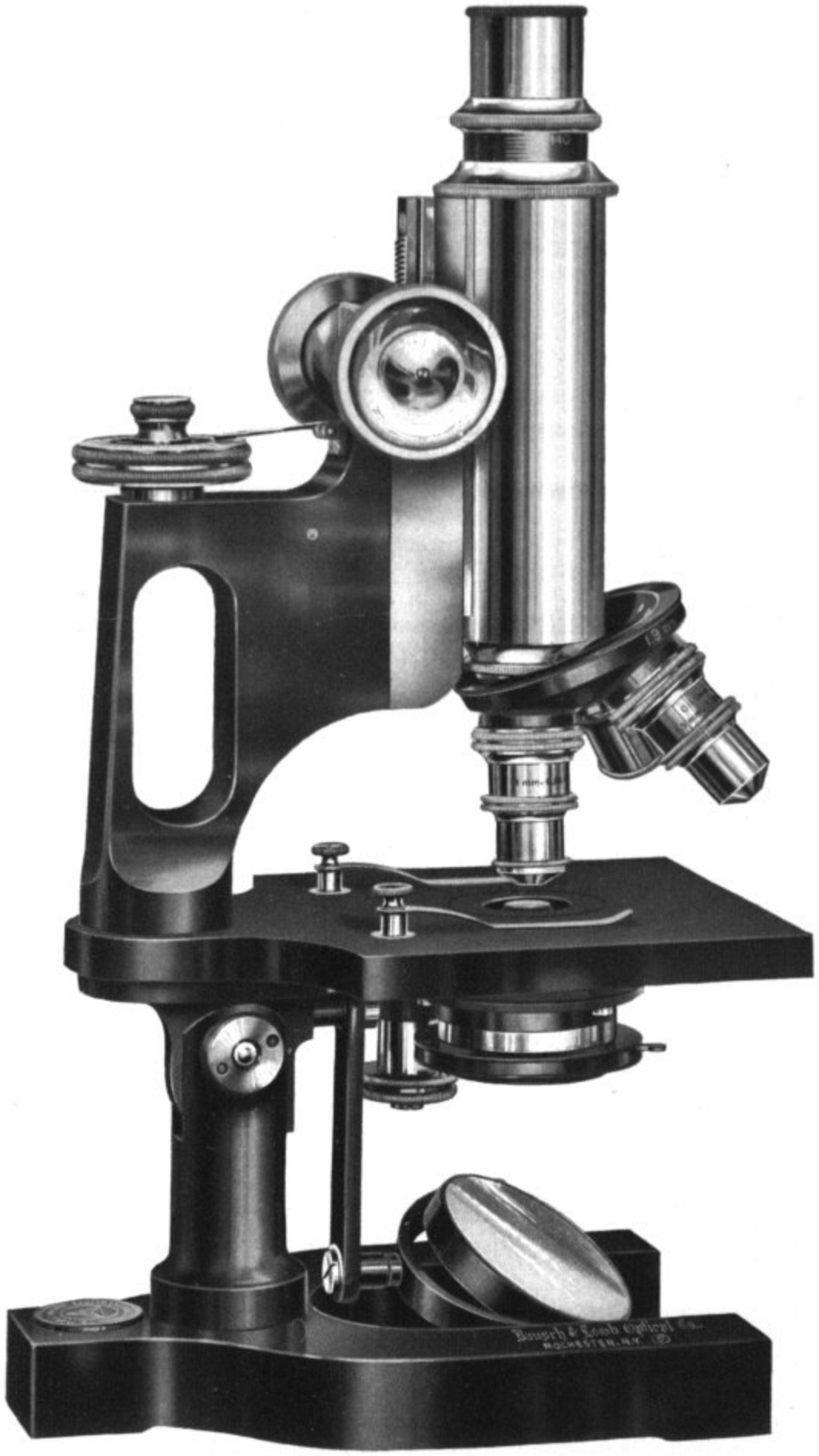
Case—Of hard wood with polished finish; fitted with brass lock and key.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepieces	Abbe Condenser	Price
		Dry	Oil Immersion				
Analects	**BB 1**	16 mm 4 mm		7.5×			**$36.50**
Analogon	**BB 2**	16 mm 4 mm		7.5×	Circular Double		**40.50**
Anaptotic	**BB 3**	16 mm 4 mm		5× 10×			**38.00**
Anarch	**BB 4**	16 mm 4 mm		5× 10×	Circular Double		**42.00**
Anastatic	**BB 6**	16 mm 4 mm		5× 10×	Circular Double	1.20 N.A.	**49.50**
Anatifa	**BB 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**75.00**

Special Swing-out Condenser

The last two prices above include an Abbe condenser in ordinary mounting. An Abbe condenser, 1.20 N. A., in the new swing-out mounting with upper and lower iris diaphragms, described and illustrated on page 20, will be substituted for the regular one at an additional cost of $5.00. When ordering this mounting, please specify "screw substage with swing-out condenser"; also add "swing" to code word.

For general optical and mechanical description see pages 8-21.



Microscope BBH

(.5 Actual Size)

Microscope BBH

Base—Horse-shoe form.

Pillar—Round; provided with inclination joint, having vertical and horizontal stops.

Arm—Handle type; grooved at base for attachment of mechanical stage A; provides ample space for manipulation of object.

Body Tube—Outside diameter, 35 mm; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified,** and provided with society screw thread for the use of low power objectives.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of our lever type with double knurled micrometer screw head for slow and rapid movement, the larger part graduated into 100 divisions, each equal to .0025 mm in vertical movement, and provided with a hinged indicator, which may be turned back from the head.

Stage—Of metal, covered with vulcanized rubber; measures 120 × 107 mm, with a distance of 70 mm from its center to base of arm; provided with spring clips.

Substage—Adjustable for focus by a quick acting screw; consists of a mounting for the Abbe condenser and an iris diaphragm, which comes into the plane of the stage when the screw is turned up as far as possible, allowing the condenser to be used in immersion contact with the objective, if desired; substage is swung to the left of the optical axis when screw reaches the limit of motion downward.

Mirror—Plane and concave, 50 millimeters in diameter; adjustable in two planes in a fork, which is mounted on a swinging arm for oblique illumination and provided with a spring click in central position.

Finish—Body tube, with connections, and pinion buttons in yellow; other parts, including draw tube unless metal fitted, in black. **Black body tubes will be furnished in place of yellow, if so specified, at no additional cost.**

Case—Of hard wood with polished finish; fitted with brass lock and key.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepieces	Abbe Condenser	Price
		Dry	Oil Immersion				
Anatomize	**BBH 1**	16 mm 4 mm		7.5×			**$41.50**
Anatron	**BBH 2**	16 mm 4 mm		7.5×	Circular Double		**45.50**
Anatto	**BBH 3**	16 mm 4 mm		5× 10×			**43.00**
Anbury	**BBH 4**	16 mm 4 mm		5× 10×	Circular Double		**47.00**
Anchorite	**BBH 6**	16 mm 4 mm		5× 10×	Circular Double	1.20 N.A.	**54.50**
Anchovy	**BBH 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**80.00**

Special Swing-out Condenser

The last two prices above include an Abbe condenser in ordinary mounting. An Abbe condenser, 1.20 N. A., in the new swing-out mounting with upper and lower iris diaphragms, described and illustrated on page 20, will be substituted for the regular one at an additional cost of $5.00. When ordering this mounting, please specify "screw substage with swing-out condenser"; also add "swing" to code word.

For general optical and mechanical description see pages 8-21.

Portable Microscope BHP

Portable Microscope BHP

Base—V-shaped, with hinge to permit parts to be folded together; stable with microscope at full inclination.

Pillar—Round; provided with inclination joint, having vertical and horizontal stops.

Arm—Handle type; grooved at base for attachment of mechanical stage A; provides ample space for manipulation of slide.

Body Tube—Outside diameter, 32 mm; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified,** and provided with society screw for the use of low power objectives.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of our lever type with double knurled micrometer screw head for slow and rapid movement, the larger part graduated into 100 divisions, each equal to .005 mm in vertical movement, and provided with a hinged indicator, which may be turned back from the head.

Stage—Of blackened metal, with vulcanized rubber top; measures 98 x 88 mm, with a distance of 58 mm from its center to base of arm; provided with spring clips; mounted on a joint with clamp, permitting it to be turned in a vertical position for placing it in case and yet to be rigid when in a horizontal position for use.

Substage—Adjustable for focus by a quick acting screw; consists of a mounting for the Abbe condenser and an iris diaphragm, which comes into the plane of the stage when the screw is turned up as far as possible, allowing the condenser to be used in immersion contact with the objective, if desired; substage is swung to the left of optical axis when screw reaches the limit of motion downward.

Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, which is mounted on a swinging arm for oblique illumination and provided with a spring click in central position.

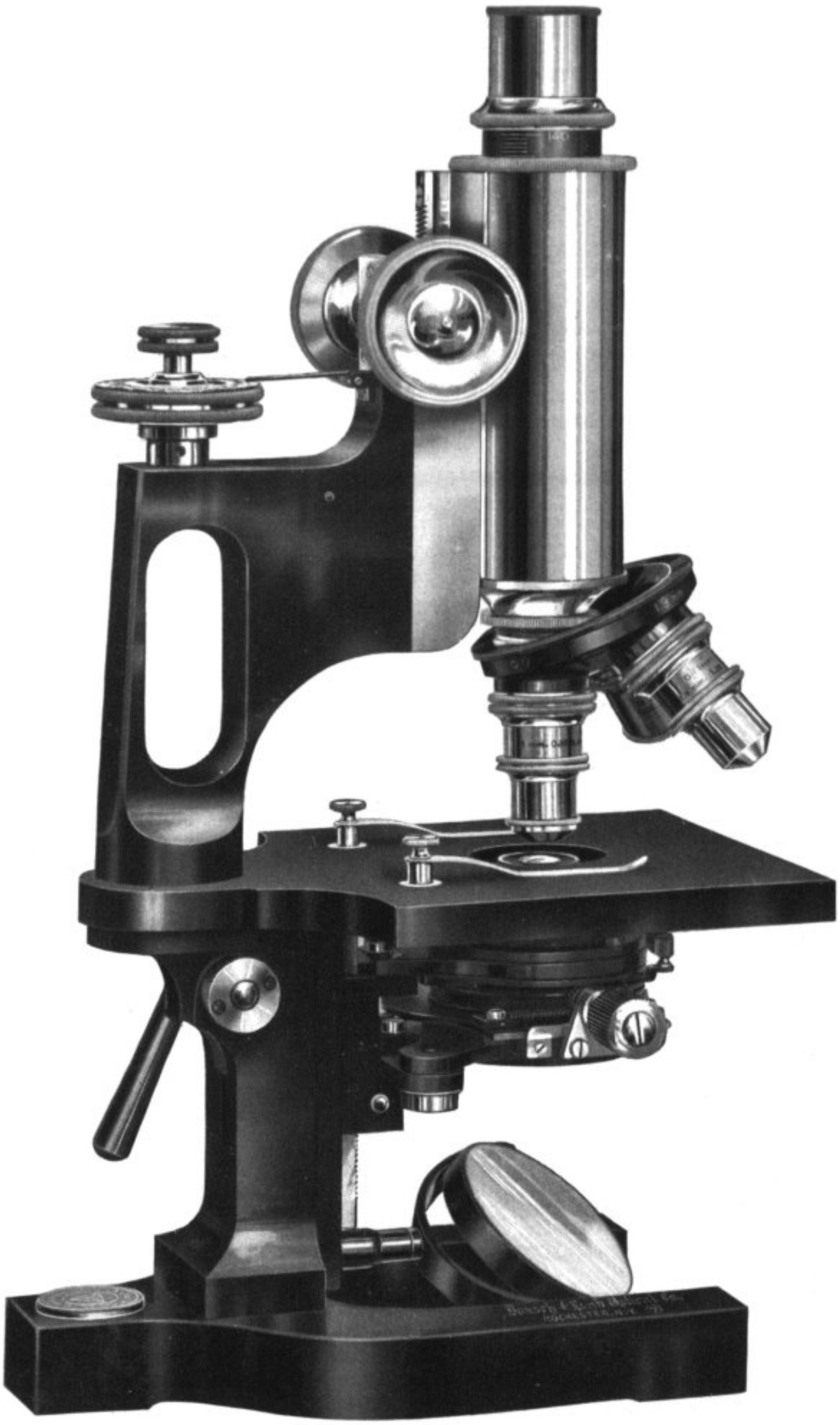
Finish—Body tube, with connections, and pinion buttons in yellow; other parts, including draw tube unless metal fitted, in black. **Black body tubes will be furnished in place of yellow, if so specified, at no additional cost.**

Case—Of hard wood with polished finish; fitted with brass lock and key; outside dimensions, 284 x 192 x 83 mm (11¼ x 7⅝ x 3¼ in.)

Weight—BHP8 in carrying case, 10 lbs., 15 oz.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepieces	Abbe Condenser	Price
		Dry	Oil Immersion				
Andarac	**BHP 4**	16 mm 4 mm		5× 10×	Circular Double	1.20 N.A.	**$56.50**
Androus	**BHP 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**92.50**

For general optical and mechanical description see pages 8-21.



Microscope CAH

(.5 Actual Size)

Microscope CAH

Base—Horse-shoe form.

Pillar—Rectangular in section; provided with inclination joint and clamping lever to secure instrument in any position, and with stops in the vertical and horizontal positions.

Arm—Handle type; of enlarged design, providing ample space for manipulation of any object desired; grooved at base for mechanical stage A.

Body Tube—Outside diameter, 39 mm; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified,** and provided with society screw thread for the use of low power objectives.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of our lever type with knurled micrometer screw head in two parts of different diameter for slow and rapid movement, the larger graduated into 100 divisions, each equal to .0025 mm in vertical movement, and provided with a hinged indicator, which may be turned back from the head.

Stage—Of metal, covered with vulcanized rubber; measures 125 x 115 mm, with a distance of 75 mm from its center to base of arm; provided with spring clips.

Substage—Complete with swing-out condenser, as illustrated in detail on page 21, and so arranged that all substage accessories, inserted into the upper sleeve, may be easily employed; adjustable by standard rack and pinion; upper iris diaphragm of dome shape, self-locking, combined with Abbe condenser, the whole easily removable from substage; Abbe condenser removable from optical axis by a double swing movement to one side, releasing upper iris diaphragm for use; lower iris diaphragm adjustable laterally by rack and pinion for oblique illumination, revolvable about its own axis and mounted on a swinging arm, allowing it to be swung entirely out of the optical axis.

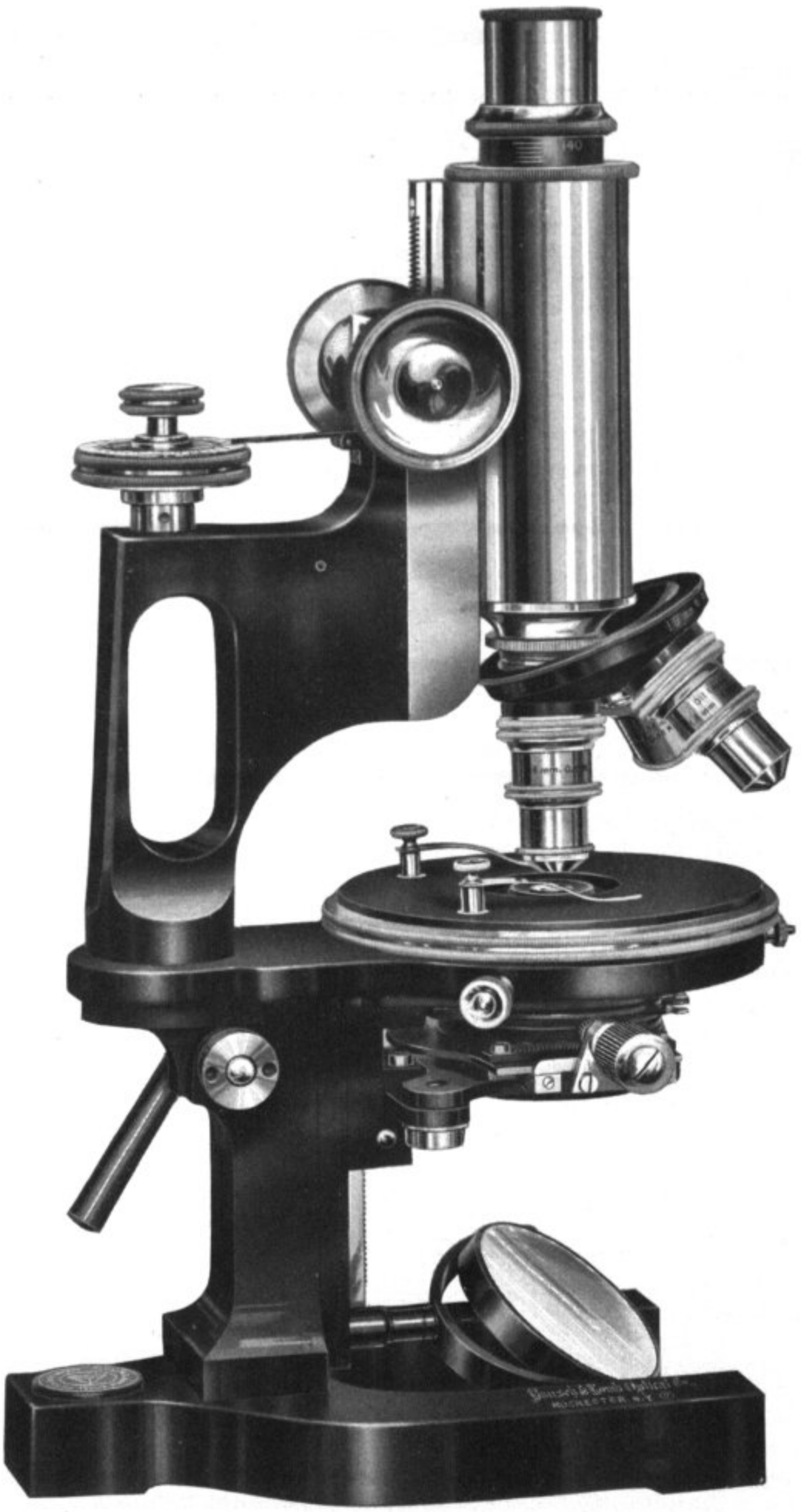
Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, which is attached in fixed position to substage support.

Finish—Body tube, with connections, and pinion buttons in yellow; other parts, including draw tube unless metal fitted, in black. **Black body tubes will be furnished in place of yellow, if so specified, at no additional cost.**

Case—Of hard wood with polished finish; fitted with brass lock and key.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepieces	Abbe Condenser	Price
		Dry	Oil Immersion				
Aneath	**CAH 1**	16 mm 4 mm		7.5×		1.20 N.A.	**$76.00**
Anemone	**CAH 2**	16 mm 4 mm		7.5×	Circular Double	1.20 N.A.	**80.00**
Anglic	**CAH 3**	16 mm 4 mm		5× 10×		1.20 N.A.	**77.50**
Angor	**CAH 4**	16 mm 4 mm		5× 10×	Circular Double	1.20 N.A.	**81.50**
Angust	**CAH 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**110.00**

For general optical and mechanical description see pages 8-21



Microscope CCH

(.5 Actual Size)

Microscope CCH

Base—Horse-shoe form.

Pillar—Rectangular in section; provided with inclination joint and clamping lever to secure instrument in any position, and with stops in the vertical and horizontal positions.

Arm—Handle type, of enlarged design, providing ample space for manipulation of any object desired; grooved at base for attachment of mechanical stage A.

Body Tube—Outside diameter, 39 mm; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified,** and provided with society screw thread for the use of low power objectives.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of our lever type with knurled micrometer screw head in two parts for slow and rapid movement, the larger graduated into 100 divisions, each equal to .0025 mm in vertical movement, and provided with a hinged indicator, which may be turned back from the head.

Stage—Circular revolving, 102 mm in diameter, with a distance of 75 mm from its center to the base of arm; of metal with vulcanite top; provided with centering screws and with spring clips; removable for substitution of revolving mechanical stage.

Substage—Complete with swing-out condenser, as illustrated in detail on page 21, and so arranged that all substage accessories, inserted into the upper sleeve, may be easily employed; adjustable by standard rack and pinion; upper iris diaphragm of dome shape, self-locking, combined with Abbe condenser, the whole easily removable from substage; Abbe condenser removable from optical axis by a double swing movement to one side, releasing upper iris diaphragm for use; lower iris diaphragm adjustable laterally by rack and pinion for oblique illumination, revolvable about its own axis and mounted on a swinging arm, allowing it to be swung entirely out of the optical axis.

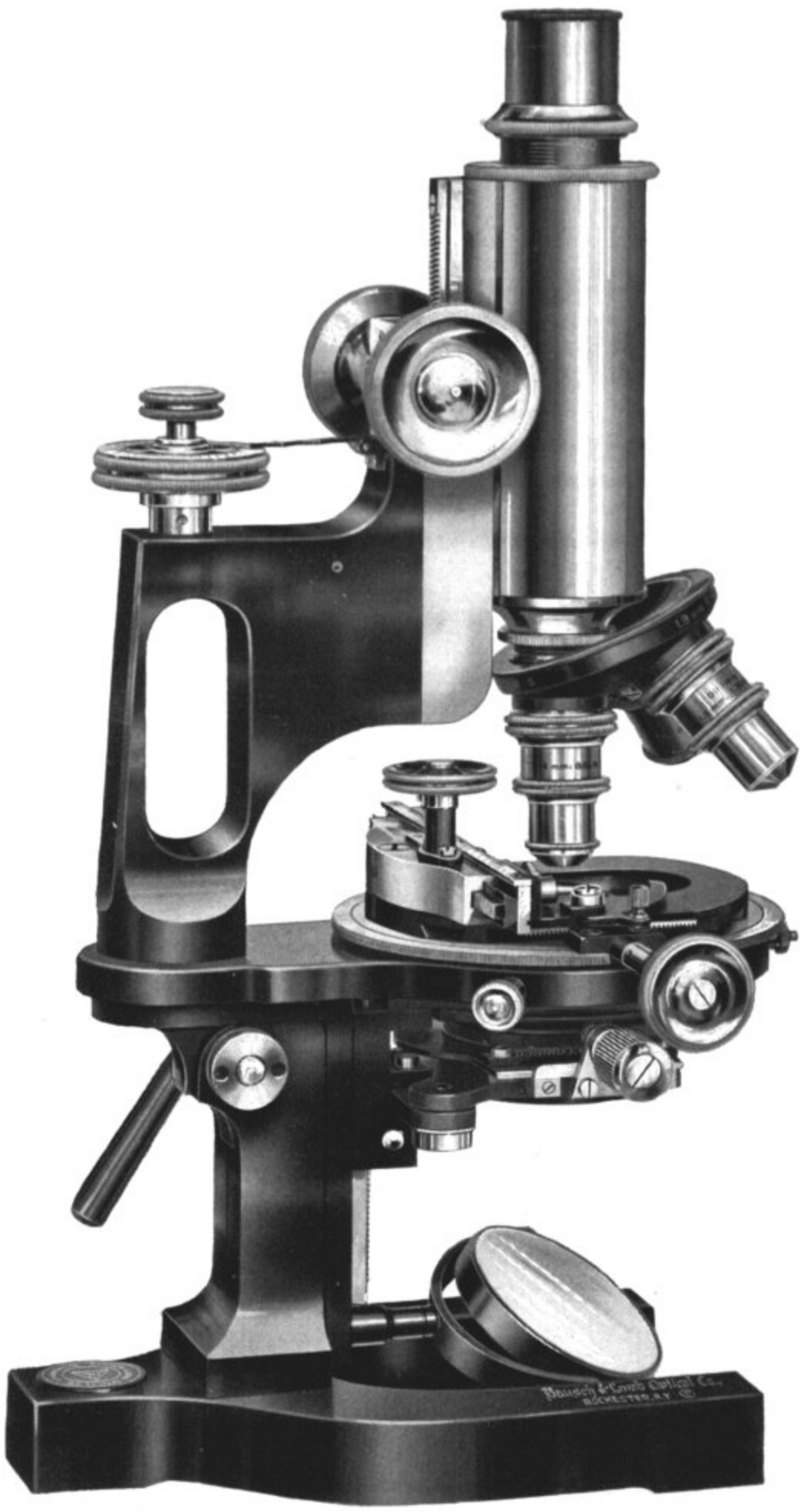
Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, which is attached in fixed position to substage support.

Finish—Body tube, with connections, and pinion buttons in yellow; other parts, including draw tube unless metal fitted, in black. **Black body tubes will be furnished in place of yellow, if so specified, at no additional cost.**

Case—Of hard wood with polished finish; fitted with brass lock and key.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepieces	Abbe Condenser	Price
		Dry	Oil Immersion				
Anhang	**CCH 1**	16 mm 4 mm		10×		1.20 N.A.	**$91.00**
Anhelose	**CCH 2**	16 mm 4 mm		10×	Circular Double	1.20 N.A.	**95.00**
Anhinga	**CCH 3**	16 mm 4 mm		5× 10×		1.20 N.A.	**92.50**
Anicut	**CCH 4**	16 mm 4 mm		5× 10×	Circular Double	1.20 N.A.	**96.50**
Animative	**CCH 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**125.00**

For general optical and mechanical description see pages 8-21.



Microscope CDH

(.5 Actual Size)

Microscope CDH

This instrument is similar to microscope CCH except in the stage.

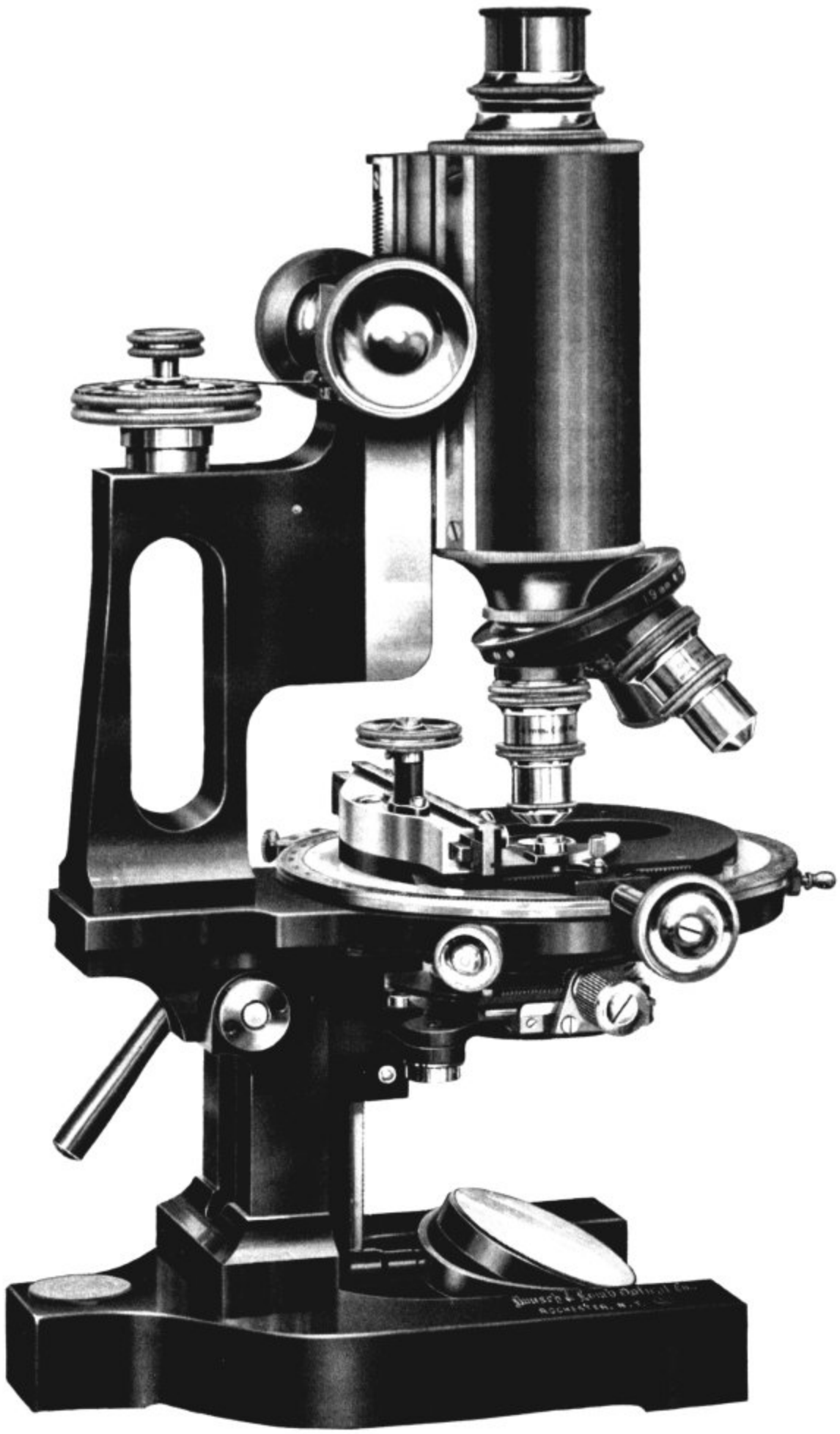
It is fitted with a revolving mechanical stage, measuring 102 mm, outside diameter, and provided with centering screws. The stage has two rack and pinion movements giving equal speeds, with a right and left movement of 70 mm and a backward and forward movement of 30 mm. Both scales are graduated in single millimeters, with verniers reading to tenths.

The slide-holder will take any sized slide up to 102 mm in length. It has two adjustable stops, one of which is actuated by a spring to hold the slide rigidly in place, the other provided with a graduated scale for position readings. The slide rests on the stage surface and may be used in immersion contact with the condenser, if desired.

The upper portion of the stage may be removed, leaving a large, flat surface with one rack adjustment. The whole stage is removed readily for the substitution of the plain stage, if desired.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepieces	Abbe Condenser	Price
		Dry	Oil Immersion				
Antmist	**CDH 1**	16 mm 4 mm		7.5×		1.20 N.A.	**$111.00**
Animus	**CDH 2**	16 mm 4 mm		7.5×	Circular Double	1.20 N.A.	**115.00**
Anion	**CDH 3**	16 mm 4 mm		5× 10×		1.20 N.A.	**112.50**
Aniseed	**CDH 4**	16 mm 4 mm		5× 10×	Circular Double	1.20 N.A.	**116.50**
Anlace	**CDH 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**145.00**
Aniline	Plain Stage for CDH, vulcanite covered - - - -						**10.00**

For general optical and mechanical description see pages 8-21



Microscope DDH

(.5 Actual Size)

Microscope DDH

Base—Horse-shoe form; extra large.

Pillar—Double rectangular in section; provided with inclination joint and clamping lever to secure instrument in any position, and with stops in the vertical and horizontal positions.

Arm—Handle type, of enlarged design, providing ample space for manipulation of any object desired.

Body Tube—Of aluminum, 50 mm outside diameter; provided with society screw thread; standard size eyepieces are used (see page 13); draw tube graduated in single millimeters with every tenth line numbered, adjustable in cloth-lined sleeve, **or in metal fitting, if so specified,** and provided with a society screw thread; lower collar may be removed for attaching the Micro-Tessar, 72 mm objective.

Focusing Adjustment—Coarse adjustment by standard rack and pinion; fine adjustment of our lever type with micrometer screw head in two parts for slow and rapid movement, the larger graduated into 100 divisions, each equal to .0025 mm in vertical movement, and provided with a hinged indicator, which may be turned back from the head.

Stage—Revolving mechanical, with circumference graduated into single degrees and read by a convenient vernier; measures 126 mm outside and 112 mm inside the graduations; provided with two rack and pinion movements, covering a range of 75 mm and 35 mm, respectively; provided with centering screws and removable for substitution of plain stage, if desired, or upper part may be removed, leaving a large, flat surface with one rack adjustment.

Substage—Complete with swing-out condenser, as illustrated in detail on page 21, and so arranged that all substage accessories, inserted into the upper sleeve, may be easily employed; adjustable by standard rack and pinion; upper iris diaphragm of dome shape, self-locking, combined with Abbe condenser, the whole easily removable from substage; Abbe condenser removable from optical axis by a double swing movement to one side, releasing upper iris diaphragm for use; lower iris diaphragm adjustable laterally by rack and pinion for oblique illumination, revolvable about its own axis and mounted on a swinging arm, allowing it to be swung entirely out of the optical axis.

Mirror—Plane and concave, 50 mm in diameter; adjustable in two planes in a fork, attached in fixed position to substage support.

Finish—Main parts, including body tube, in alcohol proof black; adjustment heads and buttons in yellow.

Case—Of hard wood with polished finish; fitted with brass lock and key.

Code Word	Cat. No.	Objectives		Eyepieces	Nosepieces	Abbe Condenser	Price
		Dry	Oil Immersion				
Annats	**DDH 1**	16 mm 4 mm		7.5×		1.20 N.A.	**$131.00**
Annex	**DDH 2**	16 mm 4 mm		7.5×	Circular Double	1.20 N.A	**135.00**
Annotto	**DDH 3**	16 mm 4 mm		5× 10×		1.20 N.A.	**132.50**
Annoyer	**DDH 4**	16 mm 4 mm		5× 10×	Circular Double	1.20 N.A.	**136.50**
Annuent	**DDH 8**	16 mm 4 mm	1.9 mm	5× 10×	Circular Triple	1.20 N.A.	**165.00**
Angular		Plain stage for DDH, vulcanite covered - - - -					**15.00**

For general optical and mechanical description see pages 8-21.

Demonstration Microscope O

This instrument enables an instructor to supplement his lecture work by showing a single object to an entire class. He has only to adjust the slide, focus the instrument and pass it around the class, the students pointing it to the light to make their observations.

Specifications

Arm—Handle type, of ample size.

Stage—Of blackened metal, 100 x 83 mm, giving a distance of 42 mm from its center to arm; provided with spring clips and with small posts underneath to hold the instrument in a vertical position when not in use.

Focusing Adjustment—Body tube slides in a cloth-lined spring tube; when properly focused, it may be secured by a small set screw above the handle.

Body Tube—Fixed length, 160 mm; provided with society screw for regular microscope objectives (see page 12); standard sized eyepieces are used (see page 13).

Code Word	Cat. No.	Objectives	Eyepieces	Price
		Dry		
Anther	**O**		7.5×	**$6.00**
Antic	**O 1**	16 mm	7.5×	**11.00**

Compound Erecting Body

This instrument can be used on either the W or Y dissecting microscopes and is useful for engraving and examining small mechanical or industrial work. It is much more convenient for this purpose than the ordinary microscope, where objects and tools appear to move opposite to their real direction.

Specifications

Post—Of size to be interchangeable with lens arm posts of dissecting microscopes W and Y.

Arm—Jointed to cover large field.

Body Tube—Covered with black leather; carries double prism system; has fixed tube to receive standard sized eyepieces (see page 13), and single nosepiece with society screw thread for the use of regular microscope objectives (see page 12.)

Prisms—Two double reflecting Porro prisms in arrangement based on principle of modern field glass.

Eyepiece—Regularly supplied with 10× eyepiece.

Code Word	Cat. No.	Objective	Eyepieces	Price
		Dry		
Ascus	**45**		10×	**$12.50**
Ashler	**46**	16 mm	10×	**17.50**
**Asian*	**46W**	16 mm	10×	**25.00**
**Asilus*	**46Y**	16 mm	10×	**32.00**

*46 W and 46 Y are complete outfits, including our dissecting stands W and Y, respectively, described and illustrated on pages 57 and 58.

Chemical, Petrographical and Metallurgical Microscopes

While these microscopes are not listed in this catalog, we are able to meet the demands of all special fields of microscopy more satisfactorily than ever before.

Our **Chemical Microscope** is constructed after the specifications of Dr. E. M. Chamot, of Cornell University, and is used in educational institutions for all branches of micro-chemistry, as well as in commercial laboratories. The instrument is equipped with a polarizer and an analyzer, in addition to the regular optical equipment.

Our **Petrographical Microscopes** we offer in different models, graded by convenience of manipulation and general efficiency for the laboratory use of teachers and students in petrographical, mineralogical and crystallographic work, also for mining engineers in practice. The polarizing equipment, illuminating apparatus and all the appliances are of the highest degree of efficiency.

We supply **Metallurgical Microscopes** in different models to meet the special needs of the metallographist. They are constructed according to the designs of Professor Albert Sauveur, of Harvard University, and with the same scientific and technical skill which characterizes our other instruments. They are widely used in manufacturing laboratories and in educational institutions.

We shall be glad to give information and quote prices on the above instruments to anyone interested.

Simple Microscopes

Pocket Magnifiers

For satisfactory results any magnifier should be held at about the distance from the eye a spectacle lens is ordinarily worn. If this rule is disregarded, the size of the visual field is limited and the marginal definition is likely to be indistinct.

Vulcanite Mounting

Made with one, two or three lenses, which may be used singly or in combination for different magnifications.

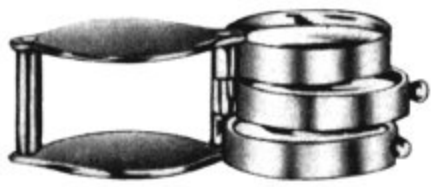
Oval Shape

Code Word	Cat. No.	Diameter of Lenses in mm	Price	Code Word	Cat. No.	Diameter of Lenses in mm	Price
Lass	**50**	18	**$0.35**	*Lackey*	**68**	37	**$0.70**
Lab	**51**	15, 18	**.50**	*Lactage*	**69**	30, 37	**1.00**
Labor	**56**	25	**.45**	*Lactant*	**74**	43	**.85**
Lace	**57**	21, 25	**.70**	*Lactim*	**75**	37, 43	**1.35**
Lacerta	**62**	30	**.55**	*Lactone*	**78**	50	**1.00**
Lacing	**63**	28, 30	**.85**	*Lactyl*	**79**	43, 50	**1.70**

Bellows Shape

Code Word	Cat. No.	Diameter of Lenses in mm	Price	Code Word	Cat. No.	Diameter of Lenses in mm	Price
Lacuna	**101**	18	**$0.35**	*Laft*	**112**	15, 18, 21	**$0.85**
Lad	**102**	15, 18	**.50**	*Lagena*	**119**	25	**.45**
Lading	**103**	12, 15, 18	**.70**	*Lagoon*	**120**	21, 25	**.70**
Ladkin	**110**	21	**.40**	*Laical*	**121**	18, 21, 25	**1.00**
Ladrone	**111**	18, 21	**.60**				

Nickeled Mounting



Bellows Shape

Code Word	Cat. No.	Diameter of Lenses in mm	Price	Code Word	Cat. No.	Diameter of Lenses in mm	Price
Lama	**101NK**	18	**$0.50**	*Lance*	**112NK**	25, 25, 25	**$1.20**
Lambda	**102NK**	18, 18	**.70**	*Lander*	**119NK**	28	**.65**
Lames	**103NK**	18, 18, 18	**1.00**	*Lang*	**120NK**	28, 28	**.95**
Laminar	**110NK**	25	**.55**	*Langate*	**121NK**	28, 28, 28	**1.35**
Lampate	**111NK**	25, 25	**.80**				

Watchmakers' Glasses

Made in different styles as indicated below.

No. 144A is fitted with two lenses, one removable, giving two different focal lengths and magnifications.

No. 144LP has a detachable spring to pass around the head and hold the glass in position.

All styles in vulcanite mounting.

Code Word	Cat. No.	E. F. of Lens in Millimeters	Price	Code Word	Cat. No.	E. F. of Lens in Millimeters	Price
Larch	**144**	50.0 or 100.0	**$0.40**	*Larget*	**144A**	60.0, 25.0	**$0.60**
Layiat	**144½**	25.0	**.40**	*Lappet*	**144LP**	50.0 or 100.0	**.55**

E. F. = equivalent focal length.

Engravers' Glass

Consists of two plano convex lenses in vulcanite mounting. Gives large flat field, with low magnification and is especially suited for work with large dissections. Should be used with a lens holder.

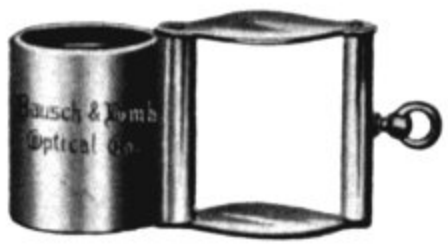
Code Word	Cat. No.	E. F.	Diameter of Lens in mm	Price
Larva	**146**	90.0	40	**$1.50**

Tripod Dissecting Microscope

Lens focused by screwing it up and down in frame; gives large, clear field, with magnification sufficient for elementary work.

Code Word	Cat. No.	Price
Lanyer	**QR**	**$0.35 net**

Doublet Magnifiers

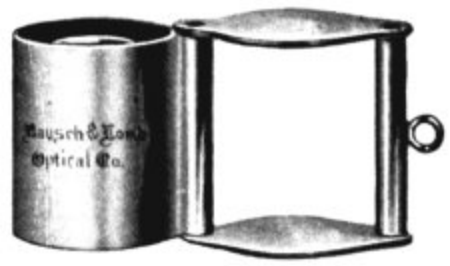


Composed of two separated plano convex lenses in three styles of metal mounting. Give satisfactory results and are recommended for use wherever a good lens is wanted at a very reasonable cost. Lenses of this type are frequently offered under the name of Coddington magnifiers, but they are not of that construction.

Code Word	Cat. No.	E. F. mm	E. F. in.	Magnification	Working Distance mm	Working Distance in.	Diameter of Field mm	Diameter of Field in.	Mounting	Price
Lateen	**1**	38	1½	**7×**	20.3	13/16	18	11/16	For Dissect. Micro.	**$0.75**
Latent	**2**	25	1	**10×**	20.1	13/16	16	10/16	" " "	**.75**
Lateran	**3**	19	¾	**14×**	8.9	⅜	10	⅜	" " "	**.75**
Latidave	**6**	19	¾	**14×**	8.9	⅜	10	⅜	Hand Magnifier with Hexagonal Handle	**.75**
Latimer	**7**	19	¾	**14×**	8.9	⅜	10	⅜	Folding Pocket Case	**1.00**

E. F. = equivalent focal length

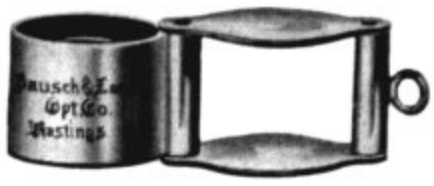
Coddington Magnifiers



Composed of a cylinder of glass, with a deep groove cut in at equal distance from the ends, acting as a diaphragm. The ends of this cylinder are ground spherically to form the lens surfaces. These magnifiers give good definition and wide field, although owing to construction of the lens, the corrections are not of the order of the Hastings Triplets or Triple Aplanats. Furnished in two styles of metal mounting, engraved "Coddington" with the focus.

Code Word	Cat. No.	E. F. mm	E. F. in.	Magnification	Working Distance mm	Working Distance in.	Diameter of Field mm	Diameter of Field in.	Mounting	Price
Laurate	**163**	38	1½	**7×**	28.	1⅛	30	13/16	Folding Case	**$1.50**
Launder	**162**	25	1	**10×**	18.8	¾	20	13/16	" "	**1.50**
Launce	**161**	19	¾	**14×**	14.1	9/16	14	9/16	" "	**1.50**
Land	**160**	13	½	**20×**	8.4	5/16	8	5/16	" "	**1.50**
Levant	**163A**	38	1½	**7×**	28.	1⅛	30	13/16	For Dissect. Micro.	**1.25**
Leucin	**162A**	25	1	**10×**	18.8	¾	20	13/16	" " "	**1.25**
Lettic	**161A**	19	¾	**14×**	14.1	9/16	14	9/16	" " "	**1.25**
Lethal	**160A**	13	½	**20×**	8.4	5/16	8	5/16	" " "	**1.25**

Triple Aplanats



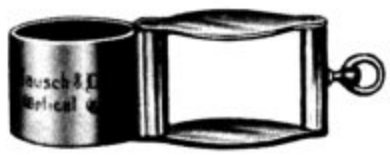
Composed of two meniscus lenses of flint glass, separated by a double convex lens of crown glass. Field is large and has a perfect correction for chromatic aberration, as well as for flatness, astigmatism and distortion. These magnifiers are of new construction, and we recommend them for the highest class of work. Their working distance is a little short of a simple lens of the same focus. Furnished in two styles of metal mounting, engraved "Triple Aplanat" with the focus.

Code Word	Cat. No.	E. F. mm	E. F. in.	Magnification	Working Distance mm	Working Distance in.	Diameter of Field mm	Diameter of Field in.	Mounting	Price
Laveer	**168**	34	1⅓	**7.5×**	29.5	1 3/16	28	1⅛	Folding Pocket Case	**$3.50**
Lavaret	**167**	25	1	**10 ×**	22.0	⅞	20	13/16	" " "	**3.50**
Laurus	**166**	17	⅔	**15 ×**	15.0	19/32	14	9/16	" " "	**3.50**
Laurel	**165**	13	½	**20 ×**	11.0	7/16	8	5/16	" " "	**3.50**
Lawing	**168A**	34	1⅓	**7.5×**	29.5	1 3/16	28	1⅛	For Dissect. Micro.	**3.50**
Lawe	**167A**	25	1	**10 ×**	22.0	⅞	20	13/16	" " "	**3.50**
Lavour	**166A**	17	⅔	**15 ×**	15.0	19/32	14	9/16	" " "	**3.50**
Lavish	**165A**	13	½	**20 ×**	11.0	7/16	8	5/16	" " "	**3.50**

E. F. = equivalent focal length

Hastings Aplanatic Triplet Magnifiers

After formulæ by Prof. Charles S. Hastings, Sheffield Scientific School, Yale University.

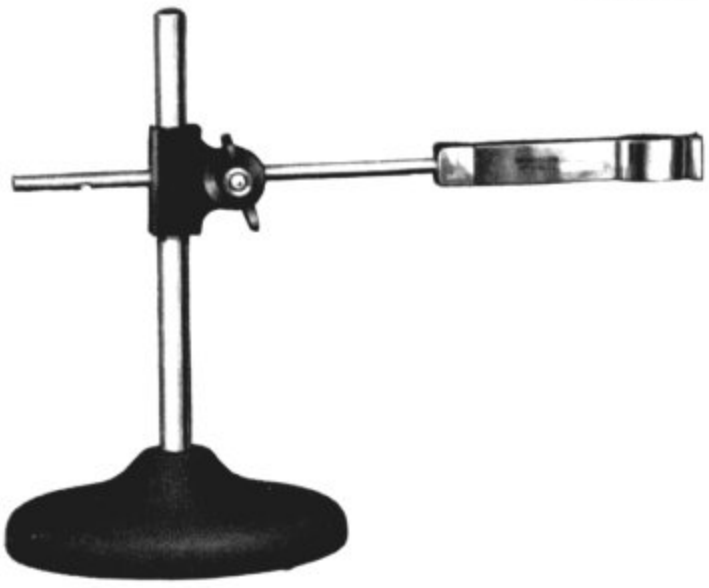


These magnifiers are among the most perfect produced. Their excellent corrections have always been appreciated by scientists. The angle of view embraced is very large and the working distance almost equal to that of a simple lens of the same focus. Furnished in two styles of metal mounting, engraved "Hastings Triplet" with the focus.

Code Word	Cat. No.	E. F. mm	E. F. in.	Magnification	Working Distance mm	Working Distance in.	Diameter of Field mm	Diameter of Field in.	Mounting	Price
Lazar	**173**	38	1½	**7×**	33.6	1 5/16	30	1 3/16	Folding Pocket Case	**$7.50**
Layer	**172**	25	1	**10×**	22.0	⅞	20	13/16	" " "	**7.50**
Laxity	**171**	19	¾	**14×**	16.5	21/32	14	9/16	" " "	**7.50**
Lawnd	**170**	13	½	**20×**	11.2	7/16	8	5/16	" " "	**7.50**
Leban	**173A**	38	1½	**7×**	33.6	1 5/16	30	1 3/16	For Dissect. Micro.	**7.50**
Leash	**172A**	25	1	**10×**	22.0	⅞	20	13/16	" " "	**7.50**
Lean	**171A**	19	¾	**14×**	16.5	21/32	14	9/16	" " "	**7.50**

Stands for Dissecting Lenses

Stand TU



Base — Of heavy metal, 98 mm in diameter.

Post — Height, 172 mm; polished to permit easy sliding adjustment of lens arm connection.

Lens Arm — One piece with spring clamp at end which will hold any lens not more than 38 mm in diameter; maximum distance from center of post to center of lens, 205 mm; may be rotated vertically to place lens at any desired angle.

Adjustments — Two, vertical on post for focus, and lateral, both controlled by convenient thumb screws.

Code Word	Cat. No.	Price
Avel	**TU**	**$3.00**

Stand TUS

Base — Of heavy metal, 122 mm in diameter.

Pillar — Round metal, 95 mm from top to base.

Lens Arm — In three parts with three joints; attached to triangular post by strong joint with broad bearing surface; maximum distance from center of pillar to center of lens, 340 mm; spring clamp will hold lenses not exceeding 38 mm in diameter.

Adjustments — Vertical, for focus, by rack and pinion, with range of 48 mm; first two joints of lens arm controlled simultaneously by single winged nut at first joint; third part of lens arm, the lens holder, adjustable through 30 mm to and from second part of arm and secured in any position by thumb screw; may also be rotated vertically to place lens at any desired angle; entire arm revolves about the pillar.

Code Word	Cat. No.	Price
Avena	**TUS**	**$9.00**

Pocket Dissecting Microscope S

Stand — Mahogany box, measuring 102 x 65 x 45 mm; reversible cover slides in groove, with stage and lens mounting on under side — inverted, microscope is in position for use, right side up, box is closed.

Lens — Doublet, No. 1, 2 or 3 regularly supplied; lens arm also will hold any of our regular magnifiers — Hastings, Triple Aplanat or Coddington (see pages 52 & 53).

Lens Arm — Swings across field on revolving post, adjustable for focus; distance from center of post to center of lens, 35 mm.

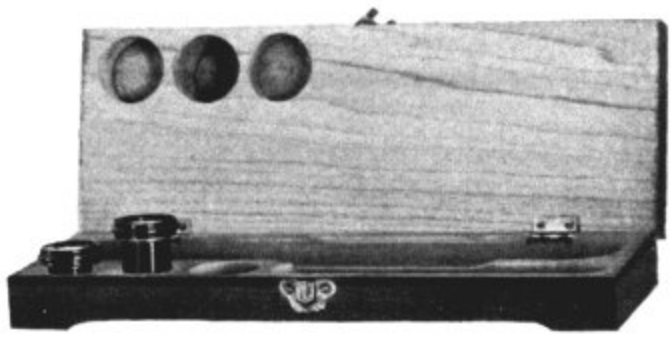
Stage — Glass, 44 x 40 mm; fits in grooves in wooden supports, attached to cover; black and white metal plate also supplied for use as opaque background.

Mirror — Plane, 44 x 40 mm; set at proper angle beneath stage, in same wooden supports.

Code Word	Cat. No.	Lens	Price
Antichlor	**S**	One Doublet	**$2.00**

Dissecting Microscope T

After design of Dr. Charles R. Barnes.



Stand — Block of wood, neatly finished and fashioned to provide hand rests; bottom measures 250 x 90 mm; base is hollowed and hinged to constitute suitable case for accessories.

Lens — Doublet No. 1, 2 or 3 regularly supplied; lens arm also will hold any regular magnifier — Hastings, Triple Aplanat or Coddington (see pages 52 & 53)

Lens Arm — Swings across field on revolving post, adjustable for focus; distance from center of post to center of lens, 50 mm.

Stage — Glass, 80 x 70 mm, removable; black and white metal plate also supplied for use as opaque background.

Mirror — Plane, 75 x 72 mm; mounted at proper angle in grooves beneath stage and removable.

Code Word	Cat. No.	Lens	Price
Antiphon	**T 1**	One Doublet	**$2.50**
Antler	**T 2**	Two Doublets	**3.25**

Dissecting Microscope U

(.4 Actual Size)

Base—Metal; horse-shoe form.

Pillar—Round; of metal; 95 mm from top to base.

Lens—Doublet, Coddington or Triple Aplanat regularly supplied; lens arm will hold any of our regular magnifiers for dissecting models (see pages 52 and 53).

Lens Arm—Jointed so that entire field of stage may be covered; maximum distance from center of pillar to center of lens, 80 mm.

Focusing Adjustment—By means of sliding post in pillar, with knob; range, 47 mm.

Stage—Glass, 80 x 66 mm, removable; second set of grooves beneath stage for black and white metal plate, supplied for use as opaque background; spring clips attached to stage support; hand rests may be attached to edges of support.

Mirror—Plane and concave, 50 mm in diameter; mounted on swinging arm.

Case—Of wood, neatly finished and fitted with catch.

Code Word	Cat. No.	Lenses		Price
		Focal Lengths	Formulae	
Antrum	**U 1**	25 mm	Doublet	**$6.75**
Anvil	**U 2**	38 mm 19 mm	Doublet	**7.50**
Aonian	**U 3**	25 mm	Coddington	**7.25**
Aortic	**U 4**	38 mm 19 mm	Coddington	**8.75**
Apaid	**U 5**	25 mm	Triple Aplanat	**9.50**
Apatite	**U 6**	25 mm 13 mm	Triple Aplanat	**13.00**
Apery	**HR**	Metal Hand Rests	per pair	**.75**

Dissecting Microscope W

(.4 Actual Size)

This model is similar to Model U in its dimensions, differing in its focusing adjustment and in being regularly supplied with hand rests, as shown in the illustration.

The focusing adjustment is by standard rack and pinion, with a knurled head on either side, giving a range of 60 mm.

The hand rests are of metal, neatly covered with leatheret, 95 mm in length and detachable.

The Compound Erecting Body can be satisfactorily used with this stand, being substituted for the lens arm (see page 47). We only recommend stands with rack and pinion adjustments for use with this instrument.

Code Word	Cat. No.	Lenses		Price
		Focal Lengths	Formulae	
Apharite	**W 1**	25 mm	Doublet	**$9.00**
Aphid	**W 2**	38 mm 19 mm	Doublet	**9.75**
Aphonic	**W 3**	25 mm	Coddington	**9.50**
Aphorist	**W 4**	38 mm 19 mm	Coddington	**11.00**
Apiol	**W 5**	25 mm	Triple Aplanat	**11.75**
Aplastic	**W 6**	25 mm 13 mm	Triple Aplanat	**15.25**

Dissecting Microscope Y

(.25 Actual Size)

Base — Metal; horse-shoe form.

Pillar — Round; of metal; 114 mm from top to base.

Lens — Doublet, Coddington, Triple Aplanat or Hastings Triplet regularly supplied.

Lens Arm — Jointed so that entire field of stage can be covered; maximum distance from center of pillar to center of lens, 90 mm; arm may be removed for substitution of erecting body (see page 47); extra removable support provided for attachment of Abbe Camera Lucida, which may be raised or lowered to get full field of view.

Focusing Adjustment — By standard rack and pinion, with a knurled head on either side; range 60 mm.

Stage — Plate glass, 90 x 80 mm, removable; second set of grooves beneath stage for black and white metal plate, supplied for use as opaque background; extra long spring clips attached to stage support; holes for hand rests in edges of stage support.

Hand Rests — Mahogany, 160 mm long; attached to edges of support and steadied by metal frames; detachable but included in outfits.

Mirror — Plane and concave, 65 mm in diameter; mounted on swinging arm.

Case — Of wood, neatly finished and fitted with catch.

Code Word	Cat. No.	Lenses		Camera Lucida	Price
		Focal Lengths	Formulæ		
Apod	**Y 1**	25 mm	Doublet		**$17.00**
Apodus	**Y 2**	38 mm 19 mm	Doublet		**17.75**
Apogaic	**Y 3**	25 mm	Coddintgon		**17.50**
Apogee	**Y 4**	38 mm 19 mm	Coddington		**19.00**
Apoise	**Y 5**	25 mm	Triple Aplanat		**19.75**
Apolar	**Y 6**	34 mm 17 mm	Triple Aplanat		**23.25**
Aport	**Y 7**	38 mm 19 mm	Hastings Triplet		**31.25**
Apozem	**Y 8**	38 mm 19 mm	Hastings Triplet	Abbe No. 1628	**41.25**

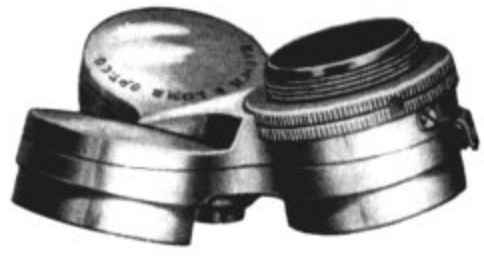
Microscope Accessories

Revolving Nosepieces

1884

1886

1880



1882

Unless otherwise ordered, we supply nosepieces of circular form, which are absolutely dust-proof in any position of the objectives, revolve easily, register accurately, are of light weight, engraved with the equivalent focus of the objectives to be used and finished neatly in durable black lacquer to prevent reflections.

A great advantage is found in the fact that on these nosepieces we adjust our objectives so that they are **accurately centered** and **par-focal**, enabling the user to change from one to the other with only a slight amount of refocusing by means of the fine adjustment. To insure this advantage it is highly important that the nosepiece be ordered with the original outfit.

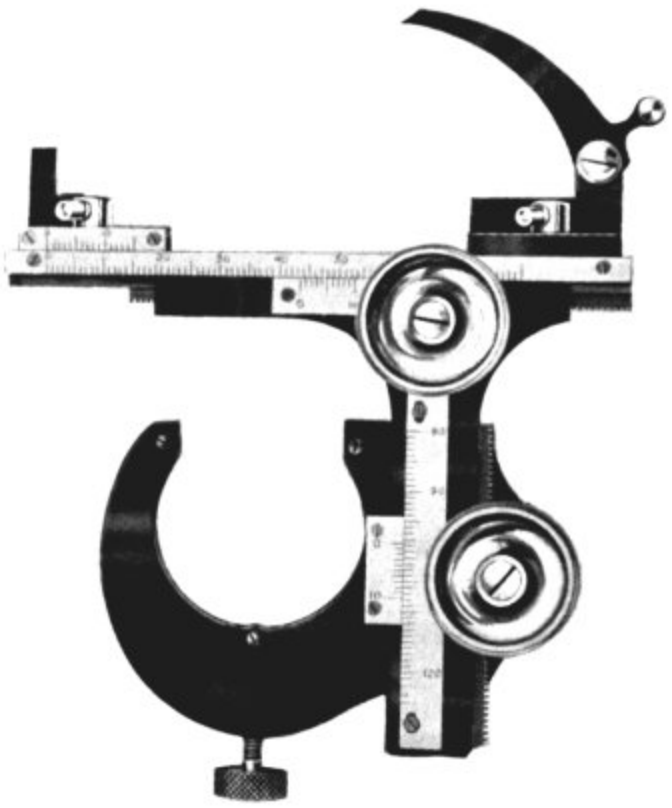
If anyone should prefer the revolving nosepieces, as formerly made (Nos. 1880 and 1882), we shall be pleased to supply them.

Code Word	Cat. No.	Style	Price
Apyrous	**1880**	Double	**$4.00**
Aquatic	**1882**	Triple	**5.50**
Aquose	**1884**	Circular Double	**4.00**
Arab	**1886**	Circular Triple	**5.50**

Mechanical Stages

With a mechanical stage the microscopist can examine systematically and conveniently an entire slide area. By means of the graduated scale readings, he also can locate a particular point on the field and return to it at any time by simply attaching his stage in the same position and setting his adjustments to accord with his original readings.

Model A



This stage is almost universal in its application. It can be attached to any of our models except the A, AH and DDH and always occupies the same relative position on any microscope.

Specifications

Clamp—Very rigid and substantial; attached by a set screw, which fits a slot in base of microscope arm and insures stage being set in fixed position always.

Adjustments—By rack and pinion, giving equal speeds in both movements; right and left movement, 75 mm full, backward and forward movement, 45 mm full; practically entire range is always available; both scales graduated in single millimeters, with verniers reading to tenths.

Slide-Holder—Provided with adjustable stops, one of which is actuated by a spring to hold slide rigidly in place, the other provided with a graduated scale for position readings; will accommodate any sized slide up to 102 mm in length; slide rests on stage surface and may be used in immersion contact with condenser, if desired.

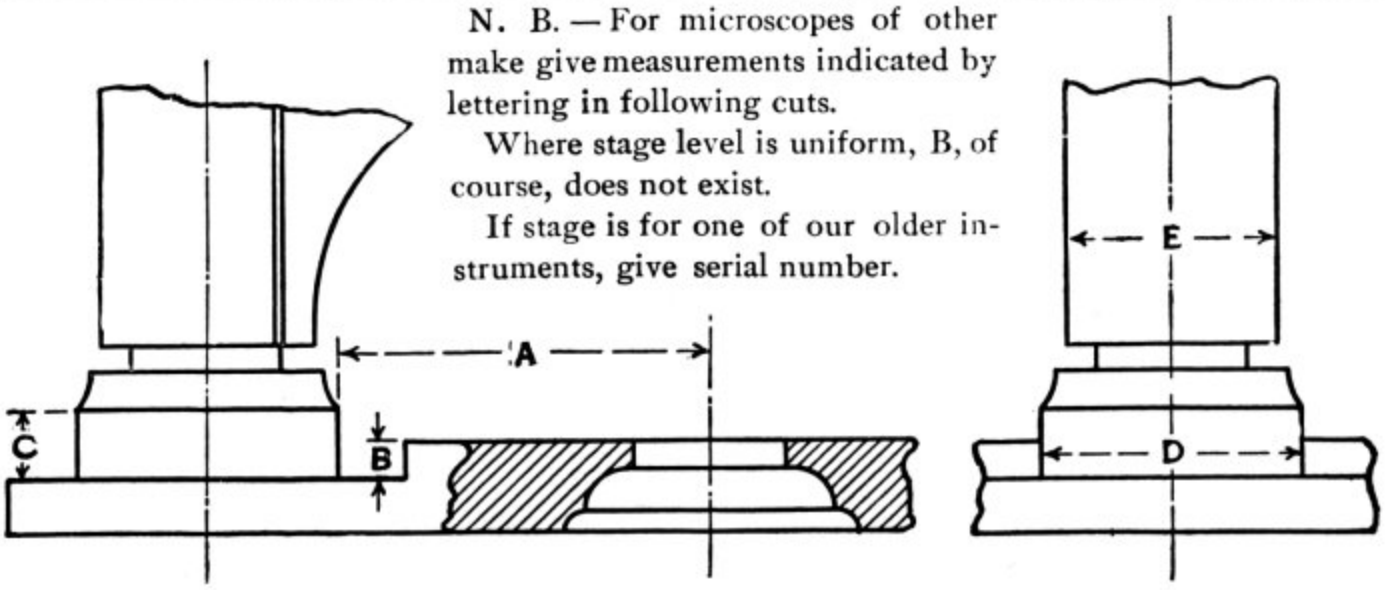
Finish—Main parts, except scales, neatly finished in black lacquer to prevent reflections.

Code Word	Cat. No.	Price
Appellar	**2114**	**$17.00**

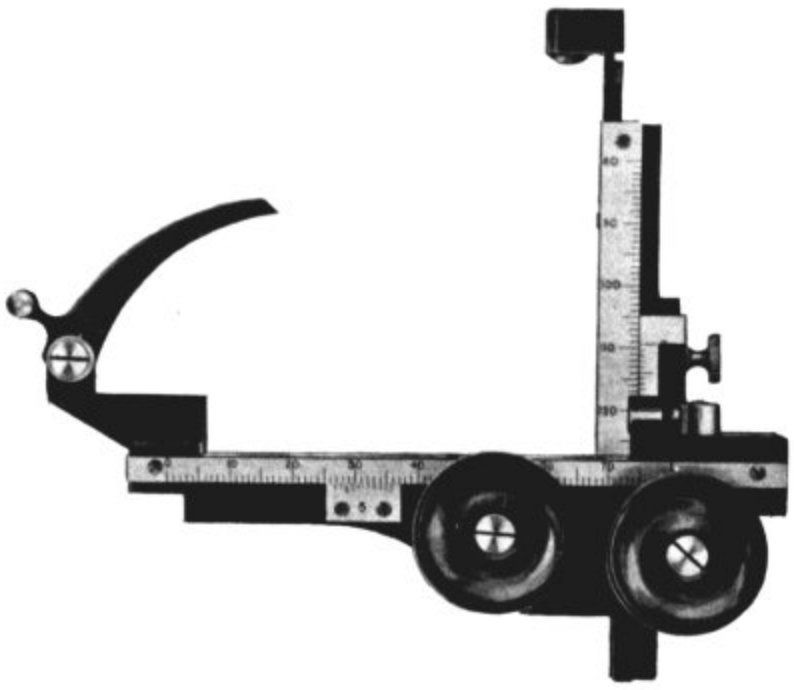
N. B.—For microscopes of other make give measurements indicated by lettering in following cuts.

Where stage level is uniform, B, of course, does not exist.

If stage is for one of our older instruments, give serial number.



Model B



This model, attaching to the side of the microscope stage, can only be used on microscopes with square cornered stages.

Specifications

Clamp—Adjustable, with closed ends, to fit corners of any square stage; attached by two set screws.

Adjustments—By rack and pinion, giving equal speeds in both movements; right and left scale reads 80 mm, backward and forward, 58 mm; range available dependent upon size of microscope stage, to which it is attached; both scales graduated in single millimeters, with verniers reading to tenths; pinion heads close together in fixed relative position.

Slide-holder—Provided with one adjustable stop and one fixed stop, which is actuated by a spring to hold slide rigidly in place; will accommodate any sized slide up to 95 mm in length; slide rests on stage surface and may be used in immersion contact with condenser, if desired.

Finish—Main parts, except scales, neatly finished in black lacquer to prevent reflections.

Code Word	Cat. No.	Price
Ambigu	**2114 A**	**$15.00**

Revolving Mechanical Stages

We manufacture revolving mechanical stages for our CCH, CDH and DDH microscopes. The two different sizes are illustrated with the CDH and DDH microscopes and are described with those two models (see pages 43 and 45). These stages can be purchased separately and applied to any one of the above mentioned models at prices which we shall be glad to quote.

Drawing Apparatus

Our Camera Lucidas are designed after the principle evolved by Professor Abbe, by which the drawing surface is superimposed in the eye upon the visual field of the microscope. We furnish three models graded chiefly according to the convenience with which the light from the drawing surface and from the object is regulated.

A drawing board is a very useful accessory with the Camera Lucida. When the mirror of the latter is inclined at any angle other than 45°, the drawing surface must be inclined at an angle to correspond with the inclination of the mirror to avoid distortion of the visual field. We furnish two types of drawing board, stationary and adjustable.

Abbe Camera Lucidas

Model A

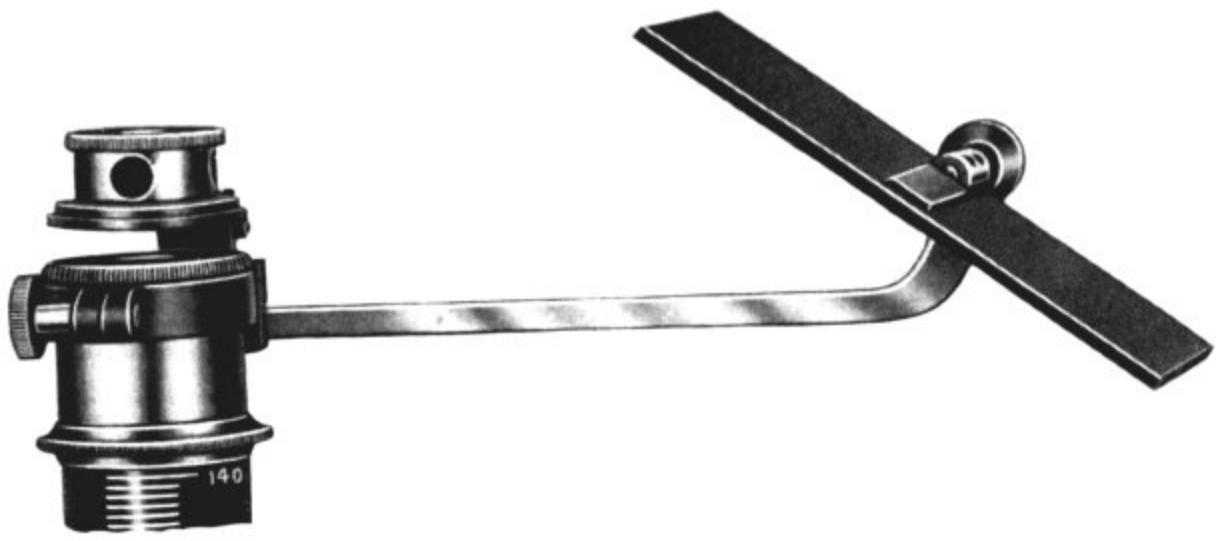
Clamp—With clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube to get full field of view for various eyepieces.

Prism—Abbe type, mounted in a closed case, which is attached to clamp by a pivot, permitting it to be swung out from eyepiece for direct examination of the object; fixed in optical alignment.

Mirror—In fixed position close to the prism; set at angle of 30° from the horizontal.

Code Word	Cat. No.	Price
Aptote	**1630**	**$8.00**

Model B



Clamp—With clamping screw conveniently placed so that it can be easily raised or lowered on eyepiece tube to get full field of view for various eyepieces.

Prism—Abbe type mounted in a closed case which is hinged so that it may be swung clear of the eyepiece for direct examination of the object; fixed in optical alignment.

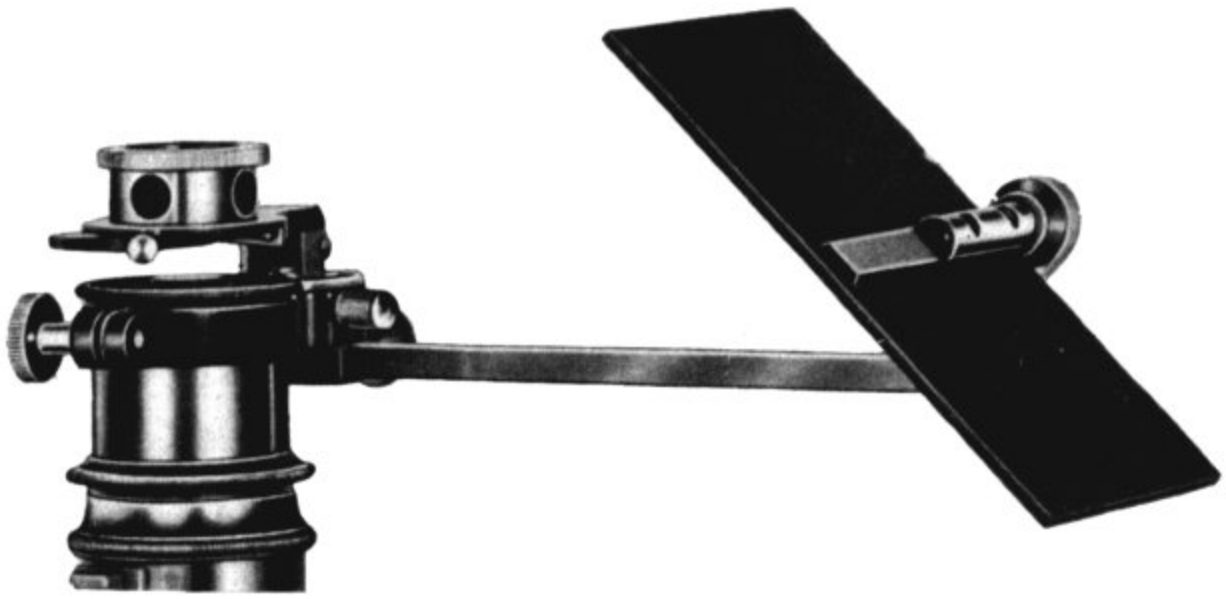
Moderating Glasses—One series, mounted in a rotating collar in the prism case to moderate the light passing from the mirror to the prism.

Mirror Bar—12 cm in length and graduated in millimeters, with every tenth line numbered; movable to permit changing the relative position of mirror to prism, with screw to secure it at any point.

Mirror—Measures 90 x 56 mm and may be rotated on bar; point of attachment graduated in degrees to indicate angle at which mirror is set.

Code Word	Cat. No.	Price
Aptness	**1628**	**$10.00**

Model C



This model is the most convenient type of Abbe Camera Lucida. It differs from model B in that it has **centering screws** to secure accurate optical alignment and is provided with **two series** of **moderating glasses,** one mounted in the rotating collar in the prism case and the other mounted in a revolving disc below the case to regulate light coming from the object. Dimensions of all other parts are the same as in Model B.

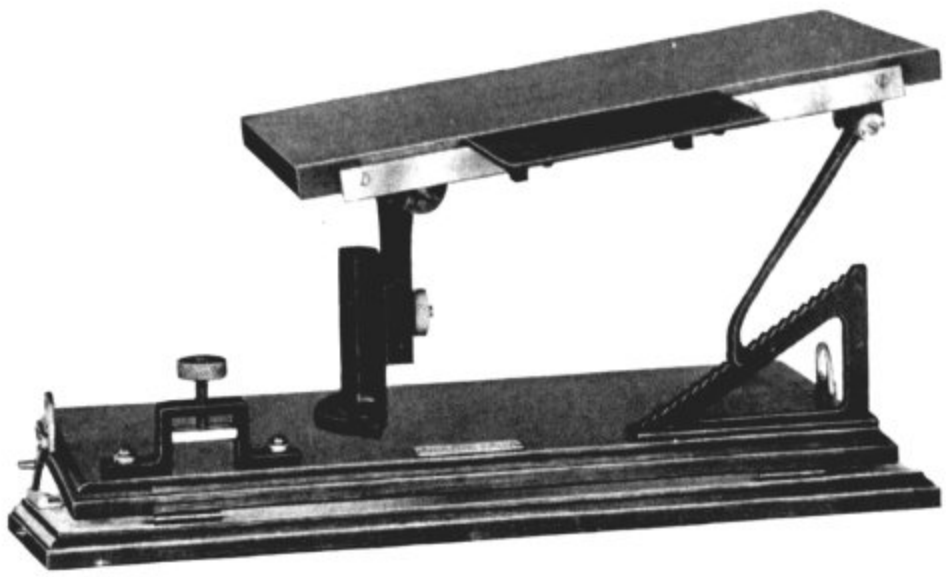
Code Word	Cat. No.	Price
Apteran	**1626**	**$17.00**

Stationary Drawing Board

Drawing surface measures 285 x 230 mm (11 x 9 in.); set at fixed angle of 30° from the horizontal; of wood throughout, neatly finished and rigid in construction. This board is designed specially for use with our Abbe Camera Lucida, Model A.

Code Word	Cat. No.	Price
Ambon	**1641**	**$1.50**

Adjustable Drawing Board



Specifications

Base—Of wood, in two parts, upper base hinged to bottom; bottom measures 520 x 350 mm (20½ x 11 in.).

Drawing Surface—Of wood, smoothly finished; measures 383 x 243 mm (15 x 9½ in.); provided with hand rest which slides in a groove.

Adjustments—Three in number; upper base may be inclined toward the operator by means of two ratchet arms; a clamp is provided to secure the microscope so that it will be inclined with the drawing surface; the drawing surface may be adjusted vertically and secured by a clamp, to permit the same magnification on the paper as appears in the microscope; it may be inclined also, to parallel the mirror of the Camera Lucida, by means of a strong ratchet and arm.

Code Word	Cat. No.	Price
Apus	**1642**	**$16.00**

Measuring Devices

These micrometers are designed for measuring the microscopical image. There are two forms, one for use in the eyepiece and the other for use on the stage. The value of the scale divisions in the eyepiece micrometer is relative, being dependent upon the optical combinations of the microscope used. The stage micrometer has absolute scale values and is used principally to determine the equivalent values of the eyepiece micrometer divisions.

Micrometer Discs

This form of micrometer we supply in four styles, consisting of glass discs, 23 mm in diameter. They fit inside the standard eyepieces (unless otherwise ordered) and are placed on the eyepiece diaphragms, when in use.

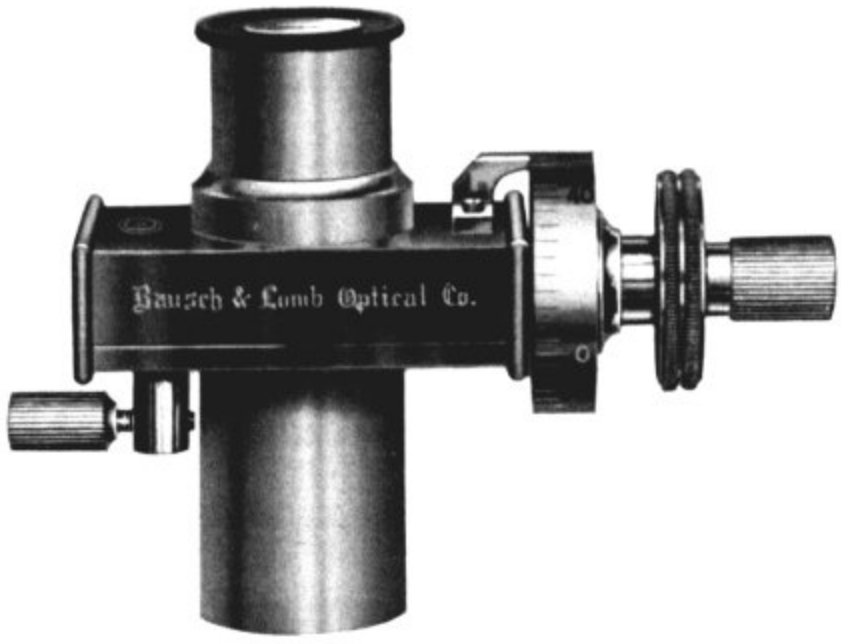
Code Word	Cat. No.	Specifications	Price
Apsis	**1858**	Ruled to 0.1 mm with every tenth line numbered - - -	**$1.25**
Apricot	**1859A**	Ruled in 0.5 mm squares; every second line on two adjacent sides numbered - - - - - - - - -	**2.00**
Apron	**1859B**	Ruled in 1.0 mm squares; every line on two adjacent sides numbered - - - - - - - - - -	**1.75**
Arbor	**1859C**	Whipple's Eyepiece Micrometer Disc, having a large square divided into four, one of which is subdivided into twenty-five squares, and one of these again subdivided into twenty-five; used for counting bacteria - - - -	**3.50**

Micrometer Eyepieces

Micrometer eyepieces are furnished in two forms— one with a movable scale and the other with a fixed scale, both scales measuring 5 mm. The scale in each case is divided into tenths of a millimeter, with each fifth and tenth line longer than the others.

Code Word	Cat. No.	Scale	Price
Apprest	**1854**	Movable	**$8.00**
Appui	**1856**	Fixed	**4.00**

Filar Micrometer



This micrometer, which is intended for the most accurate measurements, is constructed after the same general plan that we use in the micrometers for our surveying and astronomical instruments.

A micrometer screw acts on a slide that carries the movable wire. One revolution of this screw moves the wire 0.5 mm across the field. This screw has a drum head divided into 50 parts, one part, therefore, being equal to 0.01 mm. One tenth of this interval (equal to 0.001 mm = 1 μ) can easily be estimated. A fine line running through the center of the field, parallel to the axis of the screw, serves as a guide in orienting the object with reference to the direction of motion of the movable wire.

A glass scale placed in the field and ruled in intervals of 0.5 mm each serves for counting the full revolutions of this screw. Every second interval of the scale is numbered. The eyepiece, which can be focused on the movable wire and scale, is of the Ramsden type and has an equivalent focus of 20 mm (12.5 ×).

The Filar Micrometer may be attached to any microscope. It fits into the draw tube and is secured by a set-screw, shown at the left in the illustration. When ordering, the exact inside diameter of the draw tube should always be given. The instrument is finished in black in all exposed parts, except the screw heads, and is supplied in a velvet-lined morocco case.

Code Word	Cat. No.	Price
Apporter	**1850**	**$25 00**

Stage Micrometers

These micrometers consist of glass slides, measuring 75 x 25 mm, upon which scales are mounted.

Code Word	Cat. No.	Specifications	Price
Anklet	**1861**	Ruled to 0.1 and 0.01 mm.	**$3.00**
Annulus	**1862**	Ruled to 0.01 and 0.001 inches	**2.00**

Polarizing Apparatus

In order that the microscopist with only a regular microscope model may work with polarized light, we offer our polarizers and analyzers. We list them separately so that any outfit may be made up; both are necessary in combination to produce the desired results.

Styles C and D

Polarizers

These are designed for use in the substage ring and are so mounted as to be interchangeable with an Abbe condenser. The best type of Nicol prism is used in fixed mounting. We make two styles. **Style C** has one removable selenite; **style D** has three, interchangeable and mounted in metal rings, engraved to indicate the colors to be obtained with polarized light.

Code Word	Cat. No.	Style	Price
Arango	**2035 C**	**C**	**$12.00**
Arara	**2035 D**	**D**	**15.00**

Analyzers

Style A

We also furnish two styles of analyzers. Both contain prisms of the Thompson type, cemented with linseed oil, which gives the widest field of all forms of polarizing prisms.

Style A is attached immediately above the objective. It has a prism so mounted as to be revolved, placing the prism at any angle with reference to the polarizer. A society screw thread attaches the mounting to the body tube of the microscope, while the objective screws into another society thread at the lower end of the mounting.

Style B

Style B is used above the eyepiece. The Thompson prism is placed in a mounting to which is attached a collar, graduated in two-degree divisions, with every tenth line numbered. The prism also is adjustable vertically with a suitable range, to get the proper field of view. It allows the full field of the eyepieces to be utilized up to, and including, the 7.5×, but cannot be expected to do so with the 10× and 12.5× because of the very wide field of those eyepieces. The cylindrical base of the analyzer fits over the draw tube and is securely attached by means of a set-screw, which permits a fixed zero point to be established. The prism mounting, including the graduated collar, is removed from the base to permit the insertion of the eyepiece of the microscope; it is then replaced in the smoothly fitting outer collar.

Code Word	Cat. No.	Style	Price
Arak	**2035 A**	**A**	**$10.00**
Aramaic	**2035 B**	**B**	**15.00**

Bulls-Eye Condensers

This accessory is of value for the illumination of opaque objects and to throw parallel rays of light upon the mirror from an artificial source in ordinary work with transparent objects. The construction is clearly indicated in the illustration. The lens is a strong plano convex condenser. The two clamping screws secure it at any desired height and at any vertical angle. We furnish it in three sizes. In the smallest size the lens is fixed at the end of the arm, while in the two larger sizes it is swung in a forked mounting.

Code Word	Cat. No.	Diameter of Lenses in mm	Price
Autocrat	**1746**	**38**	**$3.00**
Automath	**1748**	**56**	**5.00**
Auxotic	**1750**	**75**	**7.00**

Vertical Illuminator

This is used for illuminating opaque objects, particularly metal surfaces. It is placed immediately above the objective, being attached to the body tube and the objective by society screw threads at either end. The illuminator consists of a plane glass reflector, so mounted as to be readily adjusted by means of the head shown at the right in the illustration. This reflects the light, coming through an aperture in the side, down through the objective on the object. Apertures of three sizes are provided in a revolving sleeve, by which they are swung into position.

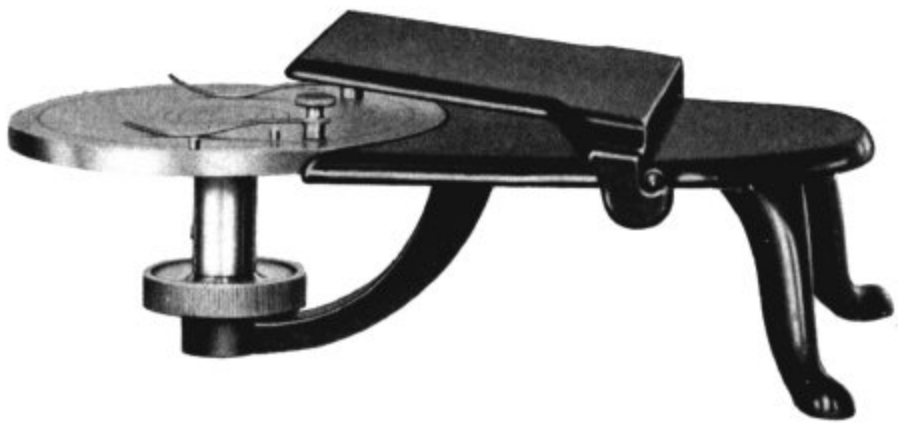
Code Word	Cat. No.	Price
Auxiliar	**1756**	**$6.50**

Immersion Oil Bottle

This bottle is of glass, of the same dimensions as our objective boxes. It is provided with a stopper to prevent leakage during shipment, which in use it is advisable to unscrew. A nickle plated cap covers the neck of the bottle completely, resting on the body and preventing evaporation and consequent gumming. A wire spring plunger for taking up the oil is attached to the cap and is enclosed within the bottle in a tapering glass cylinder, open at the bottom. This cylinder enables one to regulate the amount of oil on the plunger before drawing it out of the neck of the bottle. A hole in the side of the cylinder at the top provides an outlet for the purpose of cleaning the bottle.

Code Word	Cat. No.	Price
Ambler	**1705**	**$0.50**

Turn-Table



This is a necessary accessory in ringing mounts and making cells. It consists of a metal table, with a detachable hand rest, and a revolving disc immediately in front of the table, accurately mounted upon a bearing so that the slide may be made to revolve at a high speed. The varnish or cement is applied with a brush, the hand resting either on the table or the hand rest. The revolving disc is 88 mm in diameter, has concentric circles engraved in the center to assist in centering the slide and is fitted with spring clips. It has three centering pins, against which the edges of the slide are placed to bring it to the central position.

Code Word	Cat. No.	Price
Avale	**2164**	**$4.00**

Cover Glasses

As cover glasses must be considered in the optical correction of objectives, we are careful to furnish them of a superior quality, true to size, uniform in color and smoothly cut. They are supplied in square or circular form and rectangular—all shapes in three thicknesses. No. 1 thickness varies from 0.13 to 0.17 mm (1/200 to 1/150 in.); No. 2 from 0.17 to 0.25 mm (1/150 to 1/100 in.); No. 3 from 0.25 to 0.50 mm (1/100 to 1/50 in.). They are packed 100 in a box, or in half-ounce packages when square or circular, and are carefully cleaned before packing.

SQUARE OR CIRCULAR GLASSES

Code Word	Cat. No.	Size	Thickness	Price		
				Per 10	Per 100	Per oz.
Avocet	**1270A**	12 mm	No. 1	**$0.10**	**$0.25**	**$0.90**
Avoke	**1270B**	12 mm	No. 2	**.10**	**.25**	**.75**
Avolate	**1270C**	12 mm	No. 3	**.10**	**.25**	**.60**
Avoset	**1271A**	15 mm	No. 1	**.10**	**.35**	**.90**
Avower	**1271B**	15 mm	No. 2	**.10**	**.35**	**.75**
Avulsion	**1271C**	15 mm	No. 3	**.10**	**.35**	**.60**
Awash	**1272A**	18 mm	No. 1	**.12**	**.50**	**.90**
Awesome	**1272B**	18 mm	No. 2	**.12**	**.50**	**.75**
Awhape	**1272C**	18 mm	No. 3	**.12**	**.50**	**.60**
Awing	**1274A**	22 mm	No. 1	**.15**	**.75**	**.90**
Awl	**1274B**	22 mm	No. 2	**.15**	**.75**	**.75**
Awles	**1274C**	22 mm	No. 3	**.15**	**.75**	**.60**
Awny	**1276A**	25 mm	No. 1	**.20**	**1.00**	**.90**
Axe	**1276B**	25 mm	No. 2	**.20**	**1.00**	**.75**
Axila	**1276C**	25 mm	No. 3	**.20**	**1.00**	**.60**

The above prices apply both to square and circular cover glasses. Add "square" for squares and "round" for circles, both to numbers and code words.

RECTANGULAR GLASSES

Code Word	Cat. No.	Size	Thickness	Price	
				Per 10	Per 100
Axinite	**1278A**	22 x 40 mm	No. 1	**$0.30**	**$2.00**
Axiom	**1278B**	22 x 40 mm	No. 2	**.30**	**2.00**
Axis	**1278C**	22 x 40 mm	No. 3	**.30**	**2.00**
Axled	**1280A**	24 x 50 mm	No. 1	**.35**	**2.50**
Axman	**1280B**	24 x 50 mm	No. 2	**.35**	**2.50**
Axtree	**1280C**	24 x 50 mm	No. 3	**.35**	**2.50**

Special Cover Glasses

For selected cover glasses of specified thickness (Nos. 1 to 3, inclusive) or thinner than No. 1, double the listed price is charged; for smaller sizes than those listed there will be an advance of 25% in price.

We will supply any size of rectangular cover glasses up to 75 mm in length. Quotations on the latter will be given upon request.

Object Slides

Made of the best white glass, free from defects, of uniform thickness and color, with edges ground round. Particular attention is called to **No. 1296** which is ground and polished on both sides and is greatly appreciated by those doing precise work. The slides are packed 100 in a box—except those of medium thickness, which are packed 50 in a box—and also in half-gross packages. We will furnish also object slides of selected measured thicknesses at prices double those listed.

Code Word	Cat. No.	Size	Thickness	Price per 100	Price per Gross
Ayme	**1290**	25 x 75 mm	Medium	**$0.75**	**$1.00**
Ayont	**1292**	25 x 75 mm	Extra Thin	**.75**	**1.00**
Azarole	**1296**	25 x 75 mm	Extra Thin	**2.00**	
Azonic	**1298**	25 x 44 mm	Extra Thin	**1.50**	
Azoth	**1300**	25 x 50 mm	Medium	**1.25**	
Azotize	**1302**	38 x 75 mm	Medium	**1.50**	
Aztec	**1304**	50 x 75 mm	Medium	**2.00**	

We list three slides for culture work. **No. 1306** has one concave depression **No. 1307** has two, ground in the slide and polished, while **No. 1352** has one cavity, 16 mm in diameter, in polished plate glass.

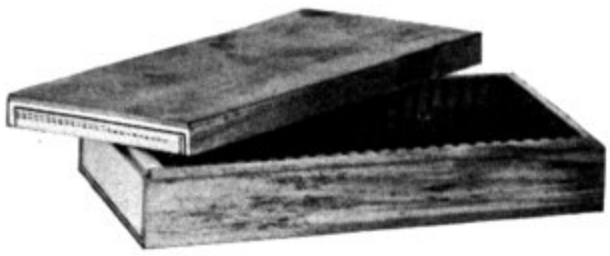
Code Word	Cat. No.	Size	Thickness	Price per 10
Azurn	**1306**	25 x 75 mm	Medium	**$0.75**
Azym	**1307**	25 x 75 mm	Medium	**1.25**
Azymite	**1352**	25 x 75 mm	Extra thick	**3.00**

Slide Mailing Cases

These cases afford a safe method of mailing one or more slides in compact form. They are made of wood, and each section is exactly identical with the others. Only the edge of the slide is held by the case, and the recess is of sufficient dimensions to hold slides with large or thick cells or covers. Any number may be piled up with slides between the sections, or two may be be reversed and used for mailing one slide.

Code Word	Cat. No.	Size of Slides	Price per Dozen
Aviso	**1995**	25 x 75 mm	**$0.10**

Slide Boxes



1934

Substantially made of light wood. **Nos. 1924 and 1930** have covers tightly fitting inside the edges; **No. 1932** has a cover sliding in grooves, while in **No. 1934** the cover fits over the top, so that when removed the slides, projecting above the box edges, can be easily removed. An index, with a number for each slide, is provided inside the box, while a label on one end of the exterior furnishes a space for recording the titles, after numbers corresponding with index numbers. The capacity of each box is listed below.

Code Word	Cat. No.	Capacity	Size of Slides	Price per 10
Averse	**1924**	12	25 x 75 mm	**$0.75**
Avert	**1930**	25	25 x 44 mm	**1.25**
Avesta	**1932**	25	50 x 75 mm	**2.00**
Avian	**1934**	25	25 x 75 mm	**1.00**

1940

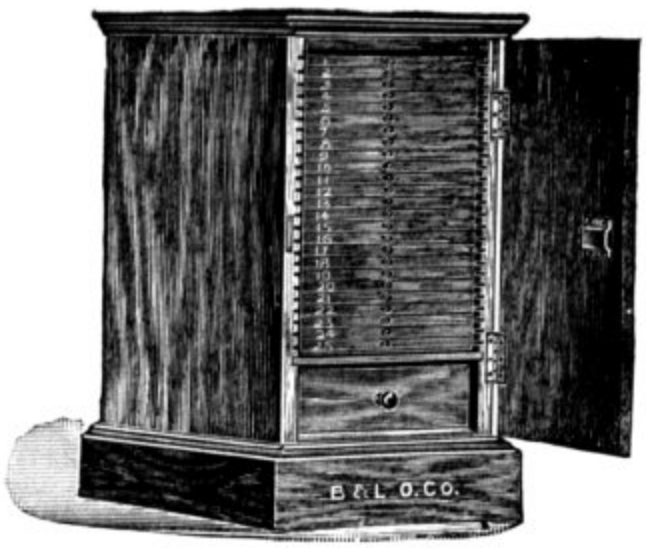
A very compact and convenient slide box is **No. 1940** one the most popular forms. It is divided into two rows, with a capacity for 100 slides. The cover is hinged and fitted with catches; when raised it exposes the slides so that they can be removed easily. The box is made of wood and heavy card-board, suitably covered. A numbered slide index is provided, while a register on the inside of the cover gives ample space for recording data of interest.

Code Word	Cat. No	Capacity	Size of Slides	Price
Avid	**1940**	100	25 x 75 mm	**$0.50**

Slide Trays

These are particularly useful in protecting slides, while they are drying, or in storing them, when they must be held horizontally. They are constructed of heavy card-board , in map form. The cover is in two parts and hinged. The capacity is indicated below. The slides are arranged in two rows, each in a separate receptacle and easily removable.

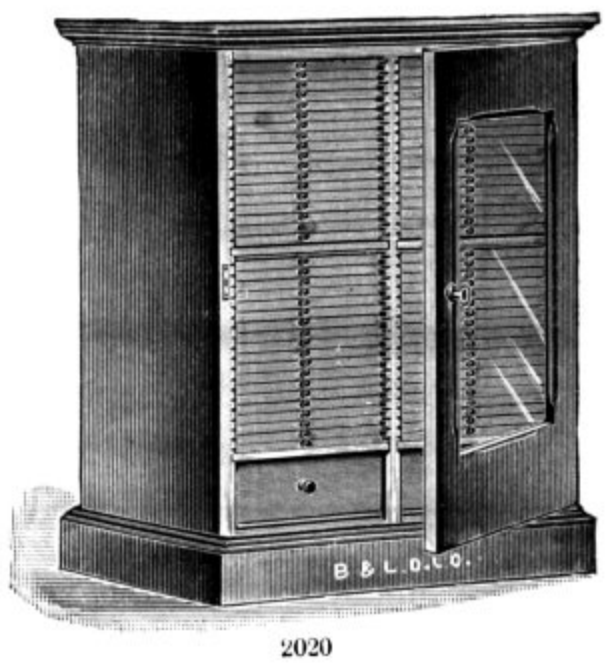
Code Word	Cat. No.	Capacity	Size of Slides	Price per 10
Avile	**1960**	14	25 x 75 mm	**$2.25**
Avisely	**1962**	20	25 x 75 mm	**2.50**



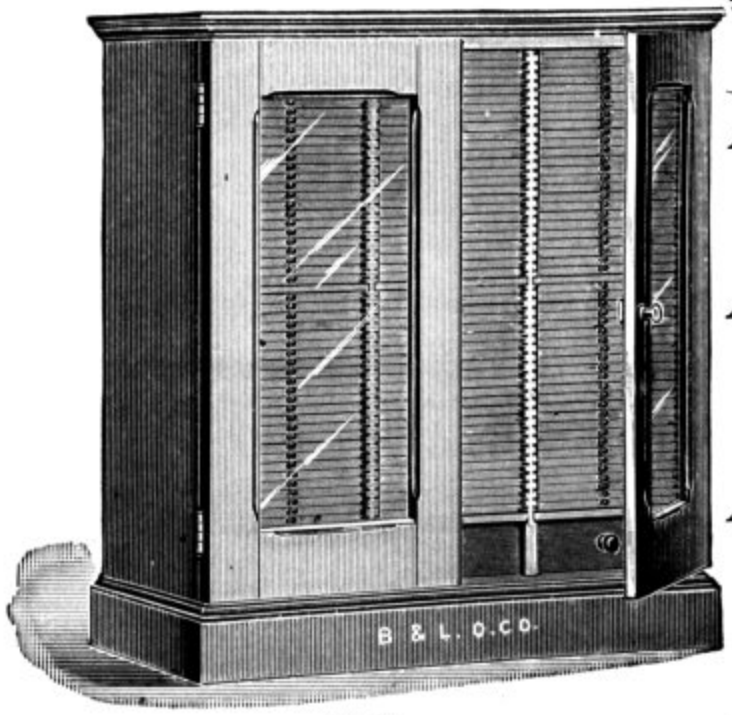
2016

Slide Cabinets

Substantially made of solid mahogany, with neat, dull finish—unlikely to warp. Thin wood trays, arranged in one, two or three tiers, according to the style, are made of mahogany frames, with basswood bottoms. They are so constructed as to take various sizes of slides—75 x 25 mm, 75 x 50 mm, 75 x 75 mm, etc.—and are grooved so that slides may be easily handled. In the wall of the cabinet there is a groove for each tray, so that each sustains only its own weight and is removable independent of the others. Each is fitted with a nickeled knob and a series number for reference. At the bottom of each tier there is a drawer with a nickeled knob, containing an indexed card catalog. This consists of a separate card for each slide, with a printed form for the registration of data to locate the slide in the cabinet, and also the history of the slide. These data cards are separated by printed guide cards, A to Z.



2020



2025

Code Word	Cat. No.	Specifications	Price
Asp	**2016**	44 cm high, 24 cm wide, 34 cm deep; contains one tier of 25 trays; capacity 500 slides, 75 x 25 mm.	**$12.00**
Asper	**2020**	59 cm high, 45 cm wide, 34 cm deep; glass paneled door; 74 trays in two tiers, holding about 1500 slides, 75 x 25 mm	**25.00**
Aspic	**2025**	73 cm high, 65 cm wide, 34 cm deep; two glass paneled doors; 150 trays in three tiers, holding 3000 slides, 75 x 25 mm.	**50.00**

Index