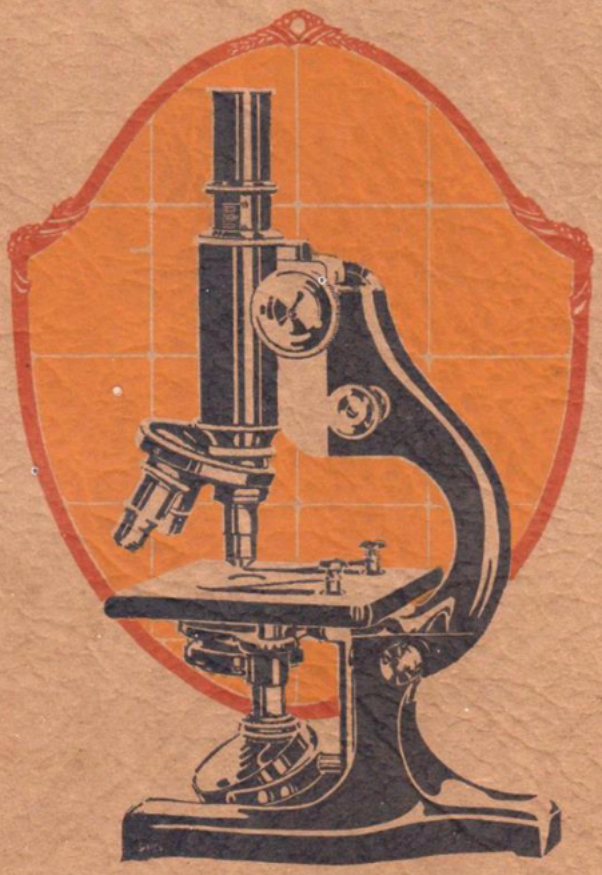
SPENCER

MICROSCOPES
MICROTOMES
DELINEASCOPES

AND

OPTICAL MEASURING INSTRUMENTS



SPENCER LENS COMPANY
BUFFALO, NEW YORK

SPENCER

CATALOG

(*Not complete*)

OF THE MORE POPULAR

SPENCER

MICROSCOPES
MICROTOMES
DELINEASCOPES

Optical Measuring Instruments

and

ACCESSORIES

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SPENCER LENS COMPANY
BUFFALO, NEW YORK

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Pioneering Down Through The Years

SPENCER microscopes date back for more than seventy-five years to the American Pioneer Maker — Mr. Charles A. Spencer, who became prominent among scientific opticians of the world.

The Spencer Lens Company was incorporated with the records of Mr. Spencer as its priceless possession and with Herbert R. Spencer, son of Charles A., as its first technical expert. Founded on pioneer research, supported by rare skill in execution, inspired by the highest ideals, this company has always endeavored to make instruments a little better than those already produced, to set a standard a little higher than that already attained.

The ideal that has inspired these noble efforts has borne fruit along many practical lines. For example, the Spencer Lens Company were the first in America to build apochromatic objectives, the first and for a dozen years the only American manufacturer to build microscopes with side fine-adjustments. They are the originators of the attachable mechanical stage that clamps on the side of a microscope stage; the originators and builders of fork-type substages, converging tube binocular microscopes, combination binocular and monocular body all in one, combination divisible substage condenser and dark-field illuminator. In short, most of the improvements in microscope construction during recent years have originated in our factory. Our reward is the satisfaction of knowing that most laboratory workers appreciate these efforts and thus prefer Spencer microscopes, not because they were the pioneers in America but especially because they have continued to pioneer all down through the years.

SPENCER
BUFFALO
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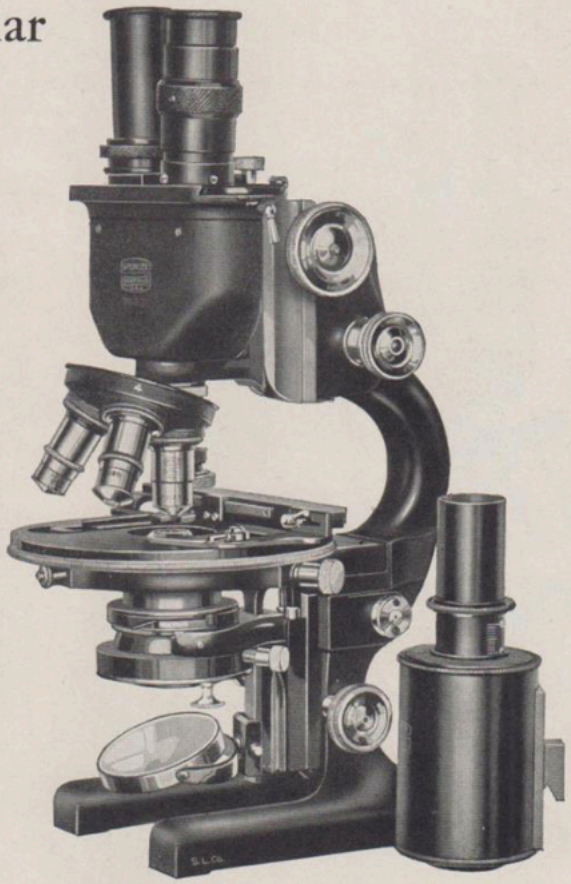
SPENCER LENS COMPANY

BUFFALO, NEW YORK

Spencer Binocular Microscopes Nos. 1 and 2



THESE microscopes are exactly alike with the exception of stages. No. 1 has a circular mechanical stage; No. 2 a plain square stage. Both are arranged to receive the binocular body and single tube interchangeably without removing either nosepiece or objectives.

BINOCULAR BODY—Spencer standard attachment with tubes converging to a point at normal working distance from the eyes.

SINGLE TUBE—Spencer standard attachment, 50 millimeters in diameter, easily interchangeable with binocular body.

ARM—Curved form, furnishing a convenient handle and providing ample space for manipulation of large objects; distance from center of stage to arm is 93 mm.

STAGE—Revolving type, 120 millimeters diameter with centering screws; regularly supplied with standard size built-in mechanical stage (493). No. 2 has rectangular stage 110 x 105 mm.

FOCUSING ADJUSTMENTS—Diagonal cut rack and pinion and patented side fine adjustment with 34 threads of the screw always engaged.

SUBSTAGE—Complete fork type substage, providing for easy manipulation and interchangeability of substage accessories and insuring stability and permanence of alignment. Focusable by rack and pinion and by fine adjustment for focusing the condenser. The condenser is a highly corrected Achromatic Condenser N. A. 1.30.

CABINET—Polished mahogany, with handle, lock and key.

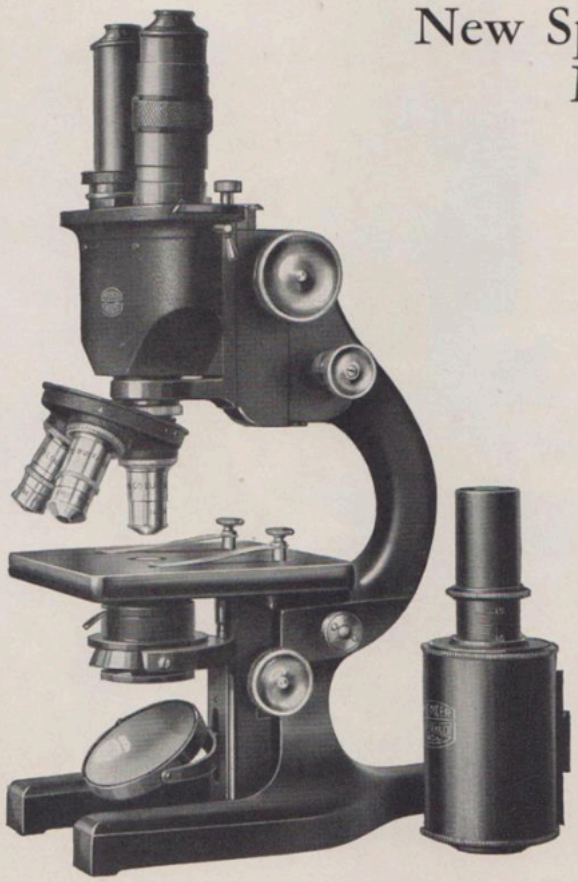
When apochromatic outfits are ordered, prefix "Apo" to code word.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Tel. Code	Catalog No.	Achromatic Objectives		Huyg. Oculars	Price	Apochromatic Objectives		Compen Oculars	Price
		Equivalent Focus-mm.	Initial magnification			Equivalent Focus-mm.	Initial magnification		
Onh	1H	16-4-1.8 Oil-imm.	10-45-95	6x-10x	$338.00	16-4-2 Oil-imm.	10-44-90	5x-10x	$445.00
Onj	1J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x	351.00				
Toh	2H	16-4-1.8 Oil-imm.	10-45-95	6x-10x	294.00	16-4-2 Oil-imm.	10-44-90	5x-10x	401.00
Toj	2J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x	307.00				

The above prices include both binocular and single body tubes. If single tube not wanted deduct $15.00

New Spencer Binocular Microscope No. 4



THIS is a new microscope which might be classed as a research microscope yet selling at the price of the regular laboratory microscopes. It is a heavier, sturdier instrument than the old No. 4 and the price the same.

BINOCULAR BODY. With this increase in size the larger binocular, which is used on all the large research instruments, is incorporated. This brings with it the shutters by which vision from either eye may be cut off at will, thereby saving the necessary squinting when one wants to make sure that both eyes are functioning. This feature is exclusively Spencer; and in combination with the converging tubes makes the most comfortable binocular equipment extant.

SINGLE TUBE. The single tube (50 mm. in diameter) accompanying the microscope is the standard tube used on all Spencer research microscopes. The large size makes it adaptable to photo-micrography.

ARM. The deep heavy arm provides a free distance of 95 mm. between it and the optical axis.

ADJUSTMENTS. The diagonal rack and pinion coarse adjustment is supported by heavy carefully machined bearings. The Spencer fine adjustment is outstanding in its superiority because it comprises a combination of the screw and lever using more threads than any other fine adjustment made. All bearings are automatically lubricated by means of oil grooves—exclusively Spencer.

SUBSTAGE. For description see No. 4M.

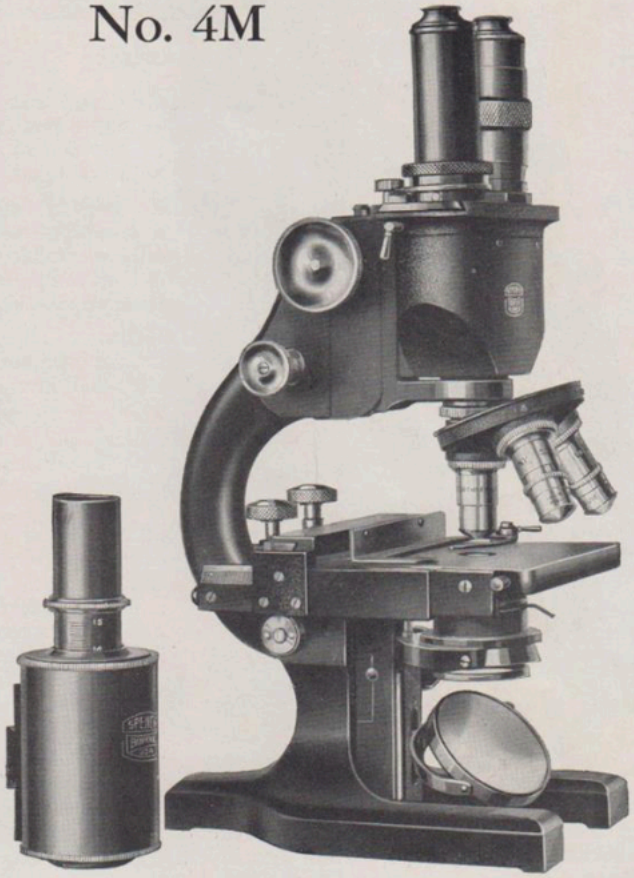
CABINET—Polished hardwood, with lock and key.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condenser N. A. 1.20	Achromatic Objectives		Paired Huyg. Oculars	Price
			Equivalent focus-mm.	Initial Magnification		
Forf	4F	Included	16-4	10-44	6x-10x	$153.50
Forh	4H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	190.00
Forj	4J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	203.00

Forsb—Single body tube for above microscope extra $12.00

New Spencer Binocular Microscope No. 4M



THIS microscope is exactly like No. 4 Microscope in every detail except that it is provided with a mechanical stage screwed to the edge of the stage. This mechanical stage accommodates the largest of the standard slides—the lateral movement being 75 mm., while the to and fro movement covers *50 mm.*

Its smooth accurate movement makes easy the most delicate movement. The moving parts of the mechanical stage may be easily removed entirely from the instrument, leaving a large plain stage of special and resisting composition 105 mm. x 110 mm.

BINOCULAR BODY. The binocular body like that on No. 4 has the Spencer converging tubes which makes observation easy and the adjustable tube provides for a possible difference in eyes.

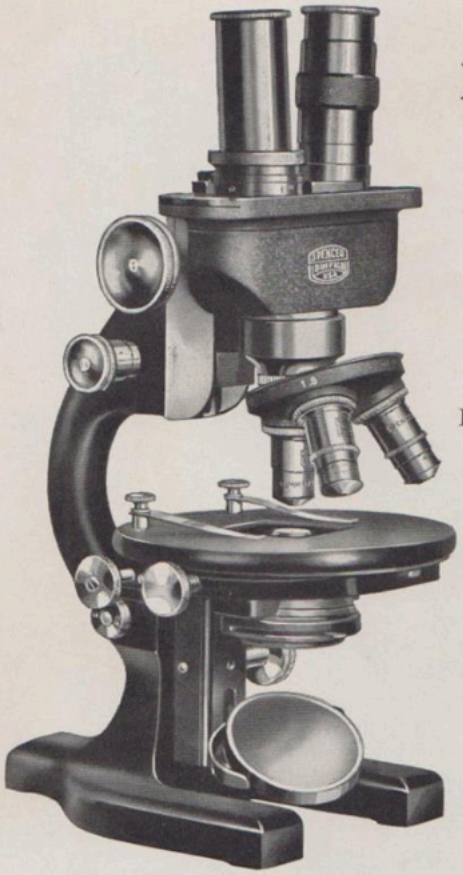
SUBSTAGE. The substage like that on No. 4 is actuated by a diagonal rack and pinion and is supported by heavy bearings insuring careful alignment of the condenser with the optical axis. The Spencer substage arm is unique. It is horse-shoe in form permitting an easy and comfortable removal of the condenser and its mount. At the same time it secures the condenser rigidly in place. Furthermore by means of it the iris may be placed in proper optical relation to the condenser—which is impossible in the older forms. The Spencer combination condenser and dark field illuminator may be had on any microscope for $5.00 additional.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condsr N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial magnification		
Formf	4MF	Included	16-4	10-44	6x-10x	$168.50
Formh	4MH *	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	205.00
Formj	4MJ	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	218.00

*With special leatherette case, $2.00 extra. Dark-Field Illuminator for Condenser, extra.....$ 5.00

Forsb—4SB—Single Body Tube for above Microscope extra 12.00



Spencer No. 6 Binocular Microscope

with:

I. Circular Mechanical Stage (ungraduated)—a real mechanical stage. Operated by two screws on one side easily reached with one hand. 18 mm. shift.

II. Fork-Type Substage, operated by rack and pinion—a universal substage taking all conceivable substage accessories—condenser, lamp, dark-field illuminator, polarizing apparatus, etc., etc.

III. Combined Divisible Substage Condenser, for long and short focus work and for dark-field illumination.

This microscope is identical with Spencer No. 40, but is a combination instrument—both binocular and monocular. The combination outfit affords an interchange of body tubes. This is accomplished by attaching the revolving nosepiece, which carries the objectives, to an independent sliding block that is actuated by the rack and pinion, and to which either tube may be affixed as required, the interchange being made without upward or downward pressure, and thus free from danger of forcing the objective against the object under examination or even throwing it out of focus.

The Binocular Body is so constructed as to incline the eye-pieces at four degrees from the normal, giving them an angle of eight degrees to each other. This construction, which is scientifically correct, possesses a real value in relieving eyestrain and in conveying a correct impression of depth and perspective.

The Single Body Tube is identical in size and length with that used on No. 40 Microscope. The microscope may be had either with or without the single tube. It is listed without.

Pupillary Distance—Adjustment for accommodation to pupillary separation is accomplished by turning a knurled ring conveniently placed on the right-hand eyepiece-tube. A similarly placed ring on the left-hand tube furnishes a means of focusing for one eye independently of the other.

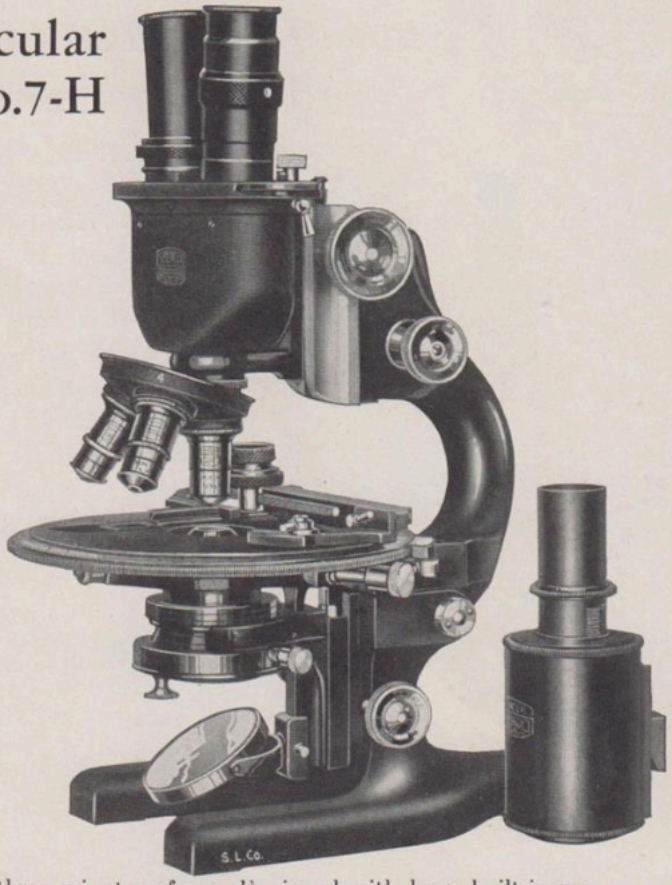
The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condsr N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial magnification		
Sixf	6F	Included	16-4	10-44	6x-10x	$168.50
Sixh	6H*	Included	16-4-1.8	10-44-95	6x-10x	205.00
Sixj	6J	Included	16-4-1.8 Oil-imm.	10-44-97	6x-10x	218.00
			Oil-imm. Fluorite			

*With special leatherette case, extra, $2.00. Dark-Field Illuminator Element for Condenser, extra....$ 5.00

Forsb—4sb—Single Body Tube for above Microscope, extra.....12.00

Spencer Binocular Microscope No.7-H



THIS is our most complete and popular research microscope. It is so arranged as to receive the binocular body and single tube interchangeably without removing either nosepiece or objectives.

BINOCULAR BODY—Spencer standard attachment with tubes converging to a point at normal working distance from the eyes.

SINGLE TUBE — Spencer standard attachment, 50 millimeters in diameter easily interchangeable with the binocular body.

ARM — Curved form furnishing a convenient handle and providing ample space for manipulation of large objects; distance from center of stage to arm is 100 millimeters.

STAGE — Revolving type, 150 millimeters in diameter, with centering screws. Has clamp and graduated periphery with vernier reading to three minutes of arc. Equipped with large built-in mechanical stage, two-in-one. One of the racks for the rack and pinion movement is imbedded in the stage of the microscope. The mechanical stage may be removed providing a plain stage. The pinion buttons are concentric, one being smaller and slightly above the other. In addition to the usual features, this mechanical stage is provided with supports by which the slide is carried entirely free of the microscope stage, so that it is moved about without contact with the stage surface.

FOCUSING ADJUSTMENTS—Diagonal cut rack and pinion and side fine adjustment with 34 threads of the screw always engaged.

SUBSTAGE—Complete fork-type substage, providing for easy manipulation and interchangeability of substage accessories and insuring stability and permanence of alignment. Focusable by rack and pinion, and by fine adjustment for focusing the condenser. The condenser is a highly corrected Achromatic Condenser N. A. 1.30.

When apochromatic outfits are required, prefix "Apo" to the code word.

CABINET—Polished mahogany, with handle, lock and key.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Tel. Code	Catalog No.	Achromatic Objectives		Paired Huyg. Oculars	Price	Apochromatic Objectives		Compen Oculars	Price
		Equivalent Focus-mm.	Initial magnification			Equivalent Focus-mm.	Initial magnification		
Sevh	7H	16-4-1.8 Oil-imm.	10-45-95	6x-10x	$358.00	16-4-2 Oil-imm.	10-44-90	5x-10x	$465.00
Sevj	7J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x	371.00				

The above prices include both binocular and single body tubes. If single body tube not wanted, deduct $15.00

Spencer Combination Binocular and Monocular Body

(PATENTED)

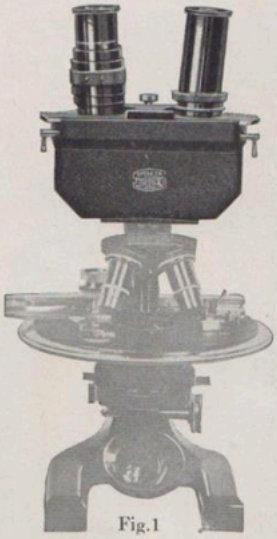


Fig.1

Two in One

Changes from Binocular to Monocular vision and vice versa, as easily and quickly made as from one objective to another on a nosepiece

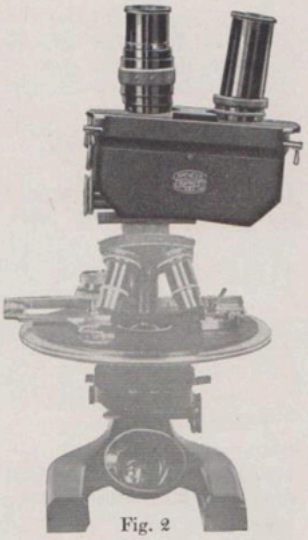


Fig. 2

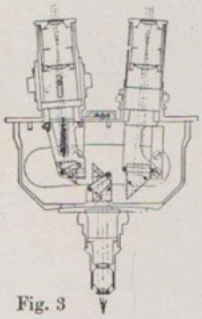


Fig. 3

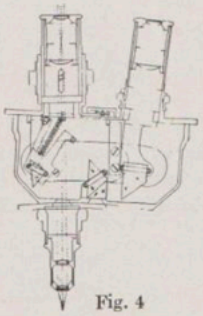


Fig. 4

BY simply pushing the combination body to one side it takes the position shown in Figure 2, the prisms being automatically removed from the light path so that the conditions for the passage of the light from the objective to the ocular are identical with those in the single tube microscope. See Figure 4.

Thus both types of vision are each immediately available and the correct interpretation of the object in many, many instances is dependent on a careful study of the same under both conditions. We are, therefore, glad to offer such an exceptional advantage in connection with the many other unique and helpful features of our microscopes.

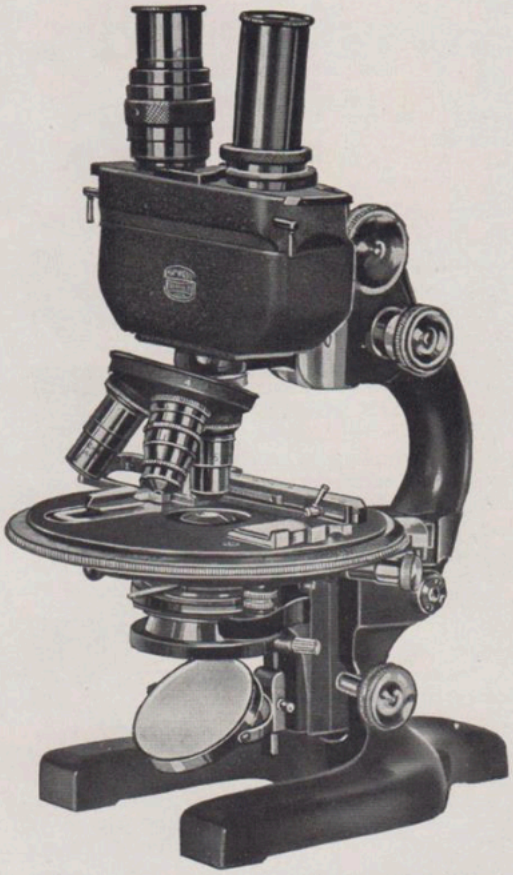
This combination body may be used on Spencer Research Microscopes Nos. 1, 2, 7 and 14. It is easily attachable to any of these.

C. B. Spencer Combination Binocular and Monocular Body tube without oculars or objectives ..... ~~$110.00~~

As the regular individual binocular body (M. O. B.) lists at ~~$80.00~~ and single body tube (S. B.) at $15.00 for the substitution of the Combination Body tube on any of the outfits previously listed (Microscopes Nos. 1, 2, 7 and 14) add $15.00.

Spencer Binocular Microscope No. 7 CB. H.

With Combination Body



THIS is the same microscope as No. 7-H described on page 7, with the combination binocular and monocular body, two-in-one, substituted for the interchangeable binocular body and monocular tube.

With this research microscope equipped with the combination body, we offer all the possibilities of both eyes at the command of the operator.

When the combination binocular body is on the microscope in the position as indicated by Figure 1 (previous page), it operates the same as any binocular body acting in conjunction with a single objective, the light passing through the prisms as indicated in Figure 3 (previous page).

It has the additional advantage of the converging tubes, which are exclusive on Spencer microscopes, having been originated and patented by us.

By simply pushing the body to one side it takes the position shown in Figure 2 (previous page), the prisms being automatically removed from the light path so that the conditions for the passage of the light from the objective to the ocular are identical with those in the single tube microscope. See Figure 4.

Thus both types of vision are each immediately available and the correct interpretation of the object in many, many instances is dependent on a careful study of the same under both conditions. We are, therefore, glad to offer such an exceptional advantage in connection with the many other unique and helpful features of our microscopes.

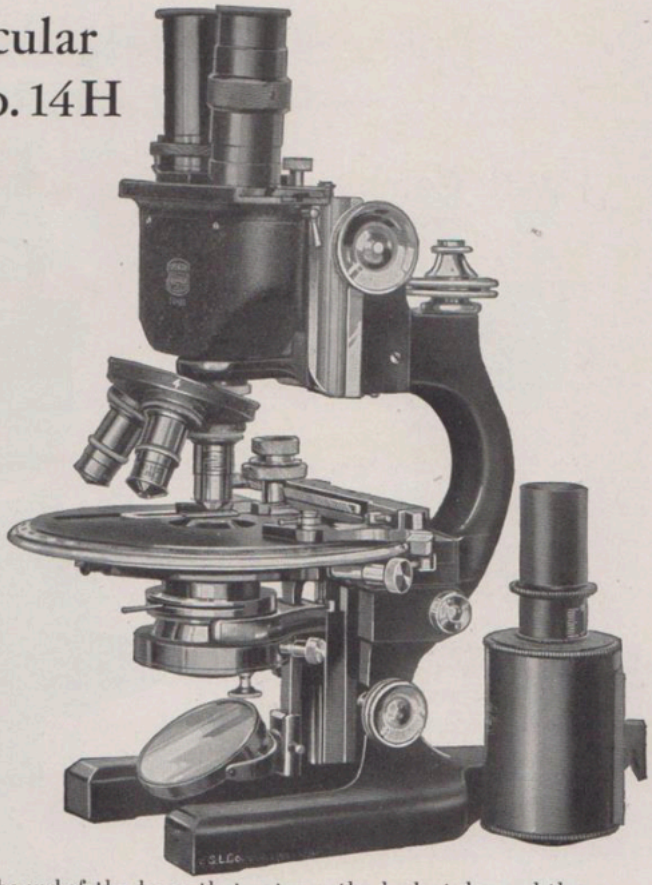
The above microscope, equipped with the combination body tube, fork-type substage with fine adjustment for focusing the condenser, Achromatic Condenser, N. A. 1.30, combination mechanical and plane stage, is the most complete, the most available,—the most delicate and accurate in its adjustments of any microscope stand made, and when fitted with Spencer achromatic or apochromatic objectives, with planoscopic or compensating oculars, makes an ideal research instrument—the very last word in microscope construction.

When apochromatic outfits are required, prefix "Apo" to the code word.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Tel. Code	Catalog No.	Achromatic Objectives		Paired Huyg. Oculars	Price	Apochromatic Objectives		Paired Compen Oculars	Price
		Equivalent Focus-mm.	Initial magnification			Equivalent Focus-mm.	Initial magnification		
Sevcbh	7CBH	16-4-1.8 Oil-imm.	10-45-95	6x-10x	$373.00	16-4-2 Oil-imm.	10-44-90	5x-10x	$480.00
Sevcbj	7CBJ	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x	386.00				

Spencer Binocular Microscope No. 14H



THIS microscope and its sister microscope 7 H, were designed after suggestions made by Professor C. E. McClung, Department of Biology, University of Pennsylvania, Philadelphia, Pa.

The two microscopes are identical with the exception of the fine adjustment. No. 7 has a side fine adjustment, No. 14 our top-lever fine adjustment, type "C." This type " C " fine adjustment is an old and standard type of fine adjustment that has proven by many years of use to be serviceable and satisfactory. In this type the movement is transmitted by means of a straight lever pivoted in the relation of 2:1, thus the movement of the tube is one-half that of the screw which is raised or lowered five-tenths millimeters by each revolution. The motion of the screw which carries it downward raises the end of the lever that acts on the body tube, and the reverse direction permits the tube to move downward under gravity assisted by the spring. This microscope like No. 7 is so arranged as to receive the binocular body and single tube interchangeably without removing either nosepiece or objectives. Likewise it will receive the Spencer combination binocular and monocular body (two-in-one) as a substitute when wanted.

ARM—Curved form with distance from center of stage to arm of 100 millimeters.

STAGE—Revolving type 150 millimeters in diameter with centering screws. Has clamp and graduated periphery with vernier reading to three minutes of arc. Equipped with large built-in mechanical stage, two-in-one. (See description of No. 7 microscope).

SUBSTAGE—Complete fork-type substage, providing for easy manipulation and interchangeability of substage accessories and insuring stability and permanence of alignment. Focusable by rack and pinion, and by fine adjustment for focusing the condenser. The condenser is a highly corrected Achromatic Condenser N. A. 1.30.

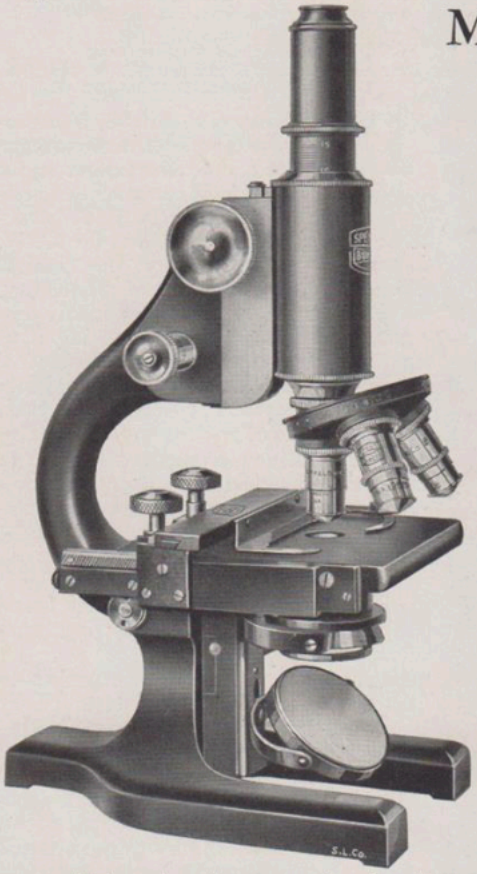
When apochromatic outfits are required, prefix "Apo " to the code word.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Tel. Code	Cat. No.	Achromatic Objectives		Paired Huyg. Oculars	Price	Apochromatic Objectives		Paired Comp. Oculars	Price
		Equivalent focus-mm.	Initial Magnification			Equivalent focus-mm.	Initial Magnification		
Onforh	14H	16-4-1.8 Oil-imm.	10-45-95	6x-10x	$348.00	16-4-2 Oil-imm.	10-44-90	5x-10x	$455.00
Onforj	14J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x	361.00				

The above prices include both binocular and single body tubes. If single body not wanted, deduct $15.00

Spencer New Laboratory and Medical Microscope No. 34M



IN this new microscope increased size and new beauty have been added to outstanding performance without increase in price.

It has been designed to meet a demand for an instrument slightly larger, slightly heavier and a bit more rugged.

In it solidarity is exemplified and the graceful lines, characteristic of all Spencer microscopes, are featured.

The *Base and Pillar* are one solid casting with a vertical recess in the pillar to receive rack and pinion substage bearings.

The *Arm* is designed for beauty and strength and to give a massive appearance to the instrument. The receding curve furnishes a convenient means for carrying the microscope and provides a *free distance of 95 mm. from the inner curve of the arm to the optical axis*, amply sufficient for any medical or research work.

The *Stage* is 105 mm. x 110 mm., and is resistant to all the ordinary laboratory reagents.

The *Mechanical Stage*, ungraduated, is of rigid construction, permanently attached, having sufficient range of motion to completely cover the usual 3″ x 2″ microscope slide.

The *Substage* is actuated by a rack and pinion. The receptacle for the optical parts is the patented Spencer fork-type arm which makes the removal and replacement of the condenser so easy, and at the same time allows the proper location of the iris diaphragm relative to the condenser lenses, which is not possible in the older type of substage ring.

The *Body Tube* and *Draw Tube* are the standard parts used on all Spencer Microscopes of medium and better grades. The rapid movement of the body tube is accomplished by a diagonal rack and pinion. The delicate movement of the same is executed by the superior Spencer *standard fine adjustment* which excels all others in delicacy, responsiveness, definiteness, accuracy and durability.

The microscope is furnished in black enamel with a rich dull satin lustre. This, and the finish on the bright parts, optional chromium plated or yellow lacquer are durable and alcohol proof. Together they produce a color harmony which is as pleasing as the unusual symmetry of proportions and grace of outlines.

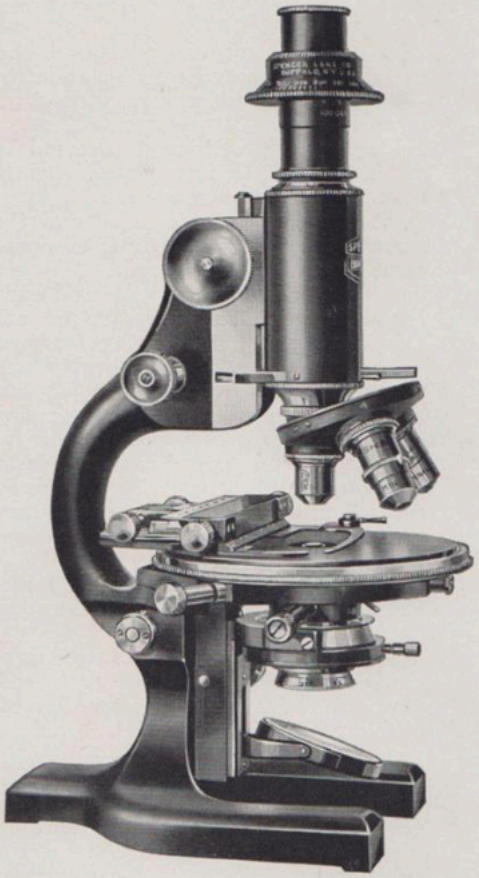
Supplied both with and without the mechanical stage. See note at bottom of page. Prices given below include the mechanical stage.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condenser N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial Magnification		
Thertiformb	34MB	Not included	16–4	10–44	10x	$ 89.75
Thertiformd	34MD	Not included	16–4	10–44	6x–10x	92.50
Thertiforme	34ME	Included	16–4	10–44	10x	100.75
Thertiformf	34MF	Included	16–4	10–44	6x–10x	103.50
Thertiformh	34MH	Included	16–4–1.8 Oil–imm.	10–44–95	6x–10x	135.00
Thertiformj	34MJ	Included	16–4–1.8 Fluorite	10–44–97	6x–10x	148.00

If mechanical stage is not wanted, deduct $15.00 from above prices.

Spencer New Chemical Microscope



Designed under the direction of
DR. E. M. CHAMOT and DR. C. W. MASON
CORNELL UNIVERSITY, ITHACA, N. Y.

THIS Microscope, No. 38, is a pronounced example of a microscope built for a definite purpose under the careful direction of two men eminently fitted to wisely guide in its construction;—Dr. E. M. Chamot and Dr. C. W. Mason of the Laboratory of Chemical Microscopy, Department of Chemistry, Cornell University. This new model presents a number of important improvements in construction and manipulative convenience. Its usefulness in the determination of physical properties has been greatly extended.

It is especially well adapted for use in courses in chemical microscopy or microchemistry. It meets the need for a relatively simple polarizing microscope for use in the chemical laboratories, in chemical and allied industries.

Chemical microscopes have been found particularly useful in the following types of work:

Identification of inorganic or organic substances by micro-chemical tests or by determinations of optical properties; examinations of raw materials and finished products in the manufacture and use of chemicals, abrasives, alloys, ceramic materials, drugs and medicinals, explosives, fats, waxes and soaps, fibres, textiles and papers, foodstuffs, leather, minerals, naval stores, pigments, fillers and protective coatings, rubber, wood, cellulose products, etc. Measurements of microscopic materials, and the quantitative estimation of the composition of mixtures; especially those which can not be determined by other methods. It is also entirely satisfactory for any investigation in which a high-grade compound microscope is required, and is recommended for biological work involving studies requiring polarized light.

THE STAND is of convenient size and is rigidly and carefully built to accomplish the purposes already set forth. The arm is of convenient form for handling. The distance from it to the center of the stage is 85 mm.

THE FOCUSSING ADJUSTMENTS consist of a diagonal rack and pinion for the rapid movement of the tube and a fine adjustment of the special Spencer Micrometer screw and lever construction which for durability, delicacy and accuracy has not been equalled. It is graduated for each complete revolution of the shaft and also for fractions of each revolution. Each of these finer divisions represents a movement of the tube of 2.5 microns. There is sufficient range to permit the use of any of the vertical illuminators.

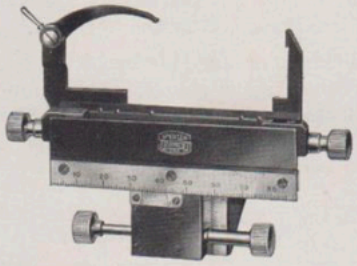
THE BODY TUBE is standard size with draw tube graduated from 150 mm. to 180 mm. There is a notch at the top of the draw tube by which the cross hair eyepieces and the cap analyzer are held in proper relation to the polarizing system. The microscope is regularly furnished with the cap analyzer (see illustration). Where it is desired to substitute for the cap analyzer the more convenient sliding analyzer which provides a

somewhat large field, a different body tube is substituted for the regular body tube. In this the analyzer is mounted toward the lower end of the body tube so that the prism may be slid in and out of the optical axis as is done in many petrographical microscopes. For the substitution of this analyzer which is equipped with an Ahrens prism add $25.00 to the prices in the price tabulation. At the lower end of the body tube is a slot for compensators, such as the quartz wedge and gypsum plates. The first order red and the quartz wedge, or both, are very essential for the study of crystals in polarized light, especially in connection with interference figures.

THE NOSEPIECE. The standard revolving nosepiece of proper capacity for objective ordered is regularly furnished. The quick change receptacle and rings such as are often used on petrographical microscopes will be furnished when ordered (see tabulation of prices). We should state for the revolving nosepiece that the objectives are very carefully centered and parfocalized thereon. One must, however, be careful to place each objective in the place marked for it on the nosepiece. *The objectives*—also *eyepieces, condensers, etc. —which are sent out on chemical microscopes are especially mounted to eliminate as far as possible any strain in the lenses, which would interfere with correct polarization.*

THE STAGE is of the revolving type, 120 mm. in diameter with centering screws. The periphery is graduated to single degrees, with vernier reading to three minutes. A lock screw is provided to prevent rotation when desired. It is easily removable for cleaning, for replacement by heating or cooling stages. It is rubber covered to better withstand ordinary reagents.

THE MECHANICAL STAGE is a new design which revolves with the stage. It is easily attached, and when removed leaves a clean even stage. It is built low so that in revolving it passes under the objectives on the revolving nosepiece, when any one of them is in focus. This stage has a lateral excursion of 75mm., and a to-and-from movement of 25mm. The stage is graduated to millimeters with verniers reading to $\frac{1}{10}$ millimeters. There are buttons for these movements on either side of the microscope, available for either hand.



SUBSTAGE—The new Spencer fork-type holds the substage parts rigidly in alignment, and at the same time permits convenient and rapid interchange of polarizer, condenser, or dark field illuminator. It is focused by the rack and pinion. Means are provided by which the substage parts always go into the fork in the same way, so that there may be no change in the relation of the nicol to the other parts. Standard RMS adapters can be furnished.

THE MIRROR, which is reversible, is plane and concave, with the usual adjustments.

SUBSTAGE CONDENSER—This substage may be equipped with our regular condenser No. 301S in which the mountings of the lenses are screwed together so that the combination of the two may be used as a short focus condenser, or the lower lens only as a narrow angle long focus condenser. A dark-field element may be substituted for the upper lens, making an excellent dark-field condenser. There is an iris diaphragm beneath the condenser.

Polarizing Equipment

POLARIZER—Ordinary equipment for parallel polarized light only is provided by a nicol prism mounted in a graduated revolving mount with knurl for easy rotation. Provision is made for fixing the zero point in a definite relation to the optical train.

COMBINATION POLARIZER WITH AUXILIARY CONDENSER N. A. 1.20—This provides a means for both parallel and convergent polarized light; the latter being necessary for the study of interference figures in crystals. This is the outfit suggested by Drs. Chamot

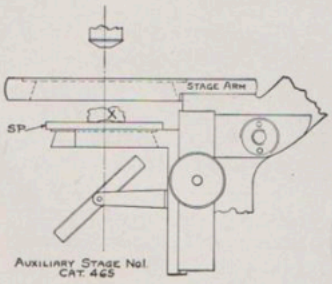
and Mason for general chemical work, and the one used in their laboratories. The nicol prism is in a knurled graduated revolving mount, which mount is easily removed without disturbing the condenser above it. The condenser is also easily removable, leaving the polarizer in operative position. The upper lens of this condenser which is large enough to cover the field of the 16 mm. objective is mounted on a swinging stirrup by means of which it may be swung out of the optical axis, leaving the lower lens to serve as a long focus condenser. There is an iris diaphragm between the condenser and the nicol. The whole assemblage goes into the substage fork in an exact way to assure that any definite graduated readings always designate the same optical relations.

ANALYZER—Composed of a Glan-Thompson prism, mounted above the eyepiece in a graduated housing which revolves in a collar attached to the upper end of the draw tube. The top of the collar is recessed for the easy interchange of eyepieces. There is a stud to engage a slot in the draw tube, so the planes of vibration of the prisms will coincide with the cross hairs in the eyepiece. The plane of vibration of the prism is marked on the mounting.

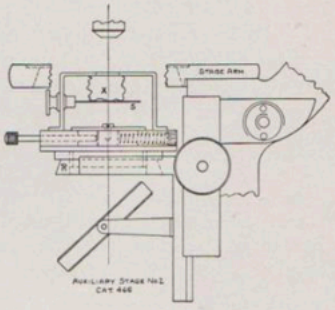
When Used for Metallurgical Purposes

WHEREAS this microscope was designed as a chemical microscope it may be used very successfully as a metallurgical microscope with some slight changes which are easily made by the operator.

The regular stage of the microscope is easily removed from the arm in which it revolves. Two auxiliary stages, Nos. 1 and 2, are provided to take its place. These stages are focussed up and down by means of their connection with the substage, which makes this instrument a very acceptable metallurgical microscope.



Auxiliary Stage No. 1 (Cat. No. 465) is of one piece construction and fits into the fork of the substage after the regular substage parts are removed. This provides a circular stage SP just above the substage fork, of sufficient size for the accommodation of ordinary specimens as shown at X. This stage is not a revolving stage in the true sense of the word. However, it can be readily rotated in the substage fork. The up and down excursion of this stage is the same as that of the rack and pinion substage, viz., ¾ inches. It is advisable to remove the regular microscope stage when using this auxiliary stage.



Auxiliary Stage No. 2 (466) consists of a ring fitting the fork as mentioned under No. 1, and an upper part for holding polished metal specimens (X) with the polished side upward, for examination without the necessity of any special waxes or mounting material. The specimen is held up by the flat spring (S) which is adjustable up and down. Placed in this frame, the specimen and frame may be revolved on a vertical axis and moved laterally by centering screws so that any point in the specimen may be moved through an area of ⅜ inches in diameter, which is the diameter of the hole in the upper part of the frame. For this work vertical illumination will generally be necessary. We call your attention to our Nos. 350, 355 and 357 for use with this microscope, listed on another page and duplicated here for convenience.

*The microscope is furnished in polished hardwood cabinet with lock and key.

TELEGRAPH CODE	CAT. NO.	OBJECTIVES DRY	OBJECTIVES OIL IMMER.	HUYGHENIAN OCULARS WITH CROSS HAIRS	RANGE OF MAGNIFICATION	TWO LENS CONDENSER	WITH REVOLVING DUST-PROOF NOSEPIECE	POLARIZER	ANALYZER	PRICE	WITH OBJECTIVE RECEPTACLE AND RINGS	PRICE
THREATEJ	38J	16mm. 8mm.	None	6X, 10X	60-200X	None	Double	B No. 536	B No. 525	$189.50	One Receptacle Two Rings	$197.00
THREATEK	38K	32mm. 16mm. 4mm.	None	6X, 10X	24-450X	None	Triple	B No. 536	B No. 525	199.00	One Receptacle Three Rings	208.00
THREATEL	38L *	32mm. 16mm. 8mm.	None	5X, 8X 10X	20-200X	Condenser	Triple	B No. 537 Combined with Cond.	B No. 525	214.25	One Receptacle Three Rings	223.25
THREATEM	38M	32mm. 16mm. 4mm.	1.8m	6X, 10X	24-950X	Condenser	Quadruple	B No. 537 Combined with Condenser	B No. 525	245.50	One Receptacle Four Rings	255.50
THREATE	38	Spencer Chemical Microscope, Stand only, as described above listed complete but without objectives, eye pieces, condenser, nosepieces or objective receptacle and rings, but with Analyzer and Polarizer. For combined condenser add $11.00.										150.00
		Stand as above with Sliding Analyzer in place of Cap Analyzer										175.00
FORNINFIV	495 *	Spencer New Mechanical Stage, as shown on microscope										35.00
FORSIXFIV	465	Spencer Auxiliary Stage No. 1 for use in Metallurgical work, as described										6.25
FORSIXSIX	466	Spencer Adjustable Auxiliary Stage No. 2 for use in Metallurgical work as described										15.00
FORTOO	420 *	Spencer Micrometer Eyepiece 10X										7.25
FORONSIX	416	Spencer Cross Hair Eyepieces 5X										4.75
FORONSEV	417	" " " " 6X										4.75
FORONATE	418	" " " " 8X										4.75
FORONNIN	419	" " " " 10X										4.75
FORFORSIX	446	Spencer Cross Hair eyepiece with focusing eye lens 5X										5.75
FORFORSEV	447	" " " " " " " " 6X										5.75
FORFORATE	448	" " " " " " " " 8X										5.75
FORFORNIN	449	" " " " " " " " 10X										5.75
CFIVTHRESEV	C-537	Polarizing Unit—Consisting of Polarizer C combined with Condenser, top lens of which swings out										55.00
FIVFORO	540	Spencer Selenite Plate, Red, First Order mounted to fit opening in Microscope Tube										4.00
FIVFORTO	542	Spencer Quartz Wedge, mounted to fit opening in Microscope Tube										25.00

*These combined represent thirty-six outfits which are supplied to the Laboratories of Chemical Microscopy at Cornell Universiy.



No. 350-355

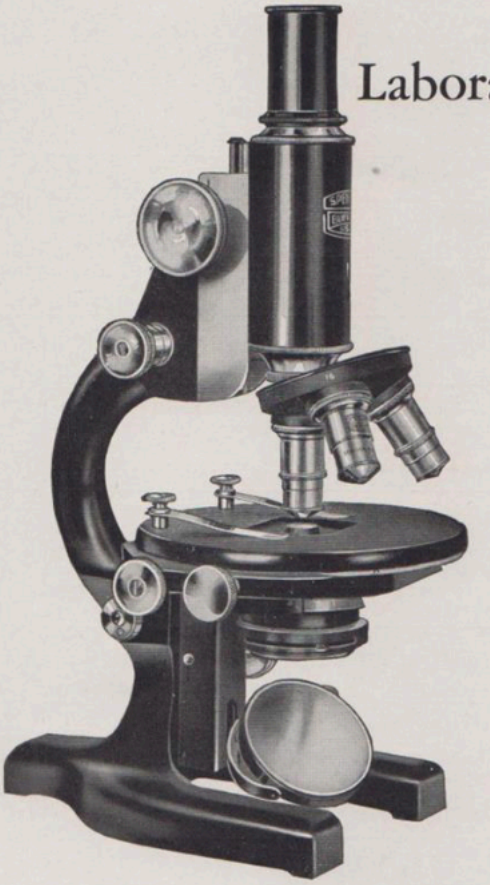
Spencer Vertical Illuminators

ALL Vertical Illuminators screw into the body tube between that and the objective. In Nos. 350 and 355 the light from a separate light source is reflected downward through the objective by a small silvered prism or a glass plate. In No. 357 the light source (6-volt bulb) is integral with the instrument.



No. 357

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threfivo	350	Vertical Illuminator, with prism reflector	$13.00
Threfivfiv	355	Vertical Illuminator, with plate glass reflector	13.00
Threfivsev	357	Electric Vertical Illuminator complete, as illustrated	35.00
Threthresev	337	Resistance to adapt above 110-V circuit	6.00
Threthresix	336	Resistance to adapt above 220-V circuit	8.00
Threthreon	331	Extra bulbs—6 volts Net	.65



Spencer Advanced Laboratory and Physicians Microscope No. 40

Equipped with:

I. CIRCULAR MECHANICAL STAGE (ungraduated)—a real mechanical stage. Operated by two screws on one side easily reached with one hand. 18 mm. shift.

II. FORK-TYPE SUBSTAGE, operated by rack and pinion—a universal substage taking all conceivable substage accessories — condenser, dark-field illuminator, polarizing apparatus, etc.

III. COMBINED DIVISIBLE SUBSTAGE CONDENSER, for long and short focus work and for dark-field illumination.

This microscope is designed for the convenience of those who want an instrument with a *real mechanical stage of moderate range* and who are not satisfied with the very limited range of ordinary centering screws. This stage is 120 mm. diameter.

In its main features this microscope is the same as Spencer Microscope No. 44, which has been and now is the standard laboratory and medical instrument.

A Real Mechanical Stage

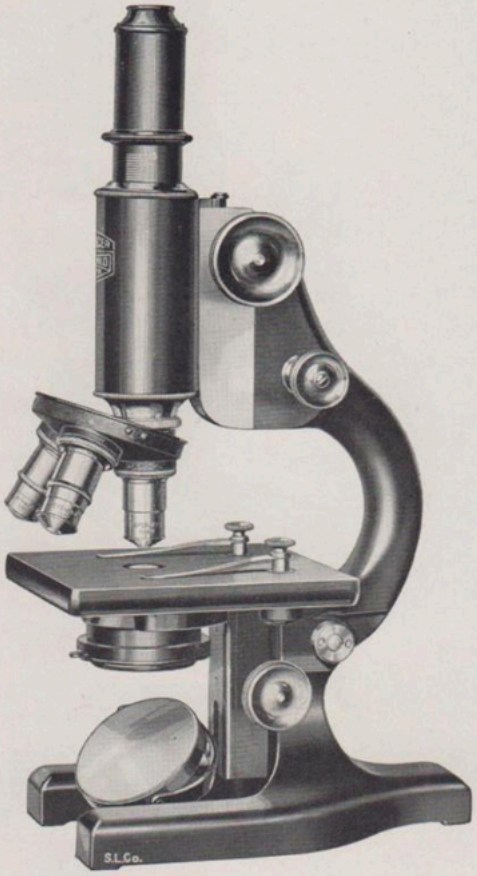
The distinguishing features of this instrument are the mechanical means by which the circular stage itself is moved in straight lines to and from the operator, also laterally by 18 mm., thereby providing sufficient range to completely cover an 18 mm. square cover glass. The movements are smooth and responsive and conveniently operated by the two buttons at the side of the stage where both may be reached by one hand.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condsr N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial Magnification		
Fortib	40B	Not included	16-4	10-44	10x	$ 89.75
Fortid	40D	Not included	16-4	10-44	6x-10x	92.50
Fortie	40E	Included	16-4	10-44	10x	100.75
Fortif	40F	Included	16-4	10-44	6x-10x	103.50
Fortih	40H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	135.00*
Fortij	40J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	148.00

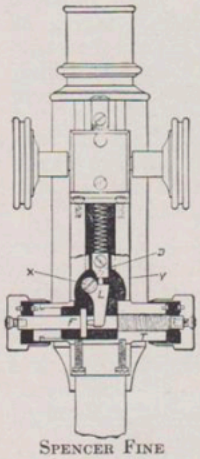
*With special leatherette case, $2.00 extra. Dark-Field Illuminator Element for Condenser, extra $5.00

Spencer Microscope No. 44



THIS has been the most popular of all Spencer microscopes for routine work in the laboratory of the hospital, medical school, or general practitioner. Simple in design and durable in construction, it fully meets all standard requirements.

BODY TUBE—Of standard size with graduated draw tube fitted in cloth-lined sleeve. Draw tube graduated in millimeters with correct tube length specially indicated.



SPENCER FINE ADJUSTMENT

ARM — Curved form furnishing a convenient handle and providing ample space for manipulating large objects. The distance from center of stage to arm is 80 millimeters.

STAGE — Rectangular 110 x 105 millimeters; of new bakelite composition, solid throughout; harder and more durable than rubber; will not warp or fade.

FOCUSING ADJUSTMENTS—Diagonal cut rack and pinion and side screw, lever-type fine adjustment with perpetual oiling device. This adjustment is the simplest, most durable and most responsive that has ever been offered on any microscope at any price. Micrometer reading drum for measuring thickness of specimens.

SUBSTAGE—Fork-type (patented), rigid, accurate, convenient. It is adjustable by rack-and-pinion movement for more accurate focusing of the condenser, with capacity for taking other substage accessories.

CONDENSER—New divisible type—Combined Substage Condenser and Dark-Field Illuminator.

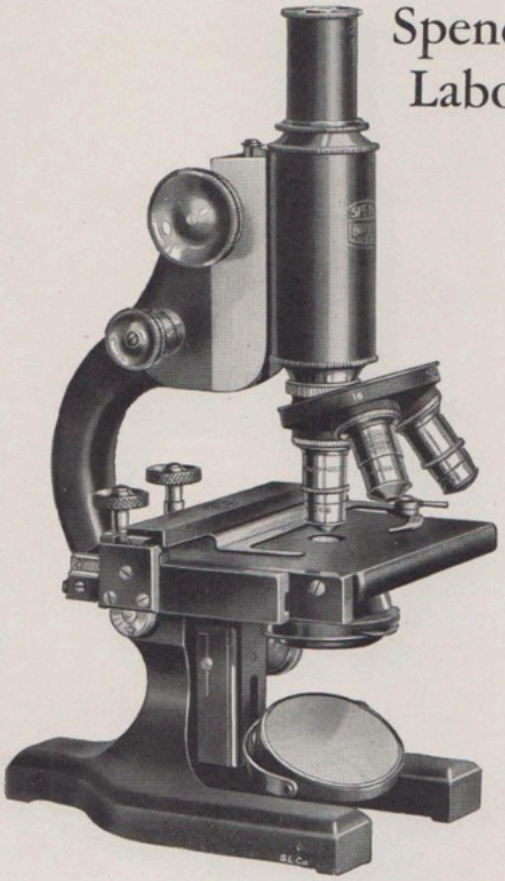
OPTICS—Objectives of the highest and best definition and resolution, corrected for tube length of 160 millimeters, accurately centered and parfocalized. All objective lenses burnished directly into metal cells.

CABINET—Polished hardwood, with lock and key.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condenser N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial Magnification		
Fortiforb	44B	Not included	16-4	10-44	10x	$74.75
Fortiford	44D	Not included	16-4	10-44	6x-10x	77.50
Fortifore	44E	Included	16-4	10-44	10x	85.75
Fortiforf	44F	Included	16-4	10-44	6x-10x	88.50
Fortiforh	44H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	120.00*
Fortiforj	44J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	133.00

*With special leatherette case, extra, $2.00. Dark-Field Illuminator Element for Condenser, extra, $5.00



Spencer Physicians' and Laboratory Microscope No. 44M

with:

I. Real Mechanical Stage (ungraduated) — permanently attached to the square microscope stage.

II. Fork-Type Substage, operated by rack and pinion—a universal substage taking all conceivable substage accessories—condenser, dark-field illuminator, polarizing apparatus, etc.

III. Combined Divisible Substage Condenser, for long and short focus work and for dark-field illumination.

This microscope has been designed for the convenience of those who prefer a square stage microscope and yet want a real mechanical stage permanently attached, having sufficient range of motion to completely cover the usual 3″ x 1″ microscope slide.

The Microscope Stand is our Spencer No. 44 and has all the advantageous features of that popular instrument. The mechanical stage affords a means by which the entire area of slide can be systematically examined. Like all Spencer mechanical stages it has exceptionally rigid construction. The diagonal cut rack and pinions are of such size and rigidity as to insure a permanently smooth and uniform movement. It is so constructed that the two adjustment buttons retain a constant relative position, affording ease and convenience in operation.

It is permanently attached to the Microscope stage and yet may be racked off, leaving a perfectly plain square stage.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condenser N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial Magnification		
Fortiformb	44MB	Not included	16-4	10-44	10x	$ 89.75
Fortiformd	44MD	Not included	16-4	10-44	6x-10x	92.50
Fortiforme	44ME	Included	16-4	10-44	10x	100.75
Fortiformf	44MF	Included	16-4	10-44	6x-10x	103.50
Fortiformh	44MH	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	135.00*
Fortiformj	44MJ	Included	16-4-1.8 Fluorite	10-44-97	6x-10x	148.00

*With special leatherette case, extra, $2.00. Dark-Field Illuminator Element for Condenser, extra, $5.00

Spencer Metallurgical Microscope No. 46

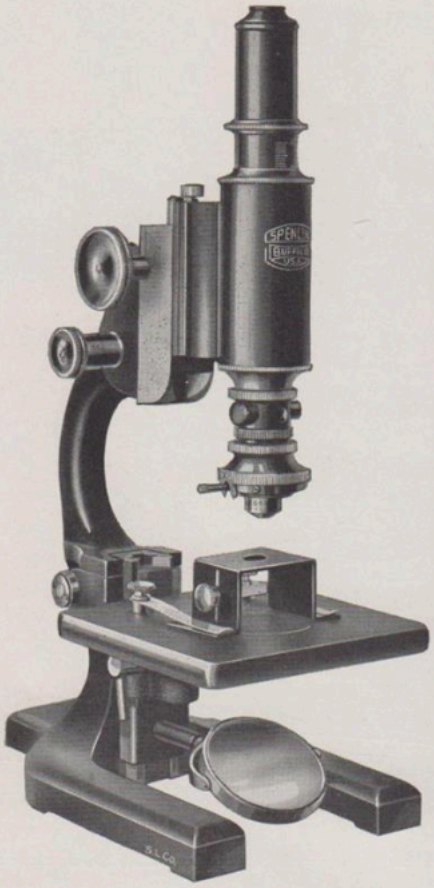


Fig. 1

IN these microscopes we offer an exceptionally adaptable set of interchangeable parts capable of being combined into a wide range of instruments.

A standard part, consisting of a base, with arm attached by inclination joint, carries a rack and pinion unit equipped with a substage mirror, and capable of receiving either the circular or the rectangular stage. When equipped with the square stage it becomes Microscope No. 46. With the revolving stage it is listed under No. 48. In either Microscope No. 46 or 48 the stand is equipped with rack and pinion for a coarse adjustment, and a fine adjustment.

The block carrying the tube is removable and may be replaced by a similar block, carrying a binocular body No. 52BT, identical with that of binocular microscope No. 52. Figure 1 illustrates microscope No. 46 with stage lowered and object holder, which is supplied with each metallurgical microscope, in position. An operating distance sufficient to permit the placing of large objects on the stage on either microscope when lowered. In this figure also is shown our new, quick-changing device, for the interchange of the several objectives, all of which, when supplied with metallurgical microscopes, are mounted in short mounts.

Rack and Pinion Substage (without condenser) similar to that supplied on Microscope No. 44 available on these microscopes for $10.00.

For selection of condensers for these substages see page 51.

Telegraph Code	Catalog No.	Achromatic Objectives		Huyghenian Oculars	Price
		Equivalent Focus-mm.	Initial Magnification		
Forsixa	46A	16-4	10-44	10x	$ 137.00
Forsixc	46C	16-4	10-44	6x-10x	139.75
Forsixl	46L	32-16-4	4-44-10	6x-10x	146.25

Spencer Metallurgical Microscope No. 48

FIGURE 2 illustrates microscope No. 48, with the graduated circular revolving stage raised so as to bring its surface close to the objective. This stage is 120 mm. in diameter with centering screws. The periphery is graduated to single degrees, with verniers reading to three minutes. A lock screw is provided to prevent rotation when not desired. The outfits tabulated below include the stand with rectangular or circular stage, as indicated by the number; with vertical illuminator, either Nos. 350 or 355; with the new quick-changing objective carrier and objective rings to accommodate the objectives supplied with each outfit. Either of these microscopes can be supplied with vertical illuminator No. 357. For description of vertical illuminator see page 53. For prices of objectives and oculars see pages 49 and 50. When ordering objectives always specify short mount.

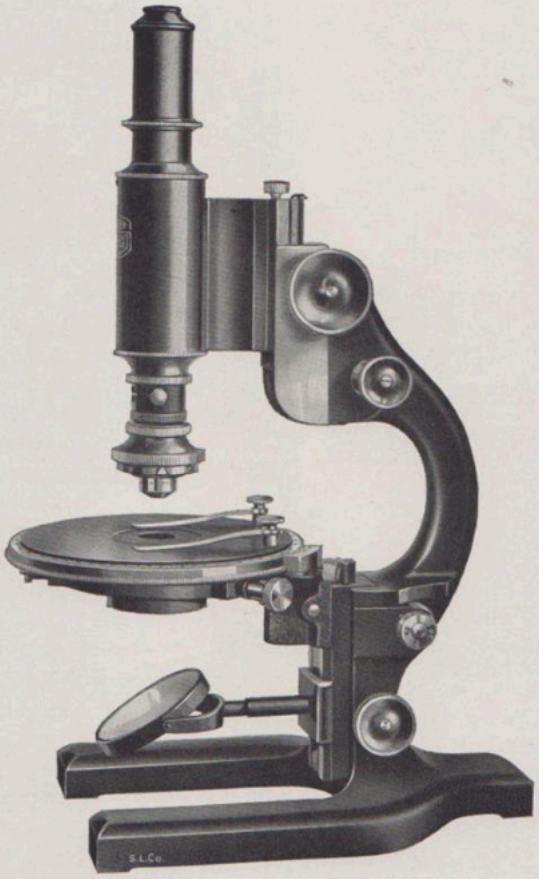


Fig. 2

Telegraph Code	Catalog No.	Achromatic Objective		Huyghenian Oculars	Price
		Equivalent Focus-mm.	Initial Magnification		
Foratea	48A	16-4	10-44	10X	152.00
Foratec	48C	16-4	10-44	6X-10X	154.75
Foratel	48L	32-16-4	4-44-10	6X-10X	161.25

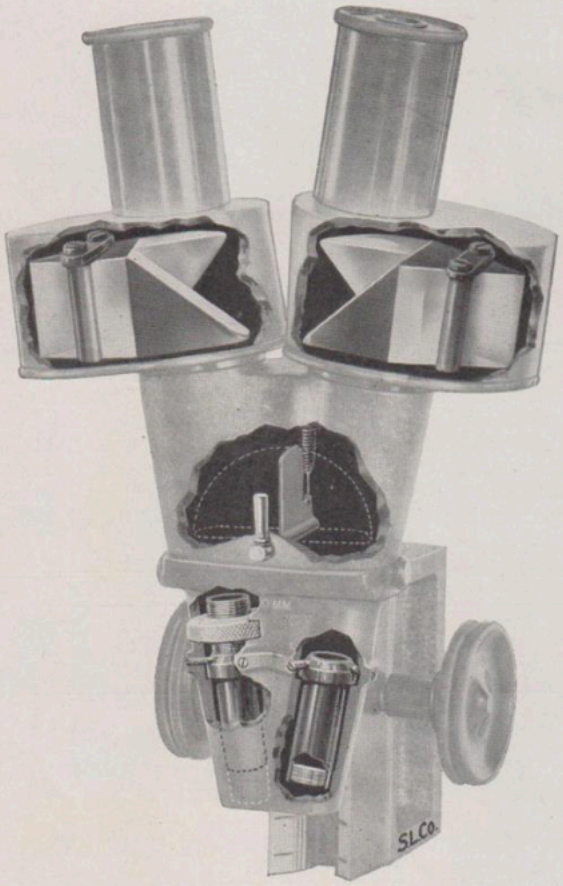
Spencer New Quick-Change Objective Carrier

This attachment provides a means of quickly interchanging any number of objectives on the body tube.

A receptacle with society thread is screwed into the tube. Into this fits a ring, carrying the objectives. Centering screws are provided, by which each ring can be adjusted to bring its objective to exact position.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Forsixto	462	Receptable for objective ring	$8.00
Forsixthre	463	Objective ring	3.00

Binocular Dissecting Microscope



THE binocular dissecting microscope, consisting of two complete optical systems converging to a common focal point, reveals small objects in a *true perspective* which is absolutely unattainable with any monocular or single tube instrument and is, therefore, especially suitable for the examination of uneven metal surfaces, small crystals, precious stones, fibers and textiles, seeds, moulds, insects and insect parts, embryos; in fact, anything in which relatively high magnification is required while still retaining an appearance of solidity.

Furthermore, these instruments are equipped with a set of porro-prisms or "erecting body" in each system which serve to "erect" the image instead of showing it inverted as in ordinary compound microscopes. The advantages of this system are very obvious in making fine dissections, since all movements of dissecting instruments are seen in their true directions, not reversed.

The prisms are constructed from the highest grade of glass; absolutely homogeneous and free from strain, ground to mathematically correct forms and polished optically plane. By a new process of mounting they are held in place in metal supports that remove practically all danger of their coming loose or getting out of alignment.

All our binocular microscopes are equipped with shutters by means of which the light to either eye may be stopped out, enabling the operator more easily to determine the correct position of the oculars for his interpupillary distance; to manipulate the substage mirror for directing light into each system and to focus for one eye independently of the other. The shutter is so designed that while either tube may be stopped at will, both can not be stopped at the same time and when released both tubes are always open, avoiding any possibility of confusion due to one tube being left accidentally closed.

Adjustment for interpupillary distance is very easily accomplished and has a range sufficient to accommodate the most extreme variation of separation.

Objectives are interchanged on the binocular body by sliding in bronze bearings with screw stops that insure absolute uniformity of position.

Spencer Paired Objectives

GREENOUGH TYPE



SPENCER paired objectives are supplied in patented mounts in which the two objectives are encased in a solid metal sheath (*see illustration above*), completely protecting them against the improper handling that results in decentering. They are centered within the mount by substantial screws available from the outside and of such size as to insure absolute rigidity. All objectives are mounted on brass plates, accurately fitted to slide-ways in the binocular body. They will not corrode or get sticky with long use and they insure absolute uniformity of position of the objectives. A collar is provided for focusing one objective independently of the other on 40, 32 and 25 millimeter objectives.

PRICES—PAIRED OBJECTIVES IN PATENTED UNIT MOUNT

Catalog No.	100P	101P	102P	104P	107P	107PL*	108P	109P
Equiv. Focus-mm.	55	48	40	32	25	25	18	15
Price per pair	$17.00	$18.00	$18.00	$18.00	$18.00	$22.50	$23.50	$23.50

*Water Immersion



Paired Oculars

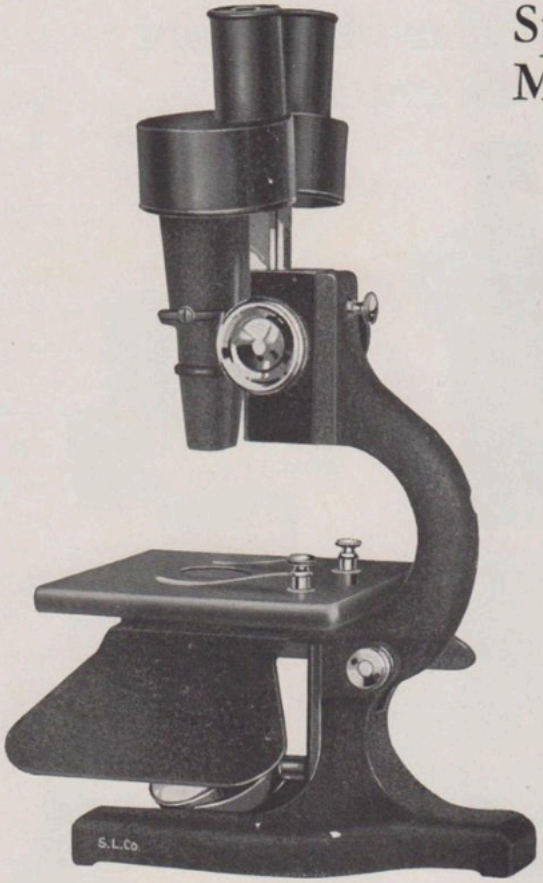
These oculars are matched with special care to insure absolutely identical magnification and afford complete freedom from eyestrain.

PRICES—PAIRED OCULARS

	Huyghenian						Planoscopic	
Catalog No.	134P	136P	138P	140P	142P	144P	179P	180P
Power	4x	5x	6x	8x	10x	12x	15x	20x
Price per pair	$5.50	$5.50	$5.50	$5.50	$5.50	$5.50	$17.00	$17.00

TABLE OF MAGNIFICATION—BINOCULAR MICROSCOPES

	Oculars							
Objectives	4x	5x	6x	8x	10x	12x	15x	20x
55mm.	8	10	12	15	19	22	27	38
48mm.	11	12	15	21	25	29	36	58
40mm.	13	18	22	27	34	40	51	68
32mm.	20	24	29	35	46	52	69	92
25mm.	30	37	45	60	74	90	117	148



Spencer Binocular Microscope No. 54

THIS is Spencer's original model modified and improved by the addition of an inclination joint and by slight changes in the form of the stand, which have added to its symmetry. The growing popularity of this instrument attests the fact that it meets the requirements of a wide range of scientists, while its moderate cost makes it available as part of the average laboratory equipment.

The block carrying the binocular body with its rack and pinion adjustment is grooved to fit a suitable receptacle on the arm of the stand, where it is held firmly in place by a single thumb screw at the back. Loosening this thumb screw permits the vertical adjustment of the block through a range of about 37 millimeters, thus increasing the range of adjustment to permit the focusing on thick specimens or on insects mounted on upright pins, etc., or the block may be entirely removed for use on stands 54s and 54T.

The binocular body is Spencer standard attachment with ample adjustment for pupillary distance and convenient shutter for stopping of either optical system.

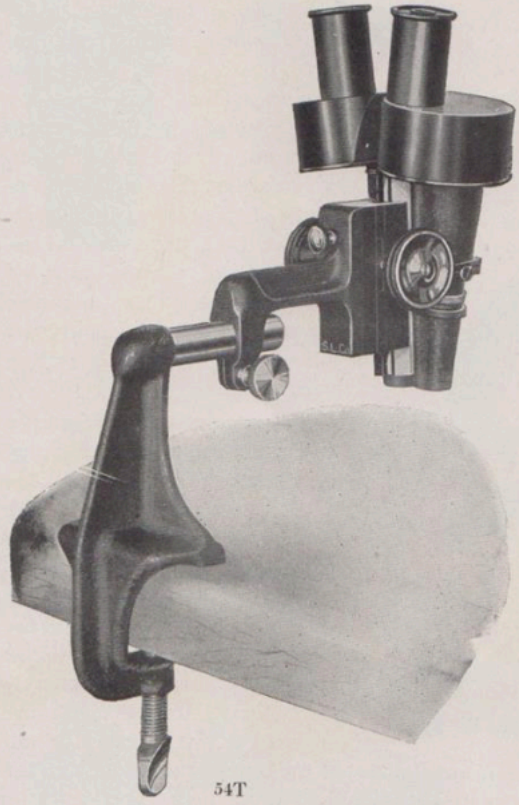
The dimensions of the stage are 110 x 105 millimeters. The central opening, covered by a removable disc, is 31 millimeters in diameter. A revolvable disc beneath the stage may be so placed as to bring into the optical axis either an unobstructed opening, a translucent, a white or a black background.

Standard hand rests, as shown in the illustration, are included. Extra-sized hand rests, reaching to the level of the table, may be substituted at an addition of $1.00 to the list price. Furnished hardwood cabinet, with lock and key.

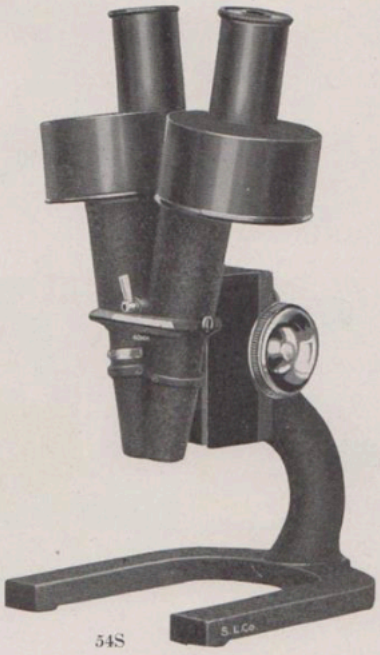
Outfits listed in the following tabulation are to be regarded only as suggestions. Substitutions in equipment may be made as required.

Telegraph Code	Catalog No.	Paired Objectives Equiv. Foc.-mm.	Paired Huyghenian Oculars	Price
Fivfora	54A	40	10x	$115.50
Fivforb	54B	48, 32	6x, 10x	139.00
Fivforc	54C	55, 40, 25	4x, 6x, 10x	161.50
Fivford	54D	55, 48, 32, 25	4x, 6x, 10x	179.50
Fivfore	54E	55, 48, 40, 32, 25	4x, 6x, 10x	197.50

Spencer Binocular Microscopes Nos. 54S and 54T



54T



54S

THE two stands illustrated on this page may be purchased either as accessories for microscope No. 54, or complete as illustrated. As accessories for No. 54 they constitute very inexpensive and convenient additions.

The binocular body, with rack and pinion block used on these stands is identical with that of No. 54, and is easily interchangeable among either stands No. 54, No. 54s or No. 54T.

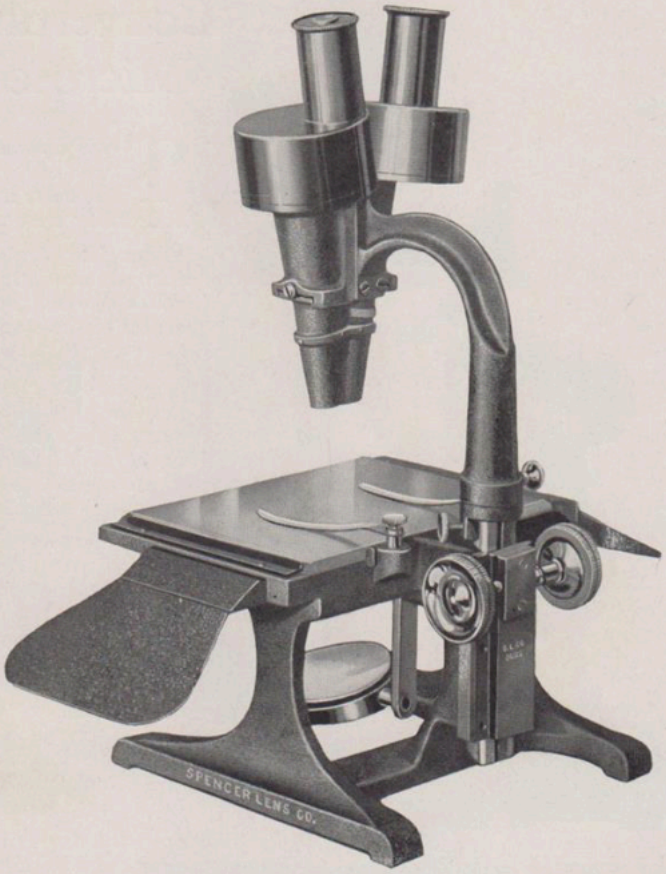
For the convenience of those who may wish to purchase equipment either with the small stand for use on the surface of the table or the stand for clamping onto the edge of the table, we list the following complete outfits. It will be observed that possessors of either of these outfits may purchase the larger stand, No. 54, as listed on the previous page, to convert their outfit into the standard instrument listed under that number.

Combinations of objectives and eyepieces listed under the several letters are in the nature of suggestions only, but any selection of optical equipment may be chosen as required. *For prices of objectives and oculars see page 22.*

Telegraph Code	Catalog No.	Price	Equipment		Telegraph Code	Catalog No.	Price
			Paired Objectives	Paired Oculars			
Fivforsa	54SA	$ 90.50	40	10x	Fivforta	54TA	$ 95.50
Fivforsb	54SB	114.00	48–32	6x–10x	Fivfortb	54TB	119.00
Fivforsc	54SC	136.50	55–40–25	4x–6x–10x	Fivfortc	54TC	141.50
Fivforsd	54SD	154.50	55–48–32–25	4x–6x–10x	Fivfortd	54TD	159.50
Fivforse	54SE	172.50	55–48–40–32–25	4x–6x–10x	Fivforte	54TE	177.50

Cat. No. 54s—Small stand only, without case	$ 4.50
Cat. No. 54T—Clamp Stand only, without case	9.50
Binocular body in case	62.50

Spencer Binocular Microscope No. 57



THE special features of this instrument are: the large plate glass stage provided with white and black backgrounds, the "gooseneck" arm which permits the examination of objects in deep dishes and the fact that the binocular body is easily interchangeable with an arm carrying our ordinary dissecting lenses or erecting body, thus making it virtually two microscopes in one. Binocular body and objectives are Spencer standard parts.

¶ The plate glass stage is 142 x 100 mm.

The stand is a single casting, light, but very rigid.

Metal hand rests, as illustrated, are included. Extra sized hand rests, reaching to the table, may be substituted for those illustrated at an additional cost of $1.00 per pair.

Suggested outfits are listed under "A," "B," "C," etc., but any combination of objectives and eyepieces will be supplied as required. *For list of objectives and eyepieces see page 22.*

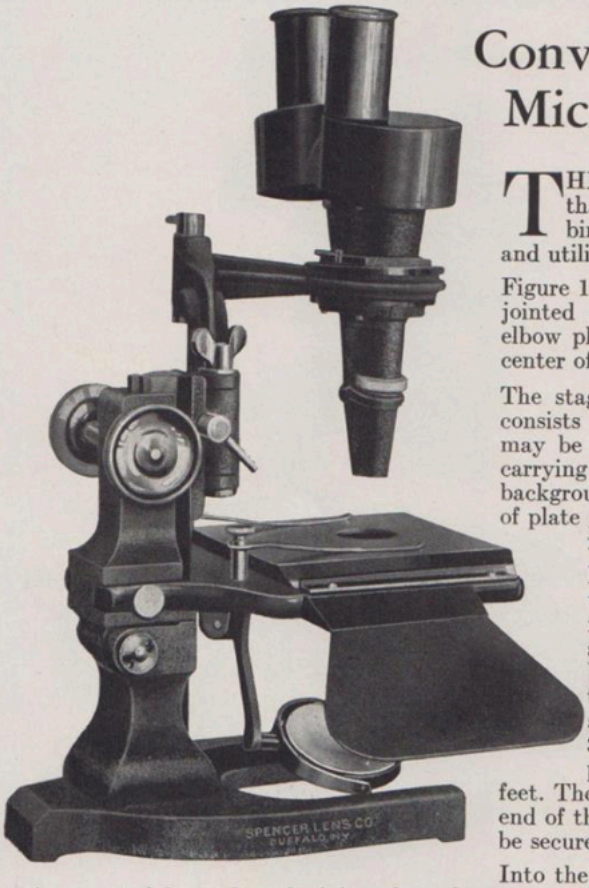
Furnished in hardwood cabinet, with lock and key.

Telegraph Code	Catalog No.	Paired Objectives Equivalent Focus-mm.	Paired Huyg. Oculars	Price
Fivseva	57A	40	10x	$112.00
Fivsevb	57B	48, 32	6x-10x	135.00
Fivsevc	57C	55, 40, 25	4x-6x-10x	158.00
Fivsevd	57D	55, 48, 32, 25	4x-6x-10x	176.00
Fivseve	57E	55, 48, 40, 32, 25	4x-6x-10x	194.00

Binocular body and arm, no objectives or oculars, without case $54.50

Combination base and stage, in case 34.00

Spencer Convertible Binocular Microscope No. 58



THIS instrument meets every demand that can be put upon a dissecting binocular microscope. Its adaptability and utility have not been equalled.

Figure 1 illustrates the instrument with the jointed arm adjusted in the form of an elbow placing the binocular body over the center of the stage.

The stage, 127 x 114 millimeters in size, consists of a metal frame-work into which may be slipped a black composition plate carrying black, white, and translucent backgrounds, or an accurately fitted piece of plate glass. A mirror with universal joint is provided.

Figure 2 shows the instrument with the stage removed: this is made possible by loosening one small thumb screw. The arm may be straightened out and by leaving the joints unlocked can be freely swung over the entire baseboard, 324 x 212 millimeters, which is provided for covering the horseshoe feet. The binocular body is swiveled at the end of the arm. The two hinged joints may be securely locked in any position.

Into the arm is fitted a grooved bar which is operated by rack and pinion through a range of 110 millimeters, while the jointed arm slides in the groove through a distance of about 125 millimeters, giving a range of focus of from the level of the table to over 200 millimeters above it.

Figure 3 illustrates the instrument with inclination joint turned back through 90° and shows how it can be conveniently used for looking into the side of an aquarium, reading daily plant growth, etc.

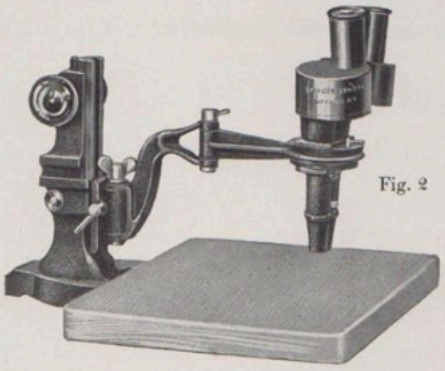


Fig. 2

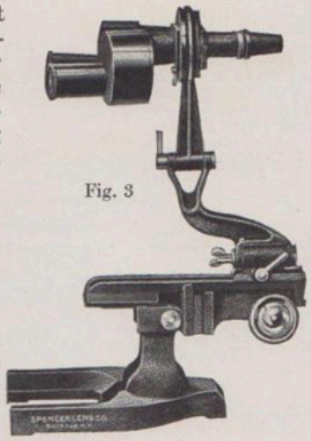


Fig. 3

For prices of the Convertible Binocular Microscope see following page

Telegraph Code	Catalog No.	Paired Objectives Equivalent Focus-mm.	Paired Huyg. Oculars	Price
Fivatea	58A	40	10x	$126.00
Fivateb	58B	48-32	6x-10x	149.50
Fivatec	58C	55-40-25	4x-6x-10x	172.00
Fivated	58D	55-48-32-25	4x-6x-10x	190.00
Fivatee	58E	55-48-40-32-25	4x-6x-10x	208.00

Binocular body with jointed arm, no objectives or oculars, without case $66.00
Standard hand rests are included. Special hand rests reaching to the table may be substituted at an additional cost of $1.00 per pair. Substitution in optical equipment may be made as desired. For prices of objectives and oculars see page 22.



Fig. 1

Spencer Binocular Microscope No. 58S

THIS instrument is a modification of the Spencer Convertible Binocular Microscope No. 58. It is simplified by leaving off the long jointed arm, substituting for it a goose neck arm, as shown in the illustration. This instrument includes the advantages of the inclination joint, the easily removable stage, the exceptional weight and stability, and wide range of vertical adjustment.

Figure 1 illustrates the instrument as set up for ordinary work, and Figure 2 with the stage removed and the arm lowered to bring the objectives into focus at the plane of the table.

Standard hand rests are included. Special hand rests reaching to the table substituted, at an additional cost of $1.00 per pair.

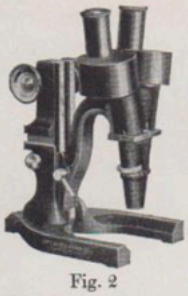
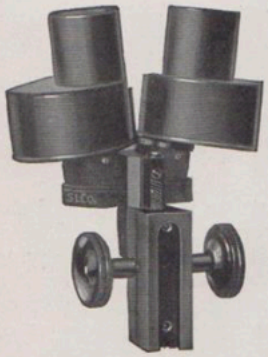


Fig. 2

Telegraph Code	Catalog No.	Paired Objectives Equivalent Focus-mm.	Paired Huyg. Oculars	Price
Fivatesa	58S-A	40	10x	$119.50
Fivatesb	58S-B	48-32	6x-10x	143.00
Fivatesc	58S-C	55-40-25	4x-6x-10x	165.50
Fivatesd	58S-D	55-48-32-25	4x-6x-10x	183.50
Fivatese	58S-E	55-48-40-32-25	4x-6x-10x	201 50

Binocular body with arm, no objectives or oculars. Without case..... $59.50
Stand only, in case 36.50
Substitutions in optical equipment may be made as desired. For prices of objectives and oculars, see page 22.

Spencer
Universal Binocular Microscope



SPENCER Universal Binocular Microscope was designed to improve upon and widen the range of adaptation of the Greenough binocular dissecting microscope, by providing in one instrument both low powers with a large wide field and long working distance and the higher powers with the greater magnification of the Greenough binoculars.

In this instrument we introduce a SPENCER fundamental principle of design that is of prime importance, viz.: The angle between the eyepieces has been made smaller than that between the objectives, thus retaining the perspective that has characterized the Greenough and at the same time affording relief from eyestrain that has been incidental to their extremely convergent eyepieces.

The importance of this fundamental change can not well be overstated—the fact is well recognized that perspective is dependent on the obtaining of two *different* images, one for each eye, and that the wider the angle between the two lines of vision, the more complete is the perspective. The practical limit is reached in unaided vision when the object under observation is brought to the nearest point to which the eyes can converge. The maximum angle of convergence of normal eyes is about sixteen degrees, corresponding to a working distance of about eight and one-half inches and this is the angle which has been generally adopted for Greenough binocular objectives. Here the erecting prisms have been so designed and mounted as to retain the same angle between the eyepieces as between the objectives and it is this sharp convergence of eyepieces that has resulted in a certain amount of eyestrain in the use of these instruments. Some have found it possible to stand this strain without apparent fatigue while others have been totally unable to use the instrument at all.

This fundamental defect, heretofore regarded as unavoidable, is entirely overcome by SPENCER'S new design of mounting, *retaining the old angle of the objectives* and introducing an angle of but eight degrees between the eyepieces giving the object under examination a virtual distance of about sixteen inches from the eyes instead of only a little over eight as in the older type of instruments. AND NOTE THAT THIS APPLIES TO THE FULL RANGE OF OBJECTIVES; HIGH POWER AS WELL AS LOW.

The binocular body is mounted, with rack and pinion adjustment, to a grooved block attachable to the stands illustrated on the succeeding pages and is easily interchangeable among them. The attachment is accomplished by a rib on the several stands which fits into the groove on the block to which it is secured by tightening a single thumb screw.

Catalog No. 51BB, Binocular Body only . . $58.00

Special Low Power Objectives

THE lowest powers of these objectives (see Cat. 97P, 98P, and 99P) are mounted on a perpendicular slideway beneath the binocular body. Where the higher powers are involved, the adapter 51AA replaces the lower power objective and these higher objectives slide into it. When the new multiple nosepiece (see pages 30 et seq.) is used, all objectives have a special mounting for the same, No. 285P, 286P, 288P, etc.

Table of Magnifications and Fields of View of
SPENCER UNIVERSAL BINOCULAR MICROSCOPE

	OBJECTIVES		EYEPIECES											
Designation	Catalog No Universal Mounting	Catalog No. Multiple N. P. M't'g.	6X Mag.	192-P Field mm.	9X Mag.	191-P Field mm.	12.5X Mag.	193-P Field mm.	17X Mag.	194-P Field mm.	25X Mag.	195-P Field mm.	30X Mag.	196-P Field mm.
.6x	99-P	.....	3.6	50	5.4	36	7.5	32	10.2	25	15.0	11.7	18.0	9.7
1.0x	98-P	285-P	6.0	30	9.0	22	12.5	20	17.0	16	25.0	7.0	30.0	5.8
1.7x	97-P	286-P	10.2	19*	15.3	13	21.2	12	28.9	9.5	42.5	4.1	51.0	3.4
1.7x	100-P	.....	10.2	19*	15.3	13	21.2	13	28.9	9.5	42.5	4.1	51.0	3.4
2.3x	101-P	288-P	13.8	13.5*	20.7	9.5	28.6	8.5	39.1	7.0	57.5	3.0	69.0	2.5
3.4x	102-P	289-P	20.4	9.0*	30.6	6.5	42.5	5.5	57.8	4.5	85.0	2.0	102.0	1.7
4.8x	104-P	290-P	28.8	6.5*	43.2	4.5	60.0	4.0	81.6	3.3	120.0	1.4	144.0	1.2
6.8x	107-P	291-P	40.8	4.5*	61.2	3.2	85.0	2.75	115.6	2.3	170.0	1.0	210.0	.83
10.5x	108-P	292-P	63.0	2.75*	94.5	2.1	131.3	1.85	178.5	1.6	263.0	.66	315.0	.55
13.0x	109-P	293-P	78.0	2.2*	117.0	1.7	163.0	1.5	221.0	1.2	325.0	.54	390.0	.45

*The 6x eyepiece is designed for use with the .6 and 1.0 objectives only. When used with other objectives the fields are cut by the prisms to—14.0, 14.0, 10.0, 7.0, 5.0, 3.5, 2.17 mm.

The first three objectives (above list) are usable only on Spencer Universal Binocular Microscopes. The other seven objectives (above list) are Spencer Standard Binocular Objectives in patented unit mounts in which the two objectives are encased in a solid metal sheath and are usable also on Spencer Greenough type microscopes.

PAIRED OBJECTIVES

Cat. No.	99P	98P	97P	100P	101P	102P	104P	107P	108P	109P
		285P	286P		288P	289P	290P	291P	292P	293P
Desig.	.6	1.0	1.7	1.7	2.3	3.4	4.8	6.8	10.5	13
Price	$17.00	$17.00	$17.00	$17.00	$18.00	$18.00	$18.00	$18.00	$23.50	$23.50

PAIRED EYEPIECES

These eyepieces are designed to cover the exceptionally large field given by the series of special objectives. They are mounted in tubes of extra size (31 mm. in diameter). They are corrected for both chromatic aberration and curvature of field. The eye lenses are of good size in all powers and all have a sufficiently high eye point to enable the user with spectacles to work with comfort.

Catalog No.	192P	191P	193P	194P	195P	196P
Designation	6x	9x	12.5x	17x	25x	30x
Price per pair	$11.00	$11.00	$11.00	$11.00	~~$11.00~~	~~$11.00~~



Spencer Universal Binocular Microscope No. 51

THIS microscope stand provides a very convenient means of holding the binocular body for the examination of small objects under reflected light. Because of its light weight and wide range of adaptability, as well as its moderate cost, it commends itself to a large number of users.

The stand is regularly supplied with a glass stage plate, beneath which may be placed a plate white on one side and black on the other. The size of stage is 100 x 100 millimeters. It is supplied when equipped with binocular body, in hardwood cabinet with lock and key.

CATALOG NO.	DESCRIPTION	PRICE
No. 51R	Universal Binocular Microscope, stand No. 51, binocular body No. 51BB, special low power paired objectives No. 99P and paired eyepieces 12.5X in cabinet	$100.00
No. 51P	Universal Binocular Microscope, stand No. 51, binocular body No. 51BB, paired objectives Nos. 99P and 97P, paired eyepieces 6X and 12.5X in cabinet	128.00
No. 51S	Universal Binocular Microscope, stand No. 51, binocular body No. 51BB, paired objectives Nos. 99P, 98P and 97P, paired eyepieces 6X, 12.5X and 17X in cabinet	156.00

Greenough type objectives may be added. See plan below



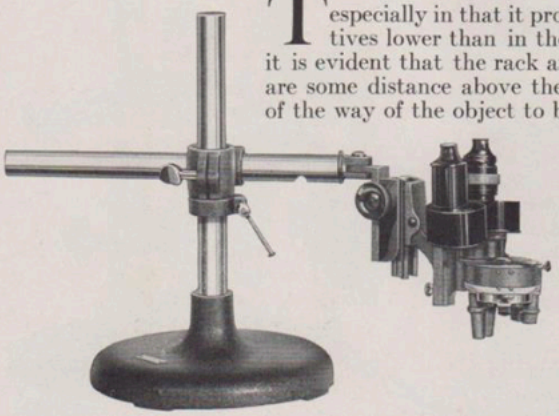
OBJECTIVE ADAPTER No. 51AA $7.50

Greenough Type Objectives (Listed Page 29)

BY the use of adapter No. 51AA the Spencer standard line of Greenough objectives may be adjusted for use with our Universal Binocular Microscope. These objectives 100P, 101P, 102P, 104P, 107P, 108P, 109P, may be added at the prices listed viz.:

No. 51R Outfit (above)	$100.00
No. 51AA Objective Adapter	7.50
No. 102P Paired Objectives 3.4x	18.00
TOTAL	$135.50

Spencer Universal Binocular Microscope No. 52



THIS new stand is an improvement on the old No. 52, especially in that it provides a means for placing the objectives lower than in the old stand. By referring to the cut it is evident that the rack and pinion and other working parts are some distance above the end of the objective, entirely out of the way of the object to be observed.

The upright support is 12″ high above the 8″ diameter base. The horizontal arm is 13″ long which, with the arm holding the microscope, provides for placing the microscope at any point over a considerable area.

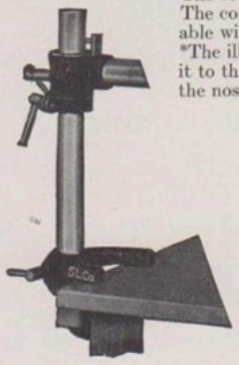
The arm may be clamped in any position in the horizontal sleeve or easily moved back and forth through it. It revolves freely around the perpendicular support at any desired height and may be clamped in any position.

Tel. Code	Catalog No.	DESCRIPTION	Price
Fivto	52	Microscope Stand only without binocular body, no cabinet	$24.00
		In the following outfits the binocular body and optical parts are in cabinet.	
Fivtor	52R	Universal Binocular Microscope, stand No. 52, binocular body No. 52BB, paired objectives No. 99P and paired eyepieces 12.5X	110.00
Fivtop	52P	Universal Binocular Microscope, stand No. 52, binocular body No. 52BB, paired objectives Nos. 99P and 97P, paired eyepieces 6X and 12.5X	138.00
Fivtos	52S*	Universal Binocular Microscope, stand No. 52, binocular body No. 52BB, paired objectives Nos. 98P, 97P and 102P, paired eyepieces 6X, 12.5X and 17X	166.00
Fivtot	52T	Universal Binocular Microscope, stand No. 52, binocular body No. 52BB, paired objectives Nos. 285P, 286P and 288P, fitted on new multiple nosepiece, paired eyepieces 6X, 12.5X and 17X	181.00

The binocular body illustrated on this stand is easily detachable and can be used on stands No. 55 or No. 56 (see prices page 36) where a more compact stand is desirable. The combination of the two stands make a very complete low-power equipment.

The complete Body Tube Unit—Cat. No. 53BB—as used on stand No. 53 is interchangeable with the one shown and can be supplied for $7.50 additional.

*The illustration shows the microscope with the No. 445 Multiple Nosepiece. To add it to this outfit add $15.00 to the price quoted. Any paired objectives may be used on the nosepiece—No. 99P excepted.



Spencer Table Clamp No. 52T

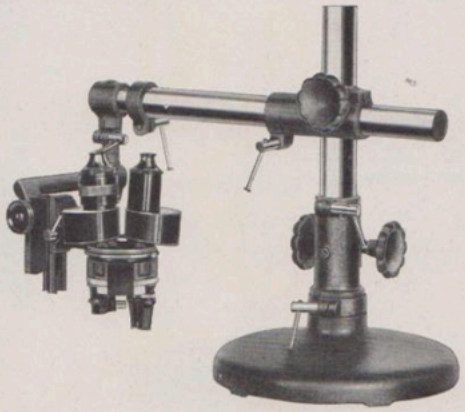
A SIMPLE and convenient support for attaching to the edge of a laboratory table and carrying the vertical rod of microscope No. 52. The rod is readily removed from its base and inserted in this table clamp.

No. 52T Table Clamp for stand No. 52 ..... $4.00

Spencer Universal Binocular Microscope No. 53

THIS new elaborate stand provides means for observing an object anywhere within a circle four feet in diameter. The adjustments are such that the microscope may be placed at any desired angle, focussed on the table or raised to a height sufficient for viewing dissections on very large bodies.

As is evident from the cut, the lateral extension of the arm and the coarser up and down movement are accomplished by heavy racks and pinions. Clamps are provided for fixing these parts rigidly in any position. The regular microscope rack and pinion is at the end of the arm. The binocular body is mounted in a swivel at the end of the arm supporting it. This permits the revolving of the binocular through 360°,—a great convenience many times.

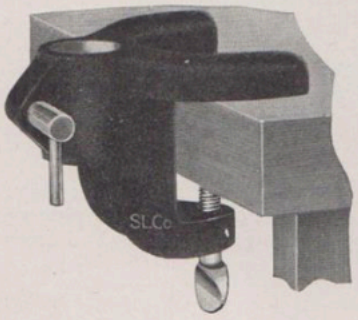


Tel. Code	Cat. No.	DESCRIPTION	Price
Fivthre	53	Microscope Stand only, without binocular body, no cabinet	$50.00
		In the following outfits the binocular body and optical parts are in cabinet.	
Fivthrer	53R	Universal Binocular Microscope, stand No. 53, binocular body No. 53BB, special low power paired objectives No. 99P and paired eyepieces 12.5x	136.00
Fivthrep	53P	Universal Binocular Microscope, stand No. 53, binocular body No. 53BB, paired objectives Nos. 99P and 97P; paired eyepieces 6x and 12.5x	164.00
Fivthres	53S*	Universal Binocular Microscope, stand No. 53, binocular body No. 53BB, paired objectives Nos. 98P, 97P and 102P; paired eyepieces 6x, 12.5x and 17x	192.00
Fivthret	53T	Universal Binocular Microscope, stand No. 53, binocular body No. 53BB, paired objectives, Nos. 285P, 286P and 288P, fitted on new multiple nosepiece; paired eyepieces 6x, 12.5x and 17x	207.00

The binocular body illustrated on this stand is easily detachable and can be used on stands No. 55 or No. 56 (See prices page 36) where a more compact stand is desirable. The combination of the two stands makes a very complete low-power equipment.

The complete Body Tube Unit—Cat. No. 53BB—as used on this stand can be supplied on Stand No. 52 for $7.50 additional.

*The illustration shows the microscope with No. 445 Multiple Nosepiece. To add it to this outfit add $15.00 to the price. Any paired objectives may be used on the multiple nosepiece—No. 99P excepted.



Spencer Table Clamp No. 53T

A SIMPLE and convenient support for attaching to the edge of a laboratory table and carrying the vertical rod of microscope stand No. 53. The rod is readily removed from its cast iron base and inserted into this stand.

No. 53T Table Clamp for Stand No. 53 $4.00

Spencer Combined Convertible-Universal Binocular Microscope No. 58U

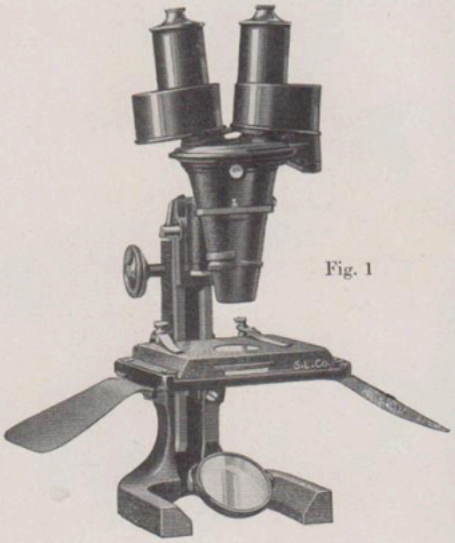


Fig. 1

TO satisfy the demands of the multitudes of laboratory workers who appreciate the many advantageous features of SPENCER Convertible Binocular Microscope No. 58 and likewise desire to work with ultra-low magnifications such as are offered with SPENCER Universal Binocular Microscope we now offer this combined instrument which incorporates the advantages of both. This instrument meets every demand that can be put upon a binocular dissecting microscope. Its adaptability and utility have not been equaled.

It has a jointed arm adjusted in the form of an elbow, placing the binocular body over the center of the stage. The stage 127 x 114 millimeters in size is removable and has black, white and translucent backgrounds.

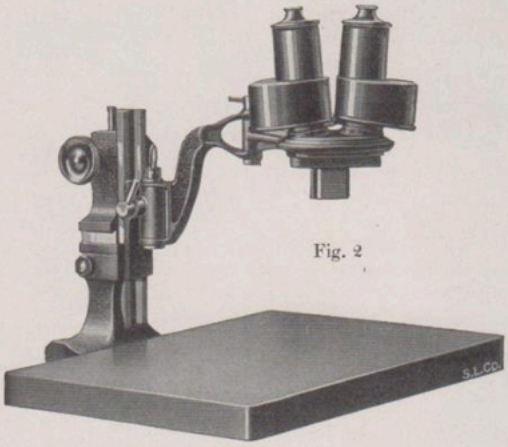


Fig. 2

Figure 2 shows the instrument with the stage removed. This is made possible by loosening one small thumb screw. The arm may be straightened out and by leaving the joints unlocked can be freely swung over the entire baseboard, 324 x 212 millimeters, which is provided for covering the horseshoe feet. The binocular body is swiveled at the end of the arm. The two hinged joints may be securely locked in any position.

Into the arm is fitted a grooved bar which is operated by rack and pinion through a range of 110 millimeters, while the jointed arm slides in the groove through a distance of about 125 millimeters, giving a range of focus of from the level of the table to over 200 millimeters above it. Supplied in hardwood cabinet.

CATALOG NO.	DESCRIPTION	PRICE
No. 58U-R	Convertible-Universal Binocular Microscope, stand No. 58, binocular body No. 51BB, special low power paired objectives No. 99P and paired eyepieces 12.5X, in cabinet	$148.50

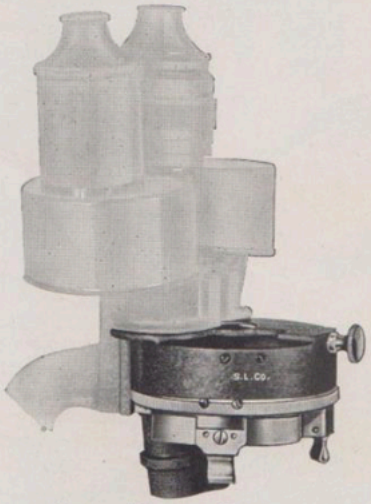
Other outfits with two and three objectives and two and three eyepieces at same additional prices as listed with outfits on preceding pages.

Greenough type objectives may also be added. See plan page 30.

Spencer New Multiple Revolving Nosepiece No. 445

For Carrying Three Pairs of Paired Objectives

(PATENT APPLIED FOR)



No. 445 Multiple Nosepiece

THIS new multiple nosepiece is an objective changer. It is very easily applied to all Spencer Universal low power binocular microscopes. Three pairs of objectives are held on the revolving portion of the nosepiece, which portion revolves on a vertical axis similar to that of an ordinary nosepiece. Any and all pairs of objectives may be easily removed by the operator and supplanted by others of the series desired. Laboratory workers will appreciate this flexibility. In addition to this great advantage, it is dust-proof and one can easily get to the objectives to clean them.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Forforfiv	445	Multiple Nosepiece	$15.00

Spencer New Universal Binocular Microscopes No. 55 and No. 56

Equipped with the New Patented Multiple Revolving Nosepiece



New Universal Binocular Microscope No. 55

THESE exceptionally large instruments meet in a most satisfactory way the demand for a large stage. The plate glass stage is 100mm. x 100 mm. Objects in the center of a dish 50mm. high and 130mm. in diameter may be brought into the lines of vision. The rack and pinion movement together with the adjustability of the arm on the slide, permits the focussing on very thick objects, also objects in the plane of a surface on which the instrument (No. 56) might be set. The large mirror (62mm. diameter) is sufficient to illuminate the large fields of the lower power objectives. No. 55 is equipped with hand rests not shown in the cut. See No. 58U.

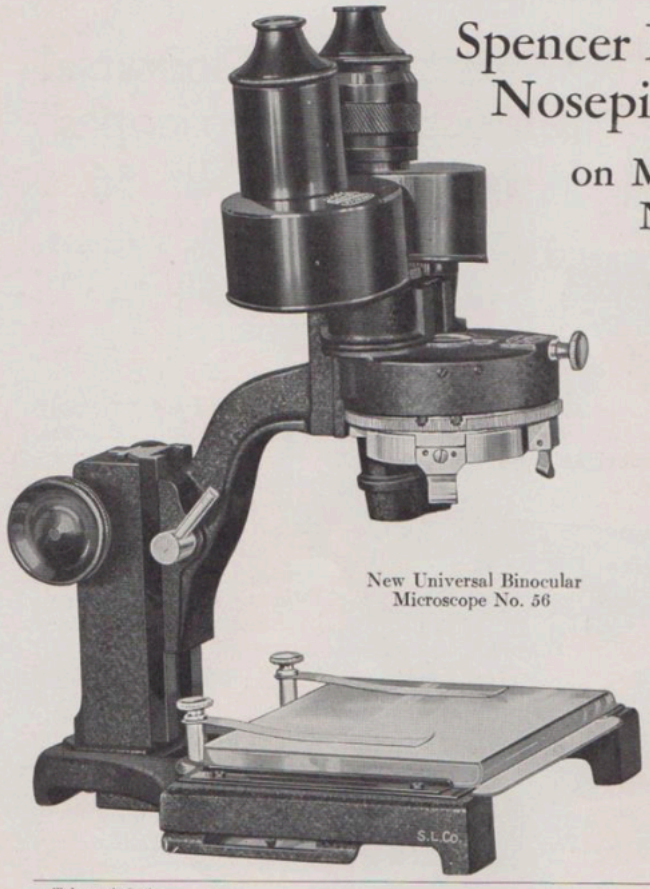
The base and pillar of No. 55 are low, to bring the stage as near to the table as possible. There is also an inclination joint. This base, joint and mirror are easily removable, and when removed the upper part of the instrument becomes No. 56.

As on all Spencer Universal Binocular microscopes the prism boxes are geared together to be manipulated by one hand only. The prisms are so arranged to permit the oculars to converge to the normal convenient angle of 8°, while the objectives maintain an angle of 16° to give the greater perspective. This valuable patented feature is found in Spencer binoculars only. The large oculars permit larger fields with the lower power combinations. One ocular tube is adjustable as to length to compensate for difference in eyes.

Both of these microscopes are illustrated with the new Spencer multiple nosepiece in position. This nosepiece is easily removable. Any and all of the objectives may be applied directly to these stands without the nosepiece. In which case, where the higher power objectives are involved, adapter No. 51AA is required as is the case with all Universal binoculars. To meet the demand for greater range and higher magnifications, a new 10.5x pair of objectives, and new 9x oculars are now available. Within a very short time new 12x objectives and new 24x and 30x oculars will be ready, providing a great variety of magnifications from 3x to 330x. These new optics will be available on any stand.

Spencer New Multiple Nosepiece No. 445

on Microscope No. 56



New Universal Binocular Microscope No. 56

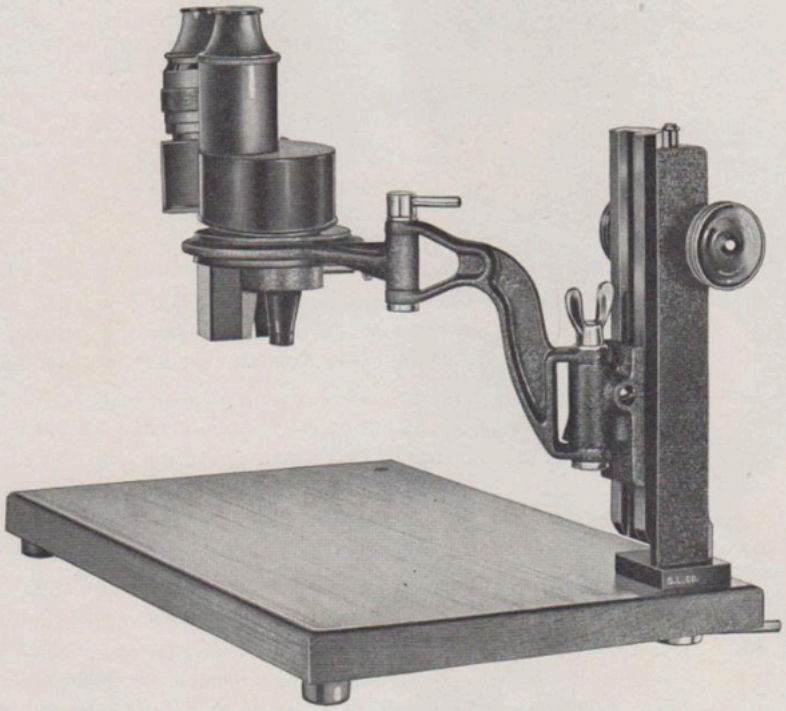
THIS new objective changer illustrated on Nos. 55 and 56 is very easily applied to all Spencer Universal binoculars. Three pairs of objectives are held on the revolving portion of this nosepiece, which portion revolves on a vertical axis very similar to that of an ordinary nosepiece. Any or all pairs of objectives may be easily removed by the operator to be supplanted by any others of the series desired*. All workers using a variety of powers appreciate this flexibility. In addition to this great advantage, it is dust proof. One can easily get to the objectives to clean them.

55—Stand only	$29.00
56—Stand only	14.00
Binocular Body to fit either of above	58.00

Telegraph Code Cat. No.	DESCRIPTION	Price
Fivfivr 55R	—New Universal Binocular Microscope, convertible stand, with horseshoe base, binocular body, low power paired objectives No. 99P and paired eyepieces 12.5x without multiple revolving nosepiece, in cabinet	$115.00
Fivfivp 55P	—New Universal Binocular Microscope, convertible stand with horseshoe base, binocular body, low power paired objectives No. 99P and No. 97P, paired eyepieces 6x and 12.5x without multiple nosepiece, in cabinet	143.00
Fivfivs 55S	—New Universal Binocular Microscope, convertible stand with horseshoe base, binocular body, low power paired objectives No. 99X, No. 98X and No. 97P, paired eyepieces 6x, 12.5x and 17x, without multiple nosepiece, in cabinet	171.00
Fivfivt 55T	—New Universal Binocular Microscope, convertible stand with horseshoe base, binocular body, low power paired objectives No. 285P, No. 286P and No. 288P *fitted on new multiple nosepiece*, paired eyepieces 6x, 12.5x and 17x, in cabinet	186.00
Fivsixr 56R	—New Universal Binocular Microscope, stand (without horseshoe base), binocular body, low power paired objectives No. 99P and paired eyepieces 12.5x, without multiple revolving nosepiece, in cabinet	100.00
Fivsixp 56P	—New Universal Binocular Microscope, stand (without horseshoe base), binocular body, low power paired objectives No. 99P and No. 97P paired eyepieces 6x and 12.5x without multiple nosepiece, in cabinet	128.00
Fivsixs 56S	—New Universal Binocular Microscope, stand (without horseshoe base), binocular body, low power paired objectives No. 99P, No. 98P and No. 97P, paired eyepieces 6x, 12.5x, and 17x, without multiple nosepiece, in cabinet	156.00
Fivsixt 56T	—New Universal Binocular Microscope, stand (without horseshoe base), binocular body, low power paired objectives No. 285P, No. 286P and No. 288P, *fitted on new multiple nosepiece*, paired eyepieces 6x, 12.5x and 17x, in cabinet	171.00
Forforfiv 445	—New Multiple Revolving Nosepiece (Triple) for carrying three low power paired objectives	15.00

*Except the lowest power No. 99P, which objectives can be used directly on the stand after the removal of the nosepiece.

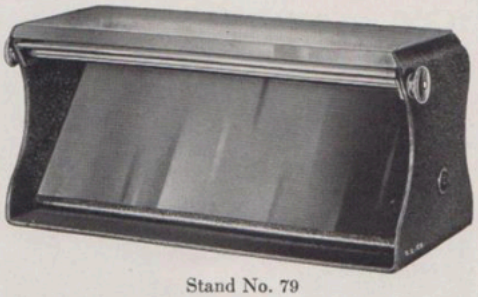
Spencer Universal Binocular Microscope No. 59



THIS microscope was designed especially for Dr. T. H. Morgan, for his work on Drosophila. It is especially available for any work, where it is desirable to move the microscope over any considerable area. The binocular body is mounted in a swivel at the end of a double jointed arm 7 inches long. This provides for the moving of the binocular body over a large area, and the placing of the same in the most convenient position for the operator. Both joints of this arm may be clamped rigidly in any desired position, and the whole may be focussed up and down by means of the rack and pinion on the 7 inch high pillar located at one corner of the 8″ x 13″ wooden base. Provision is made by which this pillar may be fastened at the adjacent corner of the base.

The illustration shows the instrument set up for work on opaque objects. For work on transparent objects the stand No. 79 is provided which may be set on the base under the objectives. This stand is 7″ long by 3″ wide. A mirror which may be tilted to any needed angle beneath the glass stage is also 7″ long. When this stand is used, it is necessary to raise on its support the arm carrying the binocular body. The arm is clamped at any desired height.

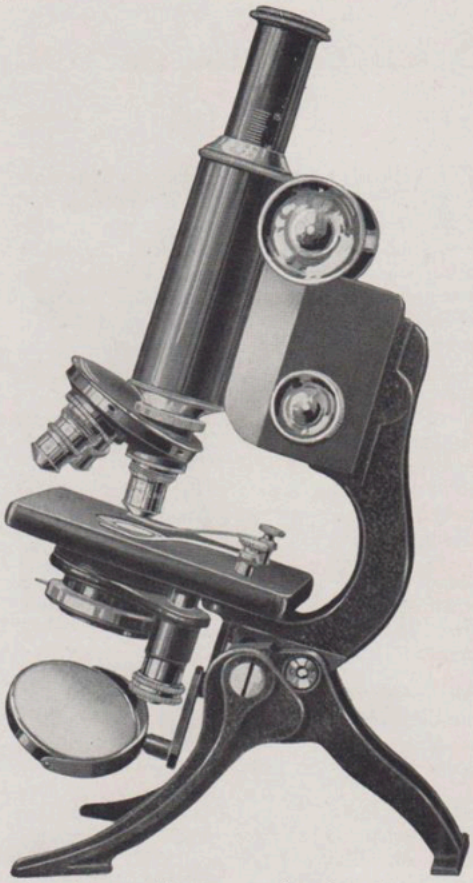
The illustration also shows the objectives mounted in the simple mount which is used when but one pair of objectives is used. Where two or three pairs of objectives are used, we strongly recommend the use of our new multiple nosepiece, by use of which any pair of objectives may be brought into use easily and quickly, just as on an ordinary microscope where the single objectives are involved.



Stand No. 79

Telegraph Code	Cat. No.	DESCRIPTION	Price
Fivninr	59R	—New Universal Binocular Microscope, with wooden base, binocular body, low power paired objectives No. 99P and paired eyepieces 12.5X without multiple revolving nosepiece, in cabinet	$115.00
Fivninp	59P	—New Universal Binocular Microscope, with wooden base, binocular body, low power paired objectives No. 99P and No. 97P, paired eyepieces 6X and 12.5X without multiple nosepiece, in cabinet	143.00
Fivnins	59S	—New Universal Binocular Microscope, with wooden base, binocular body, low power paired objectives No. 99P, No. 98P and No. 97P, paired eyepieces 6X, 12.5X and 17X, without multiple nosepiece, in cabinet	171.00
Fivnint	59T	—New Universal Binocular Microscope, with wooden base, binocular body, low power paired objectives No. 285P, No. 286P and No. 288P *fitted on new multiple nosepiece*, paired eyepieces 6X, 12.5X and 17X, in cabinet	186.00
Sevnin	79	—Stand for work on transparent objects	10.00
		Bakelite base in place of wooden, extra	10.00

Spencer Portable Microscope No. 60

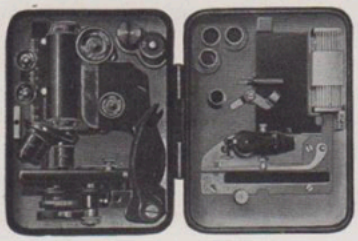


THIS is a *standard* compound microscope, equipped with a set of first-class achromatic objectives and huyghenian oculars. It is a thoroughly satisfactory instrument for use in the laboratory of the hospital, medical school or private practitioner, meeting all the requirements that are ordinarily made of a high-grade microscope, and at the same time so compact as to be packed in about one-quarter the space occupied by the case of ordinary instruments. The objectives are not removed from the nosepiece for packing. They are mounted in short mounts for compactness and provided with dust-proof caps to be screwed over them when the instrument is not in use.

The body tube is 95 millimeters in length with graduated draw tube sliding clear down to the end, thus aiding in the compactness.

The substage is of standard " quick screw " form, with condenser permanently centered. The mirror is mounted on a special jointed arm that permits its being brought close to the stage for packing.

Three legs which fold back, replace the base and pillar of the ordinary stand. They are securely fitted at the inclination joint and make a stable support for the microscope when set up.



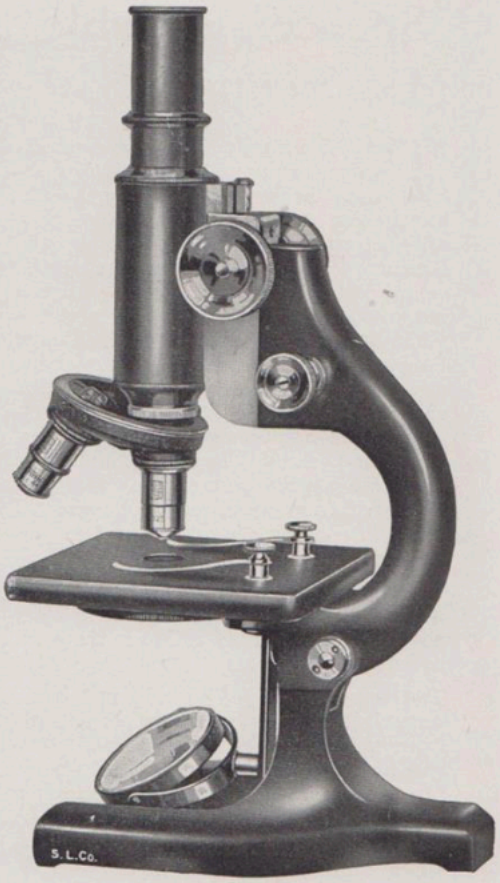
The case is made of aluminum and has lock and key. The outside dimensions are 8¾ x 6½ x 3¾ in. It is entirely dust-proof. Provision is made for carrying, in addition to the complete microscope, a special mechanical stage, a haemaglobinometer and a haemacytometer or special camera lucida.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condsr N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial magnification		
Sixob	60B	Not included	16-4	10-44	10x	$109.75
Sixod	60D	Not included	16-4	10-44	6x-10x	112.50
Sixoe	60E	Included	16-4	10-44	10x	120.75
Sixof	60F	Included	16-4	10-44	6x-10x	123.50
Sixoh	60H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	160.00
Sixoj	60J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	173.00

No. 485 Mechanical Stage modified to pack in case	$35.00
No. 500 Camera Lucida modified to pack in case	32.00
No. 505 Camera Lucida modified to pack in case	22.00

Spencer Microscope No. 64



THIS is the most popular of all Spencer Microscopes for use in the botany and zoology laboratories of high schools and colleges where simplicity and durability are paramount requirements. Its low compact construction affords ease and comfort in use. Its ruggedness in design makes it practically fool-proof and able to stand the rough and tumble of student usage. Its superior type of fine adjustment, with 34 threads of the fine adjustment screw always engaged instead of the usual one or two, enables us to guarantee the fine adjustment to last as long as any other part of the instrument. Its symmetry and beauty of design is especially marked.

BODY TUBE—Of standard size with fixed draw tube at 160 millimeters. (Adjustable draw tubes may be had at same price if so ordered).

ARM—Curved form, furnishing a convenient handle and providing ample space for manipulation of large objects; distance from center of stage to arm is 80 mm.

STAGE—Rectangular, 110 x 105 millimeters; of Bakelite, solid throughout; harder and more durable than rubber; will not warp or fade.

FOCUSING ADJUSTMENTS—Diagonal cut rack and pinion coarse adjustment; Lever type side fine adjustment with 34 threads of the fine adjustment screw always engaged.

SUBSTAGE—An iris diaphragm, operated by a knurled ring easily grasped at any position on its circumference, is placed at the lower plane of the stage. This provides a most satisfactory means of regulating the intensity of illumination. When so ordered, a ring is provided for receiving the substage condenser.

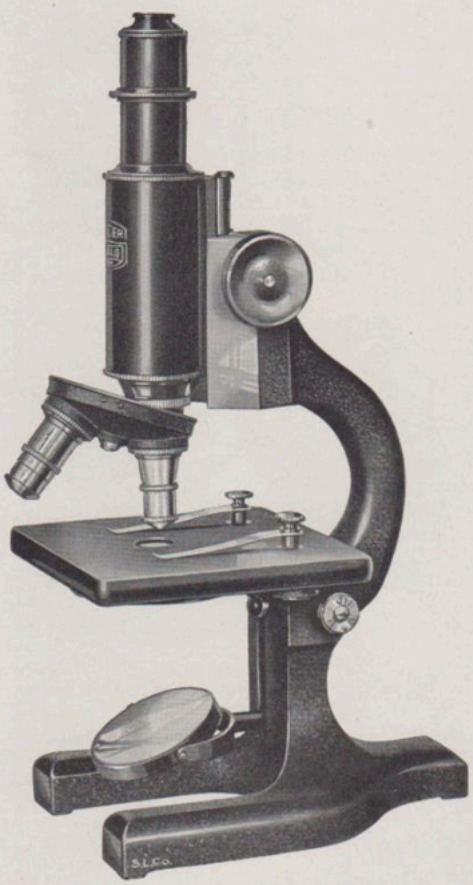
OPTICS—The objectives and eyepieces are of the high quality Spencer standard. The lenses in the objectives are mounted directly into the metal mounts.

CABINET—Polished hardwood with lock and key.

The following outfits include revolving nosepieces suitable for carrying the objectives listed.

Telegraph Code	Catalog No.	Substage Condsr N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial magnification		
Sixforb	64B	Not included	16-4	10-44	10x	71.75
Sixford	64D	Not included	16-4	10-44	6x-10x	74.50
Sixfore	64E	Included	16-4	10-44	10x	79.25
Sixforf	64F	Included	16-4	10-44	6x-10x	82.00
Sixforh	64H	Included	16-4-1.8 Oil imm.	10-44-95	6x-10x	113.50

Spencer Microscope No. 74



IS satisfactory for elementary school purposes, or in any laboratory work in which the required magnification is not over 350 diameters. It serves for commercial purposes in examining starches, drugs, earths, cements, fibers, meats for suspected parasites, paper-making materials, etc.

BODY TUBE—Of standard size with draw tube fixed at 160 millimeters.

ARM AND BASE—Made from two castings providing a convenient handle for the instrument and ample space for manipulation of large objects on the stage. It is provided with an inclination joint. Its rigidity especially recommends it for use by non-technical workers.

STAGE—Rectangular, 110 x 105 mm.; of new composition, solid throughout; harder and more durable than rubber; will not warp or fade.

FOCUSING ADJUSTMENTS — Diagonal cut rack and pinion only.

SUBSTAGE—An iris diaphragm, operated by a knurled ring easily grasped at any position on its circumference, is placed at the lower plane of the stage. This provides a most satisfactory means of regulating the intensity of illumination. When so ordered, a ring is provided for receiving the substage condenser.

CABINET—Polished hardwood.

Telegraph Code	Catalog No.	Nosepiece	Special Achromatic Objectives Equivalent Focus-mm.	Huyg. Oculars	Price
Sevforx	74x	None	Divisible 32-14	10x	$35.00
Sevfory	74y	None	Divisible 32-14—Special 5	6x-10x	45.25
Sevforz	74z	Double	Divisible 32-14—Special 5	6x-10x	52.00
Onothre	103	Special	Special 32-14—Divisible objective		6.50
Ononthre	113	Special	Special 5 mm.—Objective		7.50

The divisible objective, 32-14 mm., gives with 6x ocular, magnifications of 24 and 65 diameters; with the 10x ocular, 40 and 120 diameters. The special 5 mm. objective, with the 6x ocular 216, with the 10x ocular 360 diameters.

Spencer Microscope No. 75

A Real Pocket Microscope



THIS instrument is designed to meet the requirements of a large class of scientists who do not confine their work to their own laboratories but who frequently desire to carry a microscope to their work. For prospectors and scientific collectors, this instrument will prove an invaluable asset. It is not to be classed with toy instruments that have from time to time been placed on the market. This is a real workable microscope, having a body tube of standard length focusable by a smoothly sliding motion and by *standard fine adjustment.*

It is regularly equipped with a special divisible objective having a focal length of 6 millimeters when used complete, and 12 millimeters with the front element removed, and with a 10x huyghenian ocular. These combinations give powers sufficient for detecting minute botanical structures or for making standard blood counts with the haemacytometer. If desired, additional objectives of greater focal length for lower powers, or a specially mounted 4 millimeter objective for even higher power, may be added.

The illuminating device consists of a concave mirror so mounted on a fork as to be inclinable in all directions, and a special condenser of aperture suitable to the objectives listed with the instrument. The condenser is mounted on a swinging arm to be brought in or out of the optical axis as required.

The dimensions of the brass stage are 32 x 54 millimeters. Special clips with a double bend are attached to the under side of the stage in such a way that they can be easily brought into position for holding the slide and at the same time permit the latter to extend over the stage in any direction. Thus standard 3 x 1 slides may be used.

The body tube consists of four telescoping elements collapsing to a total length of 65 millimeters and readily extending to the standard 160 millimeters.

The entire instrument is mounted on a bed in the base of the case in such a way as to permit it to be slipped into the center of the support when required for use or brought to one end for folding. In packing, the divisible objective mentioned above is left in position on the tube while storage is provided in the cover for an additional objective.



The instrument and case are entirely of metal, neatly finished in alcohol-proof black enamel.

The dimensions of the case are 4 x 2½ x 1⅛ inches and the weight complete in case, is 13 ounces.

Tel. Code	Cat. No.		Price
Sevfiva	75A	Instrument as described, including special divisible objective 6 and 12 mm. focal length, one 10x huyg. ocular and condenser	$40.00

No. 115s—4 mm. objective in special short mount $15.00
No. 104s—32 mm. objective in special short mount..... $6.50

Silverman Illuminator for Microscopes

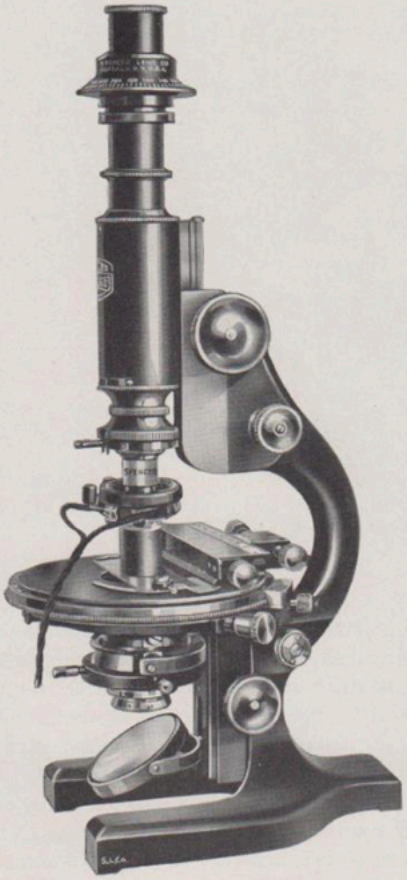


Fig. 1

THE problem of proper and adequate illumination for opaque and semi-opaque objects was solved by Professor Alexander Silverman, Head of the School of Chemistry, University of Pittsburgh, with the vertical illuminator which bears his name and which the Spencer Lens Company is now manufacturing and marketing under his patents.

The Silverman illuminator consists of an annular bulb with an annular tungsten filament following the lumen of the bulb. The bulb is mounted in an annular reflector cut away at one of the flat sides to allow the reflection from the ring of light to escape to illuminate the object. This reflector forms a support for the bulb and a means by which it may be connected to the microscope objective which it surrounds.

The connecting means consists of three fingers pivoted on the reflector with springs holding them practically in radial position when not in use. There are two " handles " on the periphery of the annulus which when pressed together make the fingers form segments of a circle, the diameter of which about equals the inner diameter of the annuloid reflector. When the fingers are in this position the ring is slipped over the end of the objective. When the handles are released the ends of the fingers approach the center until they grip the objective thus holding the illuminator thereto.

Fig. 1 shows the illuminator attached to one of our new chemical microscopes. Fig. 2 shows greater detail. The broken wire runs to the resistance. The bulb is a low voltage and must therefore be used in connection with a resistance when used on an ordinary light circuit. It requires about 13.5 volts for ordinary visual work and 18 volts when used for photographic work. Resistances suitable for these purposes are supplied with each illuminator and will always be supplied for the 104-124 volt circuit unless otherwise ordered. If the 208-248 volt circuit is used be sure to order suitable resistances. A contact key which must be held down steps up the current for photographic purposes. Be sure to turn off the current when the lamp is not in use, thus conserving the bulb. The black button on the resistance turns off the current, the white one turns it on. Ordinarily a bulb will last about 100 hours, all told, when used in the lower voltage or 3 or 4 hours when used for photography. We do not guarantee any length of life. Like all bulbs, they vary.

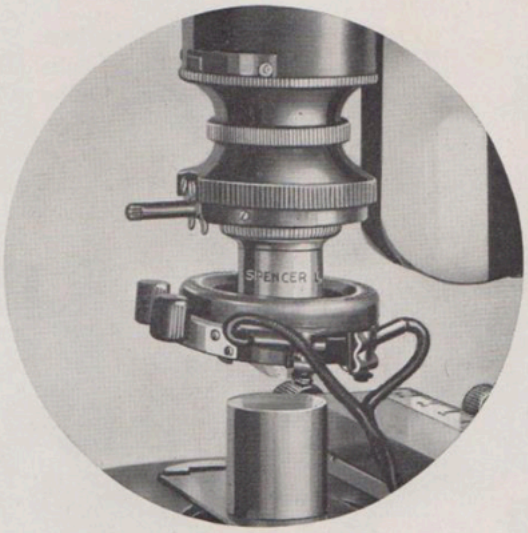
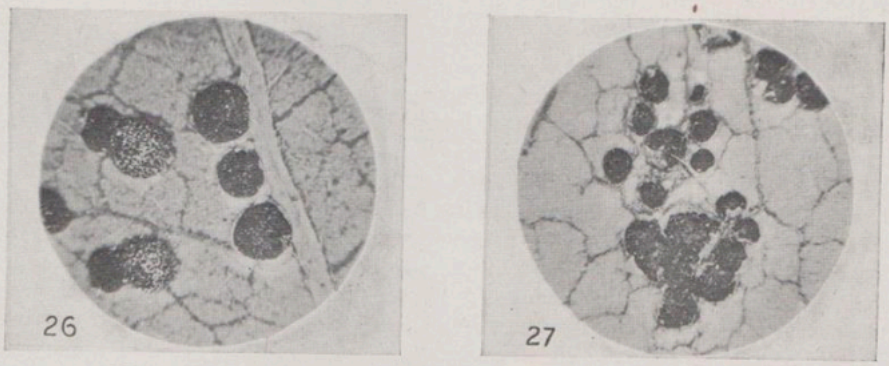


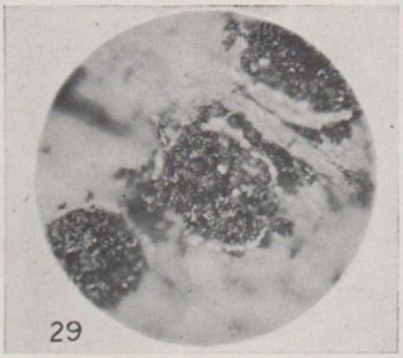
Fig. 2

The great advantage in using the Silverman illuminator lies in the even illumination over a large area. The illumination of the object from all sides and at the same time into any interstices gives a sense of penetration, or depth, not obtained by any other vertical illuminator. This, together with the soft steady light, alleviates the eye strain and gives a better interpretation of the object than can be obtained by any other illumination. For photographing opaque objects under medium and lower powers the illuminator surpasses all others for the reasons given above and for the additional reason that no careful manipulation of light is necessary. If the illuminator is properly placed the light is always ready for the best work. To illustrate the difference between the Silverman illuminator and any other vertical illuminator the following comparisons are given:



LEAF RUST. 60 diameters reduced 1/3. 26 with Silverman, 27 without it.





LEAF RUST, 100 diameters reduced ⅓. 28 with Silverman, 29 without it.

When using low power binoculars with the twin objectives it is more desirable to mount the illuminator independently of the object. The support holding the illuminator clamps on to the edge of the microscope stage. Sometimes the texture is brought out better by using light more or less from one side. The light from the side is shut off by a small shutter. A spring is fastened to the plate, spring this into the inside of the ring thus holding the plate against the lower surface of the lamp.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Fivsevnsix	576	Silverman Illuminator, complete, consisting of 1 illuminator holder, 2 illuminator lamps of plain (colorless) glass, 1 stage adapter, 1 shutter, 1 absorption disc, 1 adjustable rheostat and necessary connections for 110-volt* circuit	$45.00
Fivsevnate	578	Extra bulb, plain (colorless) glass, each ..... Net	5.00
Fivsevnnin	579	Silverman Illuminator bulb—standard size—daylight glass, each ..... Net	6.00

*For rheostat for 220-volt circuit, (Cat. No. 585) add $2.50

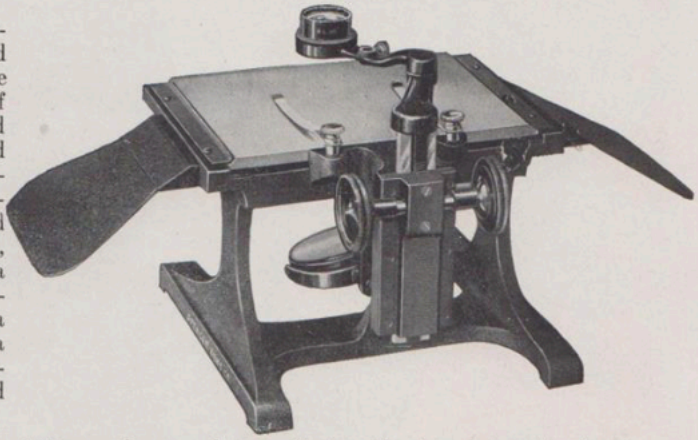
Large Silverman Illuminator

THIS illuminator is constructed on the same principles and presents the same optical advantages as the smaller one. It is designed to illuminate large areas and to rest directly upon a large object, a part of which is to be examined, such as textiles, paper, etc. It is generally used in connection with low power binocular microscopes, particularly those mounted to examine large objects.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Fivsevnsevn	577	Large Silverman Illuminator, complete as described above	$50.00
Fivateo	580	Extra bulb, plain (colorless) glass, each ..... Net	5.50
Fivateon	581	Large Silverman Illuminator bulb, daylight glass ..... Net	6.50
		RHEOSTATS FOR EITHER TYPE ILLUMINATOR	
Fivatethre	583	Silverman Illuminator Adjustable Rheostat for 110-volt Circuit	$15.00
Fivatefiv	585	" " " " " 220-volt Circuit	17.50

BE SURE TO SEND CORRECT VOLTAGE WHEN ORDERING ILLUMINATORS AND BULBS

Spencer Dissecting Microscope No. 80

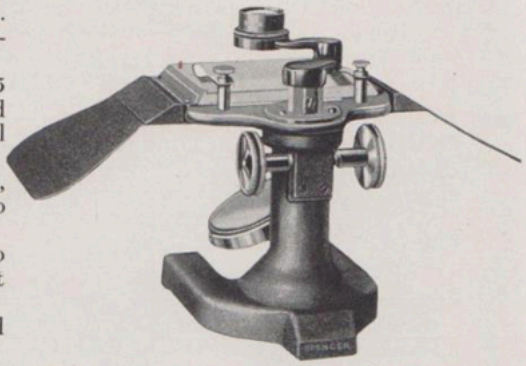


IN this dissecting microscope we use the stand of binocular microscope No. 57. The stand is of exceptional size and is very substantial and rigid. It is capable of receiving the compound erecting body No. 87 and binocular body of No. 57, thus making it truly a universal dissecting microscope. It will also carry a standard camera lucida when used with simple magnifiers or with the compound erecting body.

The plate glass stage, 146 x 100 mm. is securely attached to the base by spring brass clips. A metal black and white plate fits beneath the glass stage.
Adjustment is by diagonal cut rack and pinion having a range of 75 mm.
The lens arm is of extra length for swinging over large areas of the stage.
Detachable metal hand-rests are included.
Furnished in hardwood case, with lock and key.

Telegraph Code	Catalog No.	Type and Magnification of Lens	Equivalent Focus-mm.	Working Distance-mm.	Price
Ateoa	80A	9x Doublet	27.8	15.	$40.00
Ateob	80B	6x and 12x Doublets	41.6 and 20.8	22. and 12.	41.75
Ateoc	80C	9x Triple Aplanat	27.8	24.5	44.00
Ateod	80D	6x and 12x Triple Aplanats	41.6 and 20.8	36.8 and 18.4	49.75

Spencer Dissecting Microscope No. 82



THIS is a well made, thoroughly serviceable and convenient instrument. It finds wide use in elementary biological laboratories.

STAGE—is of polished plate glass, 100 x 75 millimeters. It is provided with black and white backgrounds and detachable metal hand-rests.

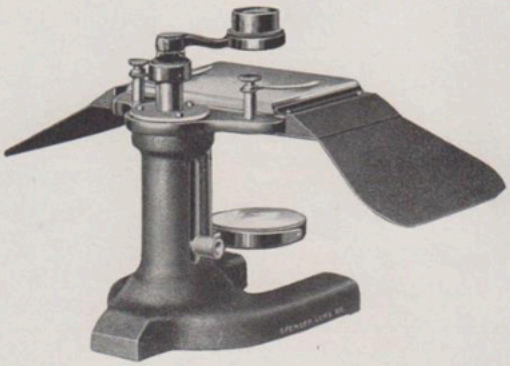
BASE AND PILLAR—are one solid casting, perfectly rigid and of sufficient weight to insure stability to the instrument.

LENS ARM—is jointed in such a way as to permit the lens to be carried over any part of the stage.

ADJUSTMENT—is by diagonal cut rack and pinion. Furnished in hardwood case.

Telegraph Code	Catalog No.	Type and Magnification of Lens	Equivalent Focus-mm.	Working Distance-mm.	Price
Atetoa	82A	9x Doublet	27.8	15.	$26.75
Atetob	82B	6x and 12x Doublets	41.6 and 20.8	22. and 12.	28.50
Atetoc	82C	9x Triple Aplanat	27.8	24.5	30.75
Atetod	82D	6x and 12x Triple Aplanats	41.6 and 20.8	36.8 and 18.4	36.50

Spencer Dissecting Microscope No. 84



IN this dissecting microscope efficiency and durability are combined with very low cost.

The STAGE, BASE and PILLAR are identical with those of Dissecting Microscope No. 82.

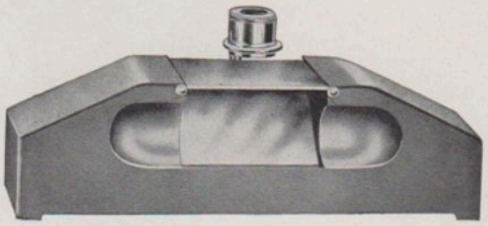
FOCUSING is accomplished by sliding the cylindrical support up or down in its bearing. This is actuated by a knob so placed as to be conveniently grasped by the right hand. A spring bearing at the lower end of the pillar insures a steady and uniform movement by which even the highest power magnifiers can be accurately focused.

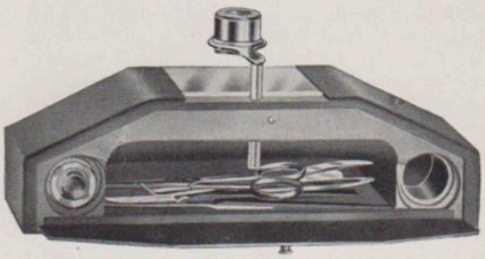
¶ Furnished in hardwood case.

Telegraph Code	Catalog No.	Type and Magnification of Lens	Equivalent Focus-mm.	Working Distance-mm.	Price
Atefora	84A	9x Doublet	27.8	15.	$20.00
Ateforb	84B	6x and 12x Doublets	41.6 and 20.8	22. and 12.	21.75
Ateforc	84C	9x Triple Aplanat	27.8	24.5	24.00
Ateford	84D	6x and 12x Triple Aplanats	41.6 and 20.8	36.8 and 18.4	29.75

Spencer Dissecting Microscope No. 86

THIS instrument is well known to biologists as "Barnes Dissecting Microscope." It has become very popular in high schools and other laboratories where a really reliable instrument is required and at low cost.

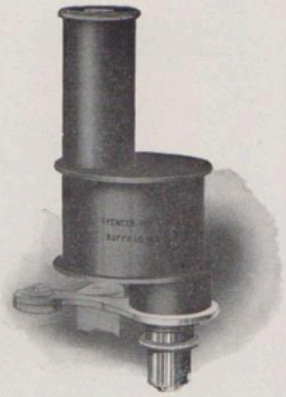




The supporting block is so shaped as to make convenient hand rests. Glass stage is 65 x 68 millimeters. Beneath the stage is set a reflecting mirror inclined at 45 degrees to the horizontal. The sides of the block are cut in such a way that light is reflected to the object even when the instrument does not directly face the light source. Black and white backgrounds are furnished. The lens arm swings freely from side to side and provides for focusing. The back of the block is hollowed out to form a convenient storage place for dissecting instruments and extra lenses and covered by a metal door hinged at the lower edge of the block.

Telegraph Code	Catalog No.	Type and Magnification of Lens	Equivalent Focus-mm.	Working Distance-mm.	Price
Atesixa	86A	9x Doublet	27.8	15.	$ 6.50
Atesixb	86B	6x and 12x Doublets	41.6 and 20.8	22. and 12.	8.25
Atesixc	86C	9x Triple Aplanat	27.8	24.5	10.50
Atesixd	86D	6x and 12x Triple Aplanats	41.6 and 20.8	36.8 and 13.4	16.25

Spencer Monocular Erecting Body No. 87



THIS erecting body consists of a set of porro prisms, mounted in a suitable protecting box with society thread and tube for receiving any standard objectives and eyepieces. It is adaptable to dissecting microscopes and gives the advantage of an " erected " image with capacity for using higher magnifications than are obtainable either with the dissecting binocular or with the single magnifier of simple dissecting microscopes. ¶ It is regularly furnished with a long jointed arm with pin to fit into the opening in the top of the adjustable pillar of dissecting microscopes Nos. 80 and 82.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateseva	87A	Erecting body without objective or ocular	$25.00
Atesevb	87B	Erecting body with 10x ocular	27.75
Atesevc	87C	Erecting body with 16 mm. objective, 10x ocular	35.75

Spencer Popular High School Dissecting Microscope No. 89



THIS microscope has been designed to meet the demands for an efficient and yet inexpensive " Barnes Dissecting Microscope." It consists of a hardwood block, nicely finished, on which is mounted a mirror, glass plate held in metal frame, providing a substantial stage, adjustable lens arm providing lateral and vertical adjustment and a magnifier ¾" diameter in metal mount.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Atenint	89T	Barnes dissecting microscope with magnifier No. 240	$3.00
Atenina	89A	With 9x Doublet Magnifier	4.00
Ateninb	89B	With 6x and 9x Doublet Magnifiers	5.75






SPENCER ACHROMATIC OBJECTIVES

Telegraph Code	Catalog No.	Equiv. foc.-mm.	Initial Magnification	Type	Num. Aperture	Working Distance mm.	Diam. of real field mm.	Mic.‡ Value	Price
						With 160 mm. tube length and 10x eyepiece			
Onoon	101	48	2.0	dry		52.5	7.0	.06	$5.00
Onoto	102	40	2.6	dry		35.2	5.3	.0453	5.00
Onofor	104	32	4.0	dry	0.10	21.0	4.0	.0338	6.50
Onosev	107	25	5.8	dry	0.20	10.0	2.65	.0227	6.50
Onoate*	108*	16	10.0	dry	0.25	4.5	1.47	.0126	8.00
Ononto	112	8	20.	dry	0.50	1.44	0.69	.0058	13.50
Ononfiv	115	4	44.	dry	0.66	.72	.34	.0029	15.00
Ononate	118	4	45.	dry	0.85	0.3	.34	.0029	15.00
Ontoto	122	3	60.	dry	0.85	0.2	.26	.0019	18.00
Ontofor	124	3	60.	Water imm.	1.00	0.24	.26	.0019	30.00
Ontofiv	125	3	60.	Oil imm.	1.25	0.25	.26	.0019	30.00
Ontosev	127	1.8	95.	Oil imm.	1.25	0.13	.15	.0013	35.00
Ontoate	128	1.5	115.	Oil imm.	1.25	0.10	.12	.0011	50.00

SPENCER FLUORITE OBJECTIVES

Ontoo	120	4	44.	dry	0.85	.57	.34	.0029	$25.00
Onthreo	130	1.8	97.	Oil imm.	1.30 or 1.25	.14	.15	.0013	48.00
Onthreon	131	3	60.	Oil imm.	.95	.25	.26	.0019	32.50

SPENCER APOCHROMATIC OBJECTIVES

Onfivo	150	16	10.	dry	0.30	4.5	1.35	.013	$26.00
Onfivto	152	8	20.	dry	0.65	1.24	.62	.00625	39.00
Onfivfor†	154	4	44.	dry	0.95	.20	.29	.00285	52.00
Onfivsix†	156	3	60.	dry	0.95	.16	.21	.00205	56.00
Onfivate	158	2	90.	Oil imm.	1.30	.14	.145	.00145	69.00
Onfivnin	159	2	90.	Oil imm.	1.40	.14	.140	.00145	~~100.00~~
Onsixo	160	1.5	113.	Oil imm.	1.30	.08	.10	.0009	90.00
Onsixon	161	3	60.	Oil imm.	1.30	.20	.21	.00205	69.00
Onsixto	162	3	60.	Oil imm.	1.40	.17	.21	.00205	~~100.00~~

*This objective is so constructed that the front element may be removed and the back element alone used. The focal length of the back element is approximately 32 millimeters.

†Furnished in adjustable mounts.

‡Value on the stage of 0.1 mm. in the focal plane of the eyepiece.

Huyghenian Oculars



THESE oculars have been redesigned so that the eyepoint is somewhat higher than in the former series. This feature will be appreciated by microscopists who wear glasses. They are engraved with numbers indicating the times that they magnify the objective image. Unless otherwise ordered they are supplied in mounts of suitable size to fit standard microscope draw tubes, 23 mm.

Telegraph Code	Catalog No.	Power	Equivalent Focus	Price
Onthrefor	134	4x	62.5 mm.	$2.75
Onthresix	136	5x	50 mm.	2.75
Onthreate	138	6x	40 mm.	2.75
Onforo	140	8x	30 mm.	2.75
Onforto	142	10x	25 mm.	2.75
Onforthre	143	16x	15.6 mm.	2.75
Onforfor	144	12x	20 mm.	2.75

Planoscopic Oculars

RECOGNIZING the need for an eyepiece superior to that of the huyghenian type which has so long been the accepted standard, our technical bureau has produced an eyepiece of entirely new design by means of which is obtained a field not only larger and flatter than is shown by huyghenian oculars, but in which is incorporated a compensating element, which to a remarkable degree corrects certain defects that are inherent in all achromatic objectives. In fact, such is their degree of correction that they are properly classified as partial compensating oculars and are satisfactorily used with apochromatic objectives.
A test of these oculars demonstrates their superior qualities.

Telegraph Code	Catalog No.	Power	Equivalent Focus	Price
Onsevfiv	175	6x	40 mm.	$6.00
Onsevsix	176	8x	30 mm.	6.00
Onsevsev	177	10x	25 mm.	8.50
Onsevate	178	12x	20 mm.	8.50
Onsevnin	179	15x	16 mm.	8.50
Onateo	180	20x	12 mm.	8.50

Compensating Oculars

Telegraph Code	Catalog No.	Power	Equivalent Focus	Price
Onsixfor	164	1.5x	170 mm.	$6.00
Onsixsix	166	5x	50 mm.	6.00
Onsixsev*	167	10x	25 mm.	8.50
Onsixate	168	10x	25 mm.	8.50
Onsevo	170	15x	16 mm.	8.50
Onsevto	172	20x	12.5 mm.	8.50
Onsevthre	173	25x	10.0 mm.	8.50
Onsevfor	174	30x	8.3 mm.	11.00

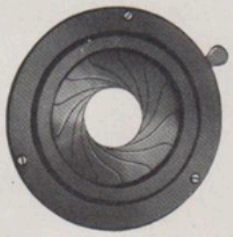
*Note: This eyepiece is constructed having an unusually high eyepoint. It is regularly supplied with an eyepiece cap above the eye lens. The entire field may easily be observed by a microscopist using glasses.



No. 300



No. 315



No. 325



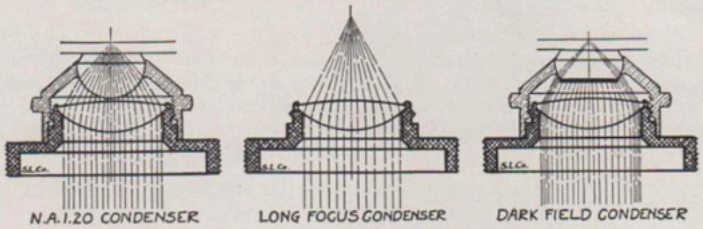
No. 305



No. 321

WE offer two distinct types of substage condenser: the ordinary or Abbe type and the achromatic type. The former has as good a degree of spherical correction as is practical with the simple design employed: they concentrate parallel rays of light to a small area and serve not only to increase the intensity of illumination, but also to utilize a wider angle of light than is otherwise employed, thereby taking advantage of a larger numerical aperture in the objective.

Spencer achromatic condensers are also aplanatic. That is, they are corrected both spherically and chromatically with the same degree of exactness as are our standard achromatic microscope objectives, so that the pencil of light directed through the object and into the objectives is as nearly as practical the theoretically correct cone of white light.



OUR new divisible condensers, Nos. 301 and 301s, corrected for increased illumination, has a three-fold purpose:

I. Used completely for illuminating the object when used with all types of objectives.

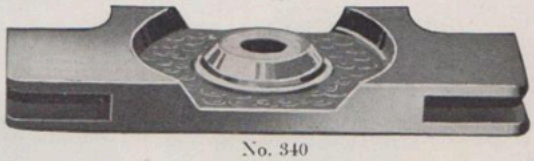
II. By removing the upper lens (unscrew it) provides a long focus condenser, corrected for use with low power objectives and especially for drop culture work.

III. By replacing the upper lens with a dark-field illuminator, made for the purpose, affords all the advantages of a separate dark-field illuminator, and obtainable at a very little extra cost. (See No. 341).

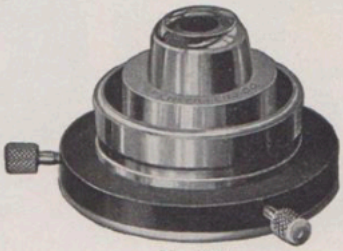
Telegraph Code	Catalog No.	DESCRIPTION	Price
Threoo	300	Abbe Condenser, large type, N. A. 1.20 without iris diaphragm .	$ 6.50
Threoon	301	Abbe Condenser, short focus type, N. A. 1.20 without iris diaphragm	6.50
Threofiv	305	Wide Angle Abbe Condenser N. A. 1.40 without iris diaphragm	8.50
Threoos	300s	Abbe Condenser, large type, N.A.1.20 in iris diaphragm mount for use on microscopes equipped with simple fork-type substages	11.00
Threoons	301s	Abbe Condenser, short focus type, N. A. 1.20 ditto	11.00
Threonfiv	315	Achromatic Condenser N. A. 1.30 without iris diaphragm	25.00
Thretoon	321	Achromatic Condenser N. A. 1.40 without iris diaphragm	25.00
Thretofiv	325	Iris Diaphragm for use with above condensers on microscopes equipped with quick screw substages	4.50

Note: The front elements of *all* the above condensers may be removed, and the rear combinations used as a low power condenser.

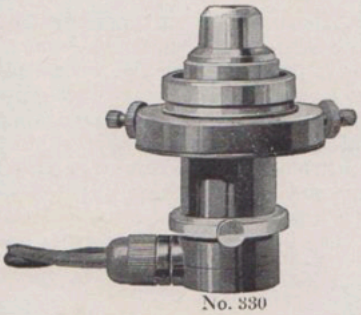
Spencer Dark Field Illuminators



No. 340



No. 342



No. 330

THE first and simplest, No. 340, is that in which the apparatus is mounted in a metal plate to be placed on the stage of the ordinary microscope. This possesses certain advantages of simplicity and quickness of operation that make it especially desirable for those who use the same microscope for a variety of purposes. ¶ No. 342 is the standard substage type designed to replace the substage condenser. This possesses the advantage of centering screws and can thus be more accurately adjusted, and when properly aligned it is much less likely to be accidentally moved. This was by far the most extensively used and satisfactory instrument until the introduction of the newer instruments with electric light included. ¶ The newest, most satisfactory, and most easily adjusted instrument is No. 330, in which an electric light is included as an integral part of the apparatus. This instrument was designed especially to meet the requirements of the U. S. Army Medical School and Hospitals where compactness as well as ease and convenience of manipulation are prime requisites.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threforon	341	Dark-field element to fit condensers, 301 and 301s	$ 5.00
Thretoate	328	Substage dark-field illuminator with built-in electric light including one bulb and objective stop to fit simplified rack and pinion fork-type substages	35.00
Thretonin	329	Ditto to fit research fork-type substages	35.00
Threthreo	330	Ditto to fit quick screw substages	35.00
Threthreon	331	6-volt, 12-candle power bulb for above, ... Net	.65
Threthresix	336	Resistance to adapt No. 331 bulb to 220-volt current	8.00
Threthresevn	337	Resistance to adapt No. 331 bulb to 110-volt current	6.00
Threnino	390	Transformer to step down 220-volt alternating current to 6volts	6.00
Threninon	391	Transformer to step down 110-volt alternating current to 6 volts	6.00
Threthrenin	339	Substage type dark-field illuminator with objective stop to fit research type substages	22.00
Threforto	342	Ditto to fit quick screw substages	22.00
Threforfor	344	Ditto to fit simplified rack and pinion fork-type substages	22.00
Threforo	340	Dark-field illuminator to be used above the stage. with objective stop	15.00

Note: Special funnel stops must be made for objectives other than our own manufacture and for this work a slight additional charge is made. The objectives should be sent to the factory to insure proper fitting.

Spencer Vertical Illuminators

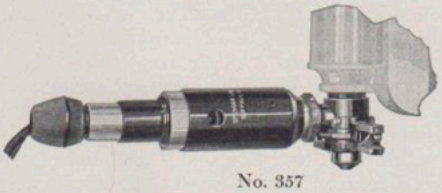


No. 350

NO. 350 Vertical Illuminator is constructed to screw into the body tube of the microscope between it and the objective. The light is directed into the opening in the side, where it strikes the silvered surface of a prism by which it is reflected to the object to be examined. It is then reflected back through the objective to the eye. The opening in the side is arranged so that it can be turned in any direction and the prism is so mounted that it can be rotated on its axis.

Vertical Illuminator No. 355 is like No. 350, except that the reflecting prism is replaced by a plate glass disc.

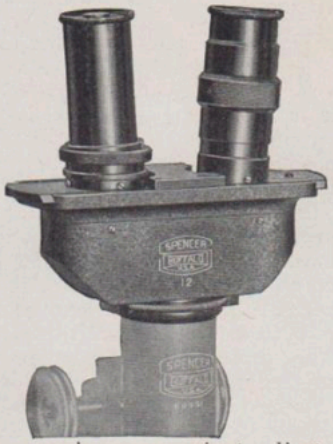
The Electric Vertical Illuminator No. 357 contains a special compound prism, so constructed that secondary reflections can not reach the eye or camera. Thus a field having a "fogged" appearance is avoided. Attached to the vertical illuminator is a tube containing a low voltage bulb and a carefully formulated condensing system. The bulb and condensers are focusable in their mountings, so that an even and brilliant illumination may be obtained over the entire field. An iris diaphragm controls the intensity of illumination.



No. 357

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threfivo	350	Vertical Illuminator, with prism reflector	$13.00
Threfivfiv	355	Vertical Illuminator, with plate glass reflector	13.00
Threfivsev	357	Electric Vertical Illuminator complete, as illustrated	35.00
Threthresev	337	Resistance to adapt above to 110-v circuit	6.00
Threthresix	336	Resistance to adapt above to 220-v circuit	8.00
Threthreon	331	Extra bulbs—6 volts ..... Net	.65

Spencer Diocular



THIS device, attachable to any standard compound microscope, possesses many advantages of the mon-objective binocular. ¶ The optical system in this apparatus is in all respects identical with that employed in our complete binocular microscopes, except that a negative lens has been introduced, compensating optically for the increased tube length that results from adding the binocular body to the tube of the ordinary microscope. The reduced field and higher magnification incidental to the greater tube length is practically balanced by the use of 6x in place of 10x oculars.

The features which characterize our binocular microscopes, such as convenient adjustment of pupillary distance, the register for individual settings and the focusing of one ocular independently of the other, are all incorporated in this attachment.

The instrument is usable with all standard oculars, the only necessary precaution being to see that they are properly matched. (We recommend the use of 6x oculars).

Telegraph Code	Catalog No.	DESCRIPTION	Price
Forforo	440	Diocular without oculars	~~$50.00~~ 60.00

Spencer New Universal Microscope Lamp No. 358



THIS microscope lamp has been designed primarily for use with the Spencer Universal Binocular Microscope. The illuminant and condensing system are so arranged that an intensely bright small spot of light or a larger spot up to 60 mm. in diameter may be obtained. The illuminant is a 11.5 volt concentrated filament miniature bulb.

This lamp is supplied with a base (illustrated) and with an adapter to attach to the Spencer Universal Binocular Microscope. The intensity of illumination is sufficient for practically all microscopic work. The lamp can, therefore, be used to illuminate the ordinary transparent specimens as well as opaque specimens. The adjustments are universal.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threfivatea	358A	Universal Miniature Lamp with base and adapter, blue and ground glasses	$12.50
Threthreon	331	6v, 12 C. P. Bulb. Net	.65
Threthresev	337	Resistance for 6-volt Bulb on 110-volt current	6.00

Spencer Electric Arc Lamp No. 360



THE arc lamp furnishes a more intense light radiating from a smaller source than any other type of illuminant; it is, therefore, especially useful where a strong light is required to be concentrated onto a small area for such purposes as dark-field illumination, etc.

The carbons are firmly held at an angle of about 70° to each other, found to be the most satisfactory angle for alternating current and is also entirely suitable for direct current. The lamp is mounted on a vertical rod, adjustable for both height and angle. The protecting hood is provided with smoked glass windows. The instrument is equipped with a focusable bulls-eye condenser and five feet of cord with plug.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Thresixo	360	Lamp with blue glass and ground glass	$27.50
Thresixob	360B	Lamp with Daylite glass	29.75
Thresixto	362	Fixed rheostat for 110 volts—5 amperes	10.00
Thresixfor	364	Fixed rheostat for 220 volts—5 amperes	12.50
Thresixsix	366	Carbons each	.06

Spencer New Microscope Lamp No. 368



THIS new lamp is an exceedingly practical lamp for general laboratory work. It consists of a 40-watt, 115-volt concentrated filament projection bulb mounted on a slideway, so as to provide ample adjustment. A ground and polished silvered glass reflector is placed directly back of the bulb to increase the illumination. The bulb and reflector are mounted to move as a unit to and from the condenser.

The illumination is sufficient for all purposes except dark-field work.

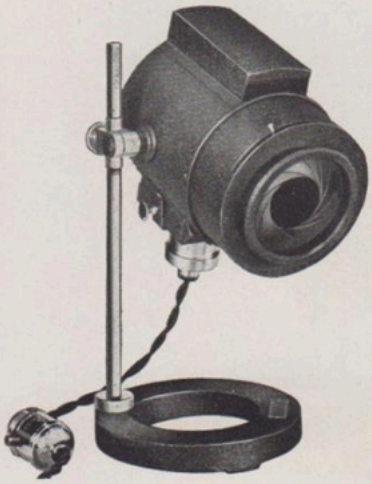
The blue and ground glasses or the daylite glass may be removed. The lamp is then serviceable for illuminating opaque objects for examination with a binocular microscope as well as the more ordinary microscope requirements.

The size of the spot of light may be controlled by moving the bulb in its slideway.

Five feet of cord with plug and switch are included with the outfit. An ideal outfit with small current consumption.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Thresixatea	368A	Lamp with bulb, blue and ground glass	$16.00
Thresixateb	368B	Lamp with bulb, and daylite glass	17.00
Thresixnin	369	40-watt, 115-volt concentrated filament projection bulb ..... Net	1.10

Spencer New Microscope Lamp No. 370



THIS new lamp has been produced to meet the demand for a high power microscope lamp of moderate size and price, equipped with a standard voltage bulb instead of a low voltage bulb.

The illuminant is a 100-watt, 115-volt monoplane filament projection bulb of high efficiency. A silvered reflector is mounted directly back of the bulb. The bulb and reflector are adjustable, as a unit, to and from the condensing system.

¶ The condensing lenses are formulated to project a brilliant spot of light. The size and intensity of the spot of light is controlled by moving the lamp in its slideway and by means of a large iris diaphragm in front of the outside condenser lens. When the blue and ground glasses, or the daylite glass, are removed, the lamp can be used for illuminating opaque objects.

The intensity of illumination is not equalled by any lamp of its type. The illumination is satisfactory for dark-field work. Five feet of cord with plug and switch are included with each lamp.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Thresevoa	370A	Lamp with bulb, blue and ground glass	$22.00
Thresevob	370B	Lamp with bulb, and daylite glass	24.00
Thresevon	371	100-watt, 115-volt projection Bulb, ... Net	~~1.65~~ 2.00
Thresevona	371A	125-watt, 220-volt Bulb ..... Net	3.00

Spencer New Laboratory Lamp No. 372



THIS lamp has been designed for laboratory use. One lamp will provide efficient illumination for four or more microscopes, depending on the seating arrangement. The lamp consists of a heavy stand, a 150-watt daylite bulb, a special globe, frosted inside, and a metal shade. The entire lamp is finished in beautiful crystal black enamel, which is both alcohol and reagent proof. The under surface of the shade is finished in white enamel, so that a white light is reflected to the table top.

The lamp is constructed so that no direct light will reach the eyes of the observers. The table top, however, is well illuminated so that additional illumination in the laboratory is not required.

The illumination approximates daylight, and micro specimens are observed with their true color values. This microscope lamp is about 17 inches high. The globe is 10 inches in diameter and the shade 17 inches in diameter.

Eight feet of flexible silk cord with switch are included with the outfit.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Thresevto	372	Table Lamp, complete with bulb as described	$25.00
Thresevthre	373	150-watt, 115-volt P. S. daylite Bulb.....Net	1.00

Spencer Microscope Lamp No. 374



THIS is an exceedingly practical lamp for general laboratory work. It consists of a standard commercial 150-watt, 115-volt gas-filled pear-shaped Mazda bulb mounted in a well ventilated hood in such a way as to provide ample adjustment.

By means of a reflector back of the bulb and a bulls-eye condenser in front of it, the light is well concentrated to a small area; it is, therefore, serviceable for illuminating opaque objects for examination with binocular microscopes as well as for the more ordinary microscope requirements.

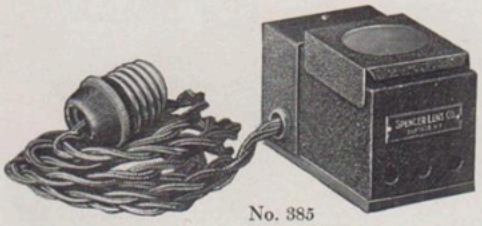
Five feet of cord, with plug and key socket, are included with the outfit.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Thresevfor	374	Lamp with one bulb, blue and ground glass	$17.50
Thresevforb	374B	Lamp with one bulb and daylite glass.....	18.85
Thresevate	378	150-watt, 115-volt P. S. 25 Mazda bulb ..... Net	.75
Thresevatea	378A	150-watt, 220-volt P. S. 25 Mazda bulb ..... Net	1.00
Threateo	380	Resistance for 150-watt bulb in series on 220-volt current	7.50

Spencer Substage Microscope Lamp

No. 385

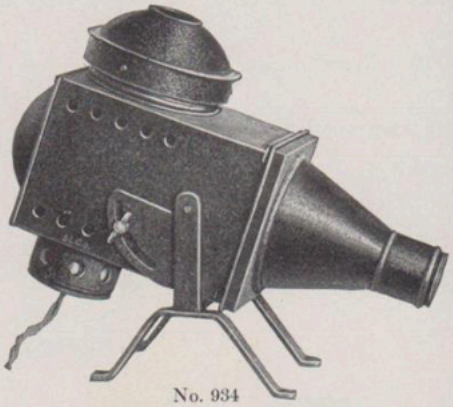
THIS is an exceedingly convenient lamp for use with the microscope. It is very compact, attaches to any standard 110-volt socket and, placed directly beneath the stage of the microscope, gives illumination sufficient for the most exacting work.



No. 385

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threatefiva	385A	Lamp with one bulb, blue and ground glass	$5.50
Threatefivb	385B	Lamp with one bulb and daylite glass	6.50
Threatesix	386	15-watt, 115-volt concentrated filament bulb .. Net	.80
Threatesev	387	Resistance for a 15-watt bulb in series on 220-volt current	4.25

Spencer High Power Mazda Microscope Lamp No. 394

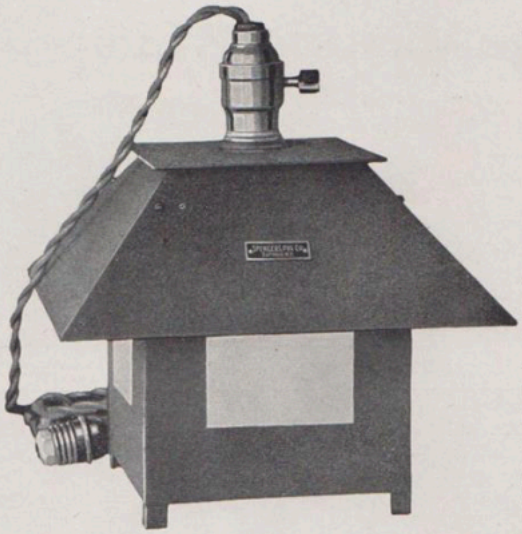


No. 934

THIS lamp furnishes a strong beam of light without the objections incident to an arc. It is equipped with a 400-watt Mazda gas-filled concentrated filament bulb, back of which is a silvered glass reflector. Directly in front of the bulb is a pair of four and one-half inch diameter condensing lenses, which throw a converging beam of light, very intensely illuminating an area about two inches in diameter. It thus becomes an excellent instrument for use with the dark-field illuminator, for photo-micrography and other microscope work. The apparatus may be tilted at any desired angle.

This lamp may be supplied with an attachable section and projection lens to form an efficient compact and very convenient stereopticon. See list below.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threninfor	394	Lamp with bulb, one blue and ground glass	$30.00
Threninforb	394B	Lamp with one bulb and daylite glass	32.25
Ateotoate	8028	Set of accessories to convert 394 lamp into a stereopticon for lantern slide projection, including lens	20.00
Threatefivthre	3853	Resistance for 400-watt bulb, in series on 220-volt current	8.75
Foroonin	4009	400-watt, 120-volt Mazda bulb Net	~~3.20~~
Foroono	4010	400-watt, 115-volt Mazda bulb Net	~~3.20~~
Foroonoa	4010a	400-watt, 230-volt Mazda bulb Net	~~6.00~~
Foronono	4110	Heat absorbing glass for 394 Lamp	5.00



The Chalet Lamp No. 395

THIS lamp was designed by Prof. S. H. Gage, of Cornell University, for use in his own and his students' laboratories. It has been found to be an eminently practical instrument.

The outfit consists of a sheet metal box, six inches square by eleven inches high, having wide, overhanging eaves on two or four sides, as required. The overhang of these eaves is such that light does not reach the eyes directly but that an even illumination is diffused over the table for general work. Illumination for microscopic work is obtained from three inch square windows of special Daylite glass, which gives a light that is practically ideal for the purpose. The inside of the lamp house and the under side of the overhanging eaves are finished in white enamel.

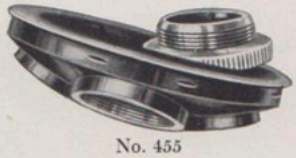
The illuminant is a 150-watt, 115-volt pear-shaped Mazda bulb.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threninfiva	395A	Lamp with one Daylite glass window	$13.00
Threninfivb	395B	Lamp with two Daylite glass windows	16.00
Threninfivc	395C	Lamp with four Daylite glass windows	22.00
Thresevate	378	150-watt, 115-volt P. S. 25 Mazda bulb ... Net	.75
Thresevatea	378A	150-watt, 220-volt P. S. 25 Mazda bulb ... Net	1.00
Threateo	380	Resistance for 150-watt bulb in series on 220-volt circuit	7.50

Spencer Revolving Nosepieces



No. 450



No. 455

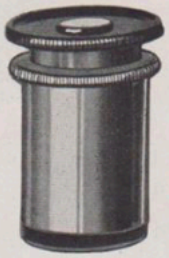
THESE nosepieces are made with extreme precision. The greatest care is exercised in their centering and they have the requisite rigidity for permanently retaining their adjustment. The finish is alcohol-proof black enamel with the focal lengths of the standard objective to be used in each receptacle neatly engraved on the edge of the revolving portion.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Forfivo	450	Double nosepiece	$6.50
Forfivfiv	455	Triple nosepiece	8.00
Forsixo	460	Quadruple nosepiece	10.00

Spencer Micrometers

THE following list of micrometers for use both on the stage of the microscope and in the eyepieces is selected with especial care, having in mind the purposes for which they are to be used. We have endeavored to steer a medium course between the demands for extreme exactness and for easy visability of lines.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Foroo	400	Stage Micrometer, Glass object slide with 2mm. scale divided into 200 parts	$3.50
Forofiv	405	Eyepiece Micrometers 5mm. divided into 50 parts (to 0.1mm.)	2.25
Forosix	406	Same micrometer as 405 to be used with low-power ocular 192P	3.25
Forosevn	407	Same micrometer as 405 to be used with low-power oculars 191P, 193P, 194P, 195P and 196P	3.25
Forono	410	5mm. divided into 100 parts (to 0.05mm.)	2.50
Foronin	409	Same micrometer as 410 to be used with low-power oculars 191P, 193P, 194P, 195P and 196P	3.50
Foronon	411	Same micrometer as 410 to be used with low-power ocular 192P	3.50
Foronto	412	"Step" micrometer disc	3.50

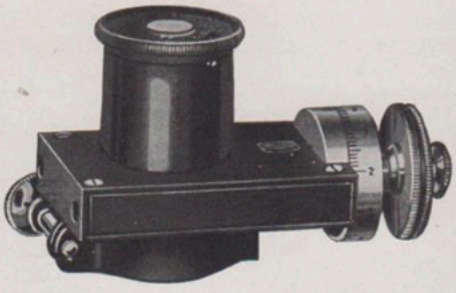


Micrometer Eyepieces With Fixed Scale

THESE instruments consist of standard eyepieces having the eye lens made focusable by spiral action. The micrometer disc is fixed to the diaphragm of these eyepieces and can be brought into sharp focus for any eye.

No. 405 Eyepiece micrometer disc is fitted in No. 415 Micrometer eyepiece and No. 410 Eyepiece micrometer in No. 420 Micrometer eyepiece.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Foronfiv	415	Micrometer eyepiece, 6x	$7.25
Fortoo	420	Micrometer eyepiece, 10x	7.25



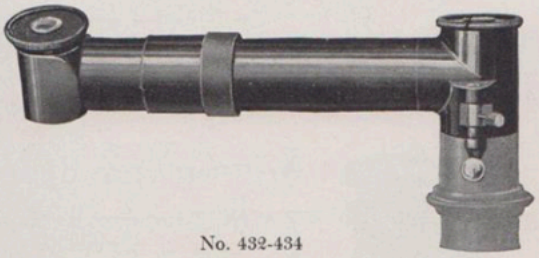
Filar Micrometer

THIS micrometer eyepiece represents the highest type of precision in construction and guarantees the greatest possible accuracy of measurement. Instead of the usual cross hairs, a finely-ruled glass scale is used in its construction. Each interval in the scale is exactly equivalent to one revolution of the screw which moves it: fractions of a

revolution of this screw are indicated by a drum graduated into 100 parts and which may be rotated on the screw axis to adjust its zero reading to any required position. This system has important advantages, especially in the measurement of large objects. Unlike other micrometers, it does not require the moving of the index over the entire length of the object, as a fraction of one rotation of the screw is all that is ever necessary. ¶ In measuring the length of an object, the scale is moved until one of the millimeter lines coincides with the margin of the object under examination; and then, by noting the amount of revolution necessary to bring another line into coincidence with the opposite side, the fractional part of the last division can be read to hundredths.
The scale has thirty divisions, with every fifth division indicated by a line of double length and numbered.
Permanence of position of the instrument on the microscope is assured by a spring collar, which is set tight on the top of the microscope tube by a thumb screw.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Fortofiv	425	Micrometer Eyepiece	~~$38 00~~

Spencer Demonstration Oculars



No. 432-434

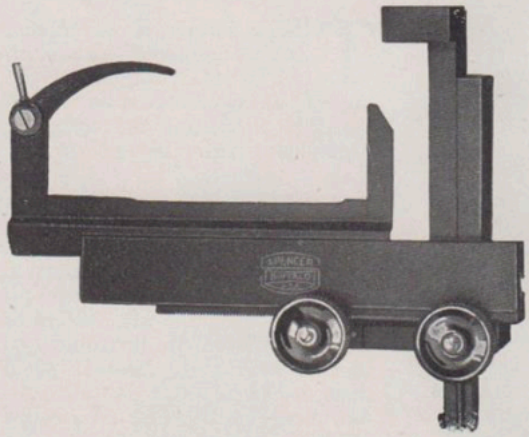


No.436-438

THIS is a well known device of extreme utility. It fits any standard microscope and enables the instructor to look in on the field that his pupil is studying. It is used by simply removing the ordinary eyepiece from the microscope and inserting the demonstration ocular in its place. The pupil then looks into the instrument as before and the instructor, by looking into the side tube, views the field at the same time; the instrument can thus be used either for giving instruction or for making quizzes. A conveniently located pointer, easily moved to any part of the field, is visible at the same time to both pupil and instructor.
The instrument is made in two designs. In numbers 432 and 434 the side tube extends out horizontally and the eyepiece revolves about the axis of the extension tube, so that the user of the extension can incline his eyepiece at such an angle to the vertical as he pleases, independently of the position of the microscope. In this design the auxiliary eyepiece is focusable independently of the one at the microscope tube by a knurled ring in the extension tube.
Numbers 436 and 438 have the extension tube fixed at an angle of about 120° to the microscope tube. The auxiliary eyepiece is placed in the end of this extension and is focusable independently of the other ocular by slightly varying its position in this tube.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Forthreto	432	With 6x oculars	~~$45.00~~ 55.00
Forthrefor	434	With 8x oculars	~~45.00~~ 55.00
Forthresix	436	With 6x oculars	~~35.00~~ 45.00
Forthreate	438	With 8x oculars	~~35.00~~ 45.00

Spencer Mechanical Stages

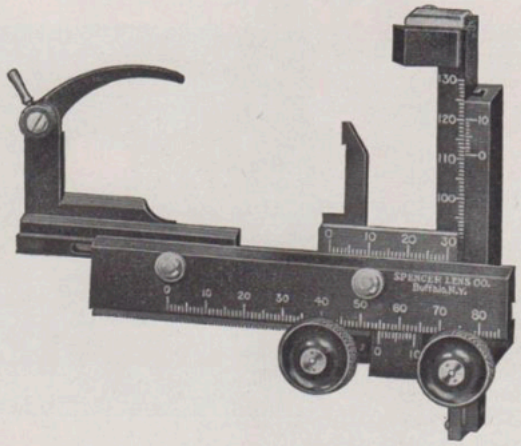


Mechanical Stage No. 484

THIS stage meets the requirements of a large class of pathologists and bacteriologists and others whose interest is in routine examination only and who do not care to record exact positions for future reference. It is permanently adjusted to receive standard size (1″ x 3″) slides. The range of motion is sufficient to completely cover such slides on microscopes having a stage of sufficient size for the purpose.

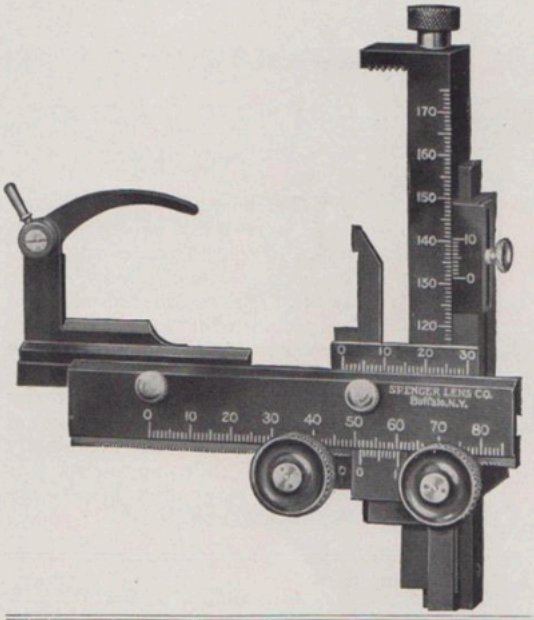
Telegraph Code	Catalog No.	DESCRIPTION	Price
Foratefor	484	Mechanical stage, in case	$25.00

Spencer Mechanical Stage No. 485



THIS is our most popular model. The arms are graduated for reading position in two directions at right angles to each other. These graduations are in millimeters with verniers reading to tenths. It is provided with a corner stop to insure its always assuming the same position on the stage of the microscope.
Both the spring finger and the end support for the slide are adjustable laterally to make compensation for different sized stages if the attachment is transferred from one instrument to another.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Foratefiv	485	Mechanical stage, in case	$30.00



Spencer Mechanical Stage No. 490

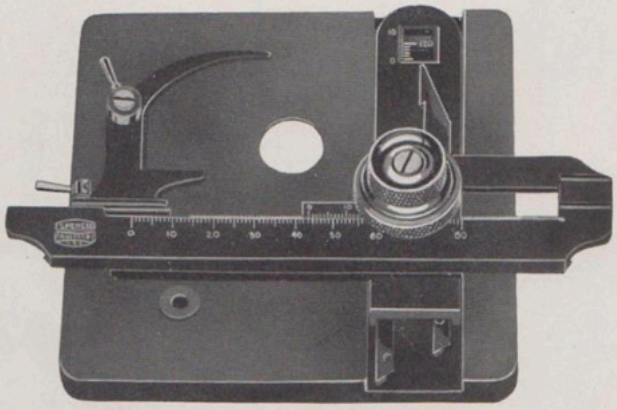
THIS is a stage of exceptional size, accommodating slides up to 2″ by 3″. It attaches to the edge of the microscope stage in such a way as to permit the corner of large slides to extend over the corner of the stage so that the entire area of even the largest sized slides can be brought under observation.

Adjustments are provided in both directions to permit compensation for varying sizes of microscope stages. Thus, if the attachment is transferred from one instrument to another having a different sized stage, it can be so set that all readings made on the first microscope will be true on the second.

Positions of the slide are read by verniers to tenths millimeters.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Fornino	490	Attachable mechanical stage, in case	$32.50

Spencer Mechanical Stage No. 493



THIS type of mechanical stage has proven so popular in connection with our revolving stage microscopes that we have been led to adapt it for use on rectangular stages as well. It differs from our "attachable" mechanical stages in that one of its racks for the rack and pinion movement is embedded in the stage of the microscope. (A slide fitting flush with the top of the stage is provided for covering this rack when the mechanical stage is removed). This method of attaching assures perfect uniformity of position, so that recorded readings are absolutely reliable and also that the slide carrier will always fit snugly to the surface of the microscope stage.

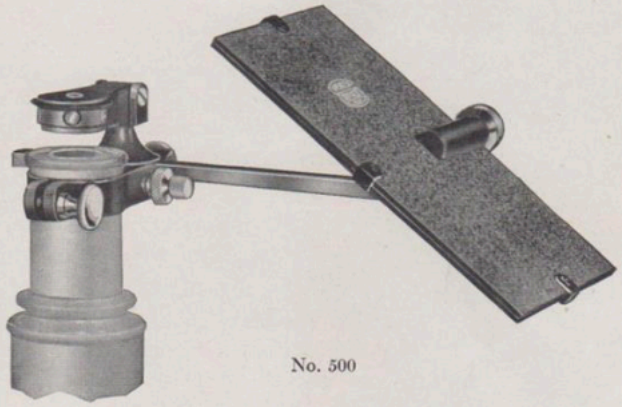
The pinion buttons are concentric, one being smaller and slightly above the other. Positions of the slide are read by verniers to tenths of millimeters.

Each instrument is individually fitted to the microscope which it accompanies and *must be ordered with it.* If required for microscopes that have already left the factory the microscope must be returned to be fitted with an entire new stage, for which an additional charge is made.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Forninthre	493	Mechanical stage as described—when ordered with the microscope.....	$35.00

See 495 Mechanical Stage, Page 15

Spencer Camera Lucidas Nos. 500 and 505



No. 500

IN these well-known instruments material improvements have been incorporated by which the entire field of the microscope is taken in, and the light can be so regulated as to illuminate both the object and the drawing pencil with the optimum relative intensity.

The adjustment for height is sufficient to permit the prism box to be brought to the eyepoint of any ocular from the highest to the lowest power. In No. 500 two concentric adjusting screws are provided for correct centering of the instrument over the eyepiece.

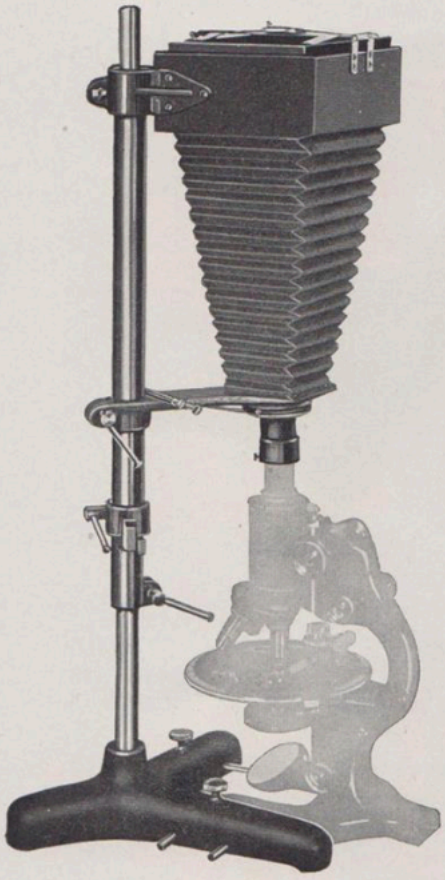
The entire prism box is so hinged as to swing on a horizontal axis and is thus easily thrown out of position for changing oculars or for careful examination of the object without the interposition of the prism.

In No. 500 the relative intensity of illumination of the object and drawing pencil is regulated by two carefully graded series of " smoked glass " discs; one between the prism and the eyepiece and the other between the prism and the mirror. By careful adjustment and correlation of these discs it is possible to divide the light to suit any individual requirements.

No. 505 differs from No. 500 in the omission of the centering screws from the prism box and the series of " smoked glass " discs between the prism and the eyepiece.

The mirror is of ample size (70 x 105 millimeters). It is supported on an adjustable bar, graduated to indicate the distance of the mirror from the microscope. Graduations are also provided to indicate the angle of inclination of the mirror.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Fivoo	500	Camera Lucida, in case	$30.00
Fivofiv	505	Camera Lucida, in case	20.00
Fivonfiv	515	Camera Lucida, in case for universal low power binocular	30.00



Spencer Photo-Micrographic Camera

THIS extremely simple apparatus meets a wide range of requirements and constitutes a valuable addition to the equipment of any laboratory.

The camera has been designed for but one purpose, photo-micrography, hence it has been possible to attain the utmost rigidity and simplicity.

The apparatus consists of a specially constructed camera (not a modified hand camera) supported on an upright pillar, attached to a heavy cast-iron tripod base. Between two feet of the tripod are adjustable stops by means of which a constant position of any given microscope can be assured.

The camera unit is adjustable vertically on the pillar, and may be rotated about the pillar through a complete circle. Suitable stops are provided so that the camera can always be returned exactly to its original position.

The camera box is designed to accommodate 4″ x 5″ plates in their plate holders. An adapter (No. 638) can be supplied so that 3¼″ x 4¼″ plates may also be used. A clamping device permits rapid interchange of ground glass and plate holders. This device also exerts sufficient downward pressure to completely eliminate any possibility of "fogging."

A high-grade photographic shutter, having time and bulb exposures, also speeds of 1, 1-2, 1-5, 1-10, 1-25, 1-50, 1-100 seconds is fastened to a rigid support, permanently aligned with the camera box. Light-tight connections are provided, fitting between the shutter and the microscope body tube.

Inasmuch as this apparatus is designed for photo-micrography only, no regular photo lens is supplied.

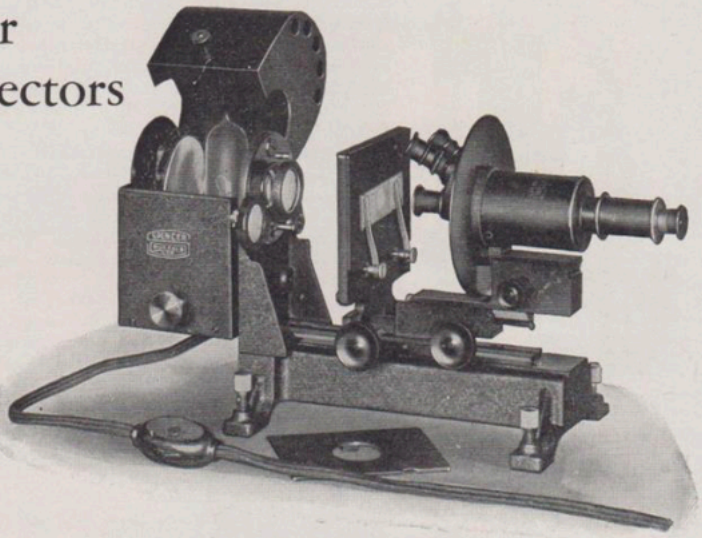
630—Camera complete with upright support, photographic shutter, two 4″ x 5″ or two 3¼″ x 4¼″ plate holders 875.00

638—Adapter plate to fit 3¼″ x 4¼″ plate holders, each 1.00

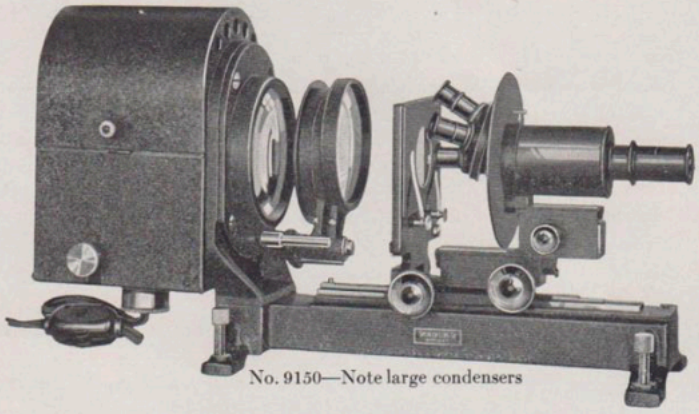
637—3¼″ x 4¼″ plate holders, each 2.00

642—4″ x 5″ plate holders, each 2.00

Spencer Micro-Projectors



No. 9100



No. 9150—Note large condensers

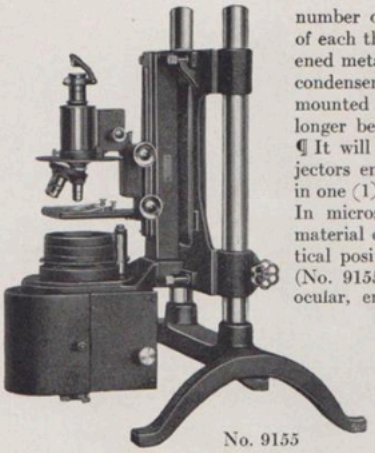
AN unusually simple, compact micro-projector of such weight to insure ease in moving about but also sufficiently heavy to insure rigidity.

The recently designed projection bulbs have been used in preference to the arc lamp since the disadvantages of the arc, even when direct current is used, appear to outweigh the somewhat greater intensity of illumination. The noise of the arc; the necessity of more or less adjustment, and of replenishing carbons is thus eliminated. It will be noted that the 6-volt, 108-watt single coil filament bulb is employed except in the case where direct current is used, in which case a 12-volt, 72-watt bulb is recommended. In micro-projection the light utilized is that derived from nearly a point source. Therefore, a greater wattage with larger filaments does not give as great intensity as the 108-watt coil filament bulb.

The optical equipment consists of a spherical reflector, a triple condensing system and a microscope equipped with special projection objectives and oculars. The reflector throws an image of the filament back through the light source and is found to be the most efficient when the reflected image and the direct image of the filament do not quite coincide. In this position the available illumination is almost double and the reflected image is not cut off by the filament. The reflector is accurately centered, if necessary, after the replacement of bulbs, by means of three centering screws projecting through the back of the hood. It is focused by a thumb screw located at the back of the hood below the three centering screws. The lamp itself has been provided with three adjustments: a lateral movement by a side screw, a vertical movement from below, and provision is also made for rotation so that the filament is placed in the proper position.

Large four inch condensers are used on Model No. 9150 to cover very large areas with low power objectives, or when employed as a drawing apparatus. The condensing systems are carefully computed for the definite purpose for which they are used and consequently accomplish results far superior to those obtainable with any system designed for " all-around " work. Thus the condensing system No. 9100 is the best available for micro-projection objectives of higher powers and No. 9150 for lower powers. A disc of special heat absorbing glass is mounted in a swinging arm in front of the condensing system to protect fresh slides.

The microscope is of standard size with a body tube two inches in diameter fitted with a draw tube identical with those of all Spencer Microscopes. This draw tube is removable to permit the use of wide angle objectives without oculars (Spencer Micro-Teleplat Objectives). In addition to the regulation coarse and fine adjustments, the microscope, including the stage, is adjustable over an ample range to and from the condensing system by rack and pinion adjustment. The fine adjustment is the micrometer screw type in which a large



No. 9155

number of threads are always fully engaged through the complete 360° of each thread—a noteworthy feature of all Spencer Microscopes. A blackened metal disc five inches in diameter intercepts any stray light from the condenser that might otherwise " fog " the screen. Both instruments are mounted on substantial beds with leveling screws; No. 9150 with a much longer bed, giving sufficient range in focusing the low power objectives.

¶ It will be noted that the catalog numbers representing the micro-projectors end in zero (0) if equipped with the 12-volt, 72-watt bulb, and end in one (1) if equipped with the 6-volt, 108-watt bulb.

In microscopic projection of living material, such as freshly mounted material or with the hanging drop, the micro-projector is placed in a vertical position with the stage horizontal by means of a substantial stand (No. 9155). A right angle prism, placed over the end of the projection ocular, enables this projection to be accomplished with practically the same intensity of illumination as with the instrument in its horizontal position. The use of a prism instead of a mirror avoids the formation of a secondary image. The entire instrument mounted on the stand may be raised or lowered to conform with particular requisites of the screen employed.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninonoo	9100	Micro-Projector with 1½-inch condensers of high aperture especially suitable for use with objectives of 16 mm. and shorter focal lengths. Length of bed 10½ inches; length of entire apparatus, 14 inches; height, 10 inches. Equipped with triple nosepiece and 4x ocular, 12-volt, 72-watt bulb, and 15 foot cord, switch and plug. Without objectives	$150.00
Ninonoon	9101	Same as 9100 but with 6-volt, 108-watt bulb	150.00
Ninonfivo	9150	Micro-Projector with 4-inch condensers adapted to covering very large areas with low power objectives. Length of bed 13½ inches; length of entire apparatus, 20 inches; height 10½ inches with triple nosepiece and 4x ocular equipped with 12-volt, 72-watt bulb, and 15 foot cord, switch and plug. Without objectives	175.00
Ninonfivon	9151	Same as 9150 but with 6-volt, 108-watt coil filament bulb	175.00
Ninonfivfiv	9155	Stand for supporting either Micro-Projector in a vertical position, includes prism	~~25.00~~ 50.00
Ninonono	9110	Variable Transformer to step down 110-volt alternating current to 6 volts for use with 9101 or 9151	35.00
Ninontoo	9120	*Resistance with ammeter attached for use on 110-volt circuit, direct or alternating current with 12-volt bulb	35.00
Ninontofiv	9125	*Resistance with ammeter attached for use on 220-volt circuit, direct or alternating current with 12-volt bulb	45.00
Ninonthreo	9130	12-volt, 72-watt bulb .....Net	2.15
Foroforate	4048	6-volt, 108-watt bulb .....Net	1.80

*If required without ammeter deduct $10.00

SPENCER MICRO-PROJECTION OBJECTIVES

THESE objectives are constructed more nearly after the formulæ of the regular microscope objectives. They are achromatic and give excellent results. The fields are unusually flat and the definition sharp and distinct. Finished in dull black to prevent reflections.

SPENCER PROJECTION OCULARS

DESIGNED to give a flat, brilliant field. The " eye lens " is focusable on the diaphragm for different screen distances so that it can always be adjusted to give a sharp margin to the picture.

Catalog No.	DESCRIPTION	Price
8794	Projection Ocular 3x,	$ 9.00
8796	Projection Ocular 6x,	9.00

DOUBLETS



A C

TRIPLE APLANATS



A C

Spencer Magnifiers

THESE Magnifiers are computed with the same care and manufactured by the same exact methods as are employed in the construction of other Spencer high-grade optical products. They will be found to be of uniformly excellent quality and to adhere rigidly to the specifications by which they are described.

Two different styles of mountings are offered according to the different purposes for which they are to be used. *A* mounts are black lacquered brass for dissecting microscopes. *C* mounts are heavily nickeled brass in folding case.

Doublets are composed of two plano-convex lenses accurately ground and polished and suitably mounted.

Triple aplanets are corrected both spherically and chromatically. They are remarkable for their large, flat field, freedom from distortion, brilliancy of illumination and greater working distance.

DOUBLET MAGNIFIERS

Telegraph Code	Catalog No.	Magnification	Focal Distance		Working Distance mm.	Diam. Real Field mm.	Mount.	Price
			Millimeters	Inches approx.				
Tooto	202	6x	41.6	1.6	22	22	A—For Dissecting Microscope	$1.75
Toofor	204	9x	27.8	1.1	15	16		1.75
Toosix	206	12x	20.8	0.8	12	11		1.75
Tooate	208	18x	13.9	0.5	8	8		1.75
Toten	210	24x	10.4	0.4	6	5.5		1.75
Tototo	222	6x	41.6	1.6	22	22	C Folding Case	2.00
Totofor	224	9x	27.8	1.1	15	16		2.00
Totosix	226	12x	20.8	0.8	12	11		2.00
Totoate	228	18x	13.9	0.5	8	8		2.25
Tothreo	230	24x	10.4	0.4	6	5.5		2.50

TRIPLE APLANAT MAGNIFIERS

Telegraph Code	Catalog No.	Magnification	Focal Distance		Working Distance mm.	Diam. Real Field mm.	Mount.	Price
			Millimeters	Inches approx.				
Tofivsix	256	6x	41.6	1.6	36.8	30	A—For Dissecting Microscopes	$5.75
Tofivate	258	9x	27.8	1.1	24.5	20		5.75
Tosixo	260	12x	20.8	0.8	18.4	15		5.75
Tosixon	261	15x	16.7	0.7	14.9	12		5.75
Tosixto	262	18x	13.9	0.5	12.1	10		5.75
Tosixfor	264	24x	10.4	0.4	9.2	7.5		5.75
Tosevsix	276	6x	41.6	1.6	36.8	30	C Folding Case	6.00
Tosevate	278	9x	27.8	1.1	24.5	20		6.00
Toateo	280	12x	20.8	0.8	18.4	15		6.00
Toateon	281	15x	16.7	0.7	14.9	12		6.00
Toateto	282	18x	13.9	0.5	12.1	10		6.00
Toatefor	284	24x	10.4	0.4	9.2	7.5		6.00



No. 240 Spencer Tripod Dissecting Magnifier

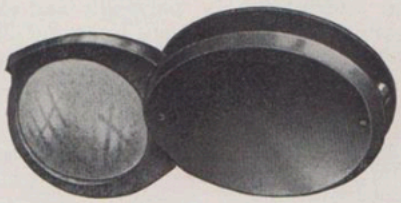
THIS dissecting magnifier gives a large, clear field and magnification sufficient for elementary work. The lens is focused by screwing it up or down in its frame.

Toforo-240-Tripod Dissecting Magnifier, each ..... $.75

Vulcanite Mounted Magnifiers

Single Lenses

Oval Shape



Bellows Shape



Double Lenses

Oval Shape



Bellows Shape



Telegraph Code	Catalog No.	DESCRIPTION	Price
Tothresix	236	Double folding Vulcanite Magnifier, oval shape, 25 mm. diameter	$1.25
Tothresev	237	Double folding Vulcanite Magnifier, oval shape, 30 mm. diameter	1.50
Tothreate	238	Double folding Vulcanite Magnifier, bellows shape, 25 mm. diameter	1.25
Tothrenin	239	Double folding Vulcanite Magnifier, bellows shape, 30 mm. diameter	1.50
Toforto	242	Single folding Vulcanite Magnifier, oval shape, 25 mm. diameter	.75
Toforfor	244	Single folding Vulcanite Magnifier, oval shape, 30 mm. diameter	.90
Tofivto	252	Single folding Vulcanite Magnifier, bellows shape, 25 mm. diameter	.75
Tofivfor	254	Single folding Vulcanite Magnifier, bellows shape, 30 mm. diameter	.90

Slides and Cover Glasses

ALL of our slides are carefully selected, free from bubbles or other defects, and all have plain faces, so that they will lie flat on the stage of the microscope. We list two types; it would be incorrect to say two grades; one pure white and the other having a slightly greenish tinge. The slight discoloration that results from the use of the greenish slides is absolutely unobservable under any ordinary conditions for microscopic work.

Catalog No.	DESCRIPTION	Price
1000	Slides, 75 x 25 mm. (3 x 1 inch) medium thickness, white. Per gross	~~$1.60~~
1002	Slides, 75 x 25 mm. (3 x 1 inch) medium thickness, slightly green. Per gross	1.50
1005	Slides, 75 x 25 mm. (3 x 1 inch) thin, white. Per gross	1.60
1020	Slides, 75 x 38 mm. (3 x 1½ inch) medium thickness, white. Per gross	2.25
1025	Slides, 75 x 50 mm. (3 x 2 inch) medium thickness, white. Per gross	3.00
1030	Slides, 75 x 25 mm. (3 x 1 inch) one concave center. Per dozen	.90
1032	Slides, 75 x 25 mm. (3 x 1 inch) two concave centers. Per dozen	1.20
1034	Slides, 75 x 25 mm. (3 x 1 inch) three concave centers. Per dozen	1.40
1035	Slides, 75 x 25 mm. (3 x 1 inch) drop culture, cavity 16 mm. diameter and 2 mm. deep, in polished plate glass. Each	.30
1036	Slides, 75 x 25 mm. (3 x 1 inch) drop culture with polished spherical cavity 18 mm. diameter and 1.75 mm. deep, each	.20

COVER GLASSES

Catalog	Shape	Thickness	Dimensions*	Price per oz.
1055	Squares	No. 1—0.13 to 0.17 mm.	15, 18, 22 or 25 mm.	$1.50
1060	Squares	No. 2—0.17 to 0.25 mm.	15, 18, 22 or 25 mm.	1.20
1065	Squares	No. 3—0.25 to 0.50 mm.	15, 18, 22 or 25 mm.	1.10
1075	Circles	No. 1—0.13 to 0.17 mm.	15, 18, 22 or 25 mm.	1.50
1080	Circles	No. 2—0.17 to 0.25 mm.	15, 18, 22 or 25 mm.	1.20
1085	Circles	No. 3—0.25 to 0.50 mm.	15, 18, 22 or 25 mm.	1.10

*Always designate size wanted with catalog number.

APPROXIMATE NUMBER OF COVERS PER OUNCE

Circle	13 mm	16 mm	18 mm	22 mm	24 mm	Squares	13 mm	16 mm	18 mm	22 mm	24 mm
No. 0	855	550	375	254	214	No. 0	700	450	312	208	176
No. 1	564	362	280	182	142	No. 1	462	296	206	150	116
No. 2	444	286	195	157	112	No. 2	364	234	162	120	92
No. 3	372	240	166	122	93	No. 3	306	196	136	100	76

RECTANGULAR COVER GLASSES

Catalog No.	No. 1	Approx. No. per oz.	Price Per oz.	Catalog No.	No. 2	Approx. No. per oz.	Price Per oz.
1090	22 x 30 mm.	120	$1.50	1130	22 x 30 mm.	90	$1.20
1095	22 x 40 mm.	106	1.50	1135	22 x 40 mm.	65	1.20
1100	22 x 50 mm.	75	1.50	1140	22 x 50 mm.	62	1.20
1105	22 x 60 mm.	65	1.60	1145	22 x 60 mm.	48	1.30
1107	22 x 70 mm.	54	1.60	1147	22 x 70 mm.	46	1.30
1110	24 x 30 mm.	110	1.60	1150	24 x 30 mm.	86	1.30
1115	24 x 40 mm.	100	1.60	1155	24 x 40 mm.	62	1.30
1120	24 x 50 mm.	70	1.60	1160	24 x 50 mm.	60	1.30
1125	24 x 60 mm.	54	1.60	1165	24 x 60 mm.	40	1.30
1127	24 x 70 mm.	50	1.60	1167	24 x 70 mm.	38	1.30

Slide Boxes

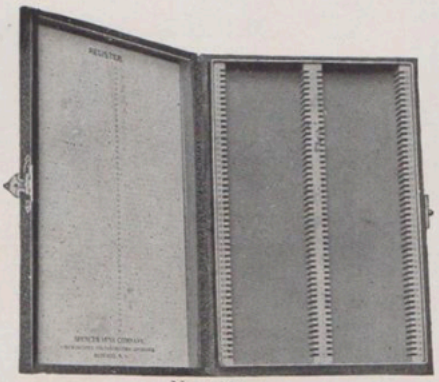
1205 Slide Box, grooved to hold one hundred object slides, 25 x 75 mm., covered with imitation leather, hinged cover and catch. Price, each $0.80

1206—Slide Box, grooved to hold one hundred object slides, 25 x 75 mm., all wood, hinged cover and catch (same size as No. 1205 but all wood) 0.85

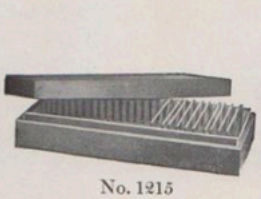
1215—Slide Boxes, made of white wood, with cover so arranged that, when removed, the ends of the slides are exposed so that they can be easily removed. Grooved to hold twenty-five objects, size 25 x 75 mm., numbered and indexed. Price, each 0.25

1220—Slide Boxes, made of white wood, with closely fitting covers. Grooved to hold twenty-five objects, 25 x 75 mm., numbered and indexed. Price, each 0.15

1225—Slide Boxes, same as No. 1220, but grooved to hold twelve objects, size of slide, 25 x 75 mm., numbered and indexed. Price, each 0.15



No. 1205



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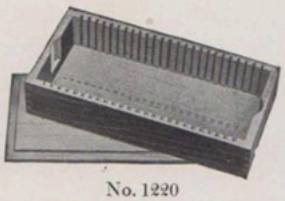
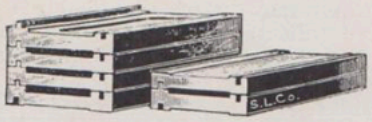


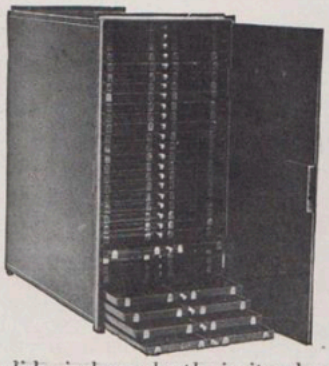
No. 1220



No. 1240

1228—Slide Boxes, same as No. 1220, grooved to hold twenty-five objects, size of slide, 50x75 mm. Price, each $0.30

1240—Slide mailing cases for standard sized (3" x 1") slides—can be stacked together in any number required, each stack taking a number of slides one less than the number of pieces used. Price, a dozen pieces $0.40



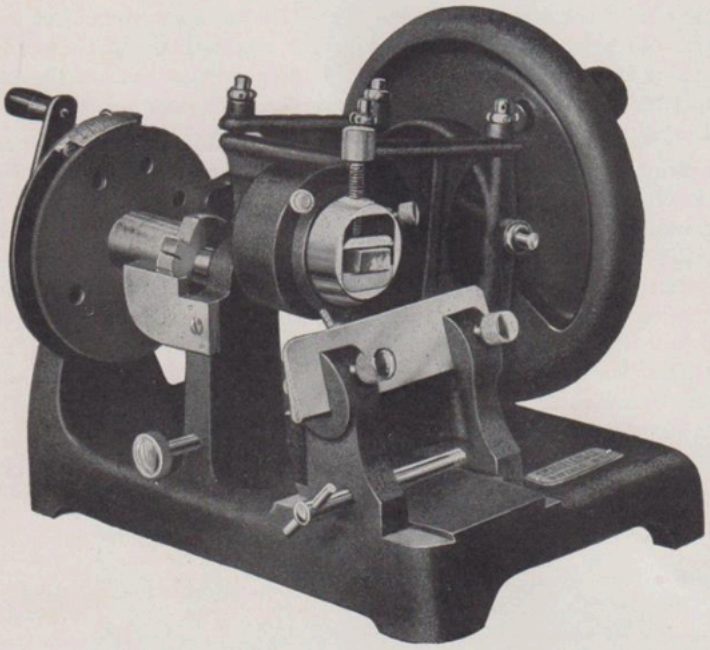
Slide Receptacles

Minot's Metal Cabinet No. 1200

THIS cabinet was designed by Dr. Chas. S. Minot. It is very compact, occupying much less space than a wooden cabinet of the same capacity and affording better protection against fire. It is made of metal throughout, neatly finished on the outside in maroon colored japan with bronze stripes and on the inside in black japan. It contains thirty trays, each holding twenty-four slides, and provided with convenient knobs and with card holders. The new, improved construction of the trays holds each slide independently in its place, preventing it from slipping when trays are removed. The cabinet is furnished with a good brass lock. The outside dimensions are 17.5 x 32.5 x 36.5 cm. high.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ontooo	1200	Minot's metal slide cabinet with thirty trays....Net	$39.00

Spencer Rotary Microtome No. 810



THIS is a rotary microtome of simplified construction. It meets the demand for a dependable instrument of precision at a moderate price. For the laboratory, whose requirements are of the highest order, and where accuracy is necessary, this new instrument is heartily recommended.

This accuracy is attained by following the same principle of construction which has won for Spencer Rotary Microtome No. 820 an international reputation for precision and is generally recognized to be without an equal.

The feed mechanism is absolutely independent of the up-and-down movement of the object, same as with Microtome Nos. 815 and 820, this being the most essential requirement for accuracy.

The polished surface on the back of the block holding the object clamp is held back against the end of the micrometer screw of the feed mechanism by a coil spring in such a way that it is free to move up or down but can not move backwards and forwards without the turning of the screw. This insures a feed without the possibility of any lost motion, as the threads are continually working against the tension of the spring.

The feed mechanism is a substantial micrometer screw, cut two threads to the millimeter, to which is fastened a wheel having 250 notches cut on its periphery. The arm carrying the pawl which works in these notches revolves around an axis coincident with that of the screw and is actuated by an arm attached to the part which carries the object. The pawl working in the notches feeds on the upward stroke and is automatically released, returning free of the teeth on the downward stroke.

The number of teeth engaged on the upward stroke is determined by a movable cam which may be set to secure the desired thickness of section. Each notch represents a thickness of two microns in the section. The instrument will cut any thickness up to forty microns in multiples of two. The total excursion of the feed is 30 mm. A crank at the other end of the screw provides a means for adjusting the object to the knife with extreme delicacy and also for returning the object clamp to the position necessary for starting a new series of sections. When the clamp has reached the extreme forward position the feed mechanism automatically ceases to work.

The object clamp holder above referred to, as being held back against the micrometer screw by a spring, is moved up and down at the ends of two parallel hinged arms entirely independent of the feed mechanism. It can be locked in its uppermost position for trimming paraffin blocks. This holder together with the object clamps is our standard ball-and-socket mechanism which has proven itself to be the most rigid and easily adjustable clamp yet devised. Three screws impinge against a flange at the back of the clamp to orient it to any desired position without losing control of any other position already secured. The clamp may be rotated on its axis by loosening any one of the screws. This clamp regularly takes in a block 32 mm. wide and 17 mm. thick. There is a provision by which the latter dimension may be increased to 27 mm. Three metal object discs accompany each microtome.

The knife is held in the knife clamp in the ordinary way. This clamp is very rigid and easily adjustable to and from the object.

The whole instrument is rigidly made and runs extremely easily and quietly.

It is finished in crystal black, a surface which is exceedingly serviceable and durable, and is supplied in a substantial case.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateono	810	Spencer Rotary Microtome with one No. 940 knife, handle and back for sharpening and with three object discs	$150.00
Ninforo	940	Extra knife, 110 mm., no handle	8.50

Spencer Rotary Microtome No. 815

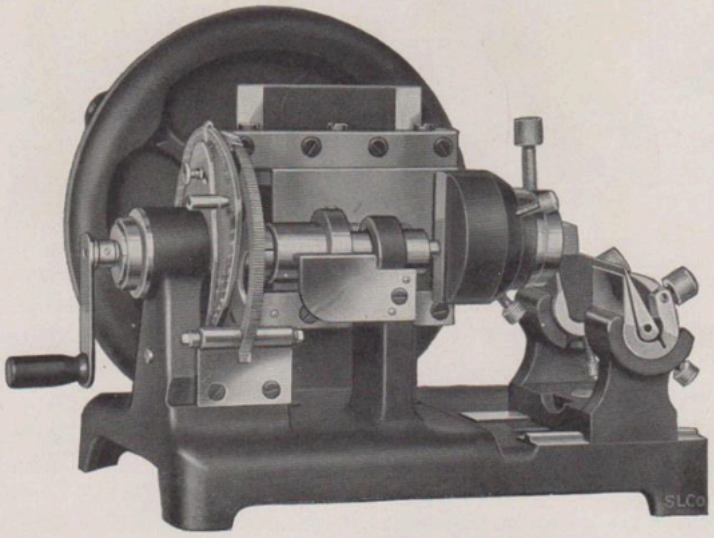
REALIZING the demand among many laboratory workers, especially Sergeant R. W. French, Walter Reed General Hospital, Washington, D. C., for a rotary microtome intermediate between our No. 810 and No. 820, we offer Microtome No. 815.

This microtome, in common with the other Spencer rotary microtomes, is so constructed that the feed mechanism is independent of the up-and-down movement of the object:—a principle necessary to the accurate cutting of sections of uniform thickness.

The object clamp mechanism in which the object clamp is carried forward on a horizontal slideway, is carried up and down on a broad and very rigid perpendicular slideway.

The object clamp is the ball-and-socket construction which has been so greatly appreciated on Spencer microtomes. The same rigidity, ease and accuracy of orientation can not be accomplished in any other construction. The clamp is large enough to accommodate a block 32 mm. wide, by 17 mm. thick, with removable adapter which increases the capacity to 27 mm. thickness.

The feed screw is unusually heavy, being 12 mm. in diameter. There are two threads to the millimeter. There are 250 teeth in the wheel at the end of this screw. Each tooth, therefore, represents a section 2 microns in thickness. Any thickness may be cut in multiples of two microns up to forty microns. The total excursion is 30 mm. The feed screw automatically ceases to operate at the end of this excursion. At the end of each stroke the pawl actuating the toothed wheel is *not lifted* out of the tooth but *recedes* from it, returning on the back stroke entirely free from the teeth, which is another feature involved in perfect sectioning. The little crank at the end of the feed screw provides a means for quickly returning the screw to any desired position, or for quickly and definitely feeding the object up to the knife.

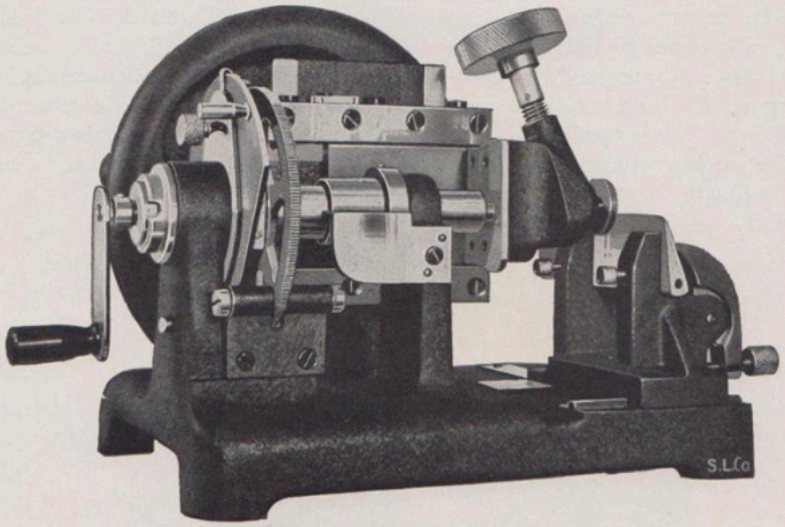


The knife support is the same as that on No. 820, where the two clamps grip the knife along the edge at the same time they secure it at the back. These clamps may be moved to and from one another to bring them as close to the ribbon as desired. The knife is easily adjusted to any angle. This rigid microtome equipment is pre-eminently adapted to the use of the large ten-inch knives, which may be slid through the clamps to use practically all of the cutting edge, thereby lessening the necessity of resharpening. The balance wheel is grooved so that the microtome may be run by a motor (see No. 832).

The instrument is finished in black enamel. It is rigidly and accurately made, and eminently suited to perfect any strenuous laboratory work. It is supplied in a substantial case.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateonfiv	815	Spencer Rotary Microtome with one No. 942 knife, handle and back for sharpening and with three object discs	$175.00
		Object discs, large 1½″ diameter, each	.60
		Object discs, medium 1⅛″ diameter, each	.30
		Object discs, small ⅞″ diameter, each	.30

Spencer Rotary Microtome No. 817



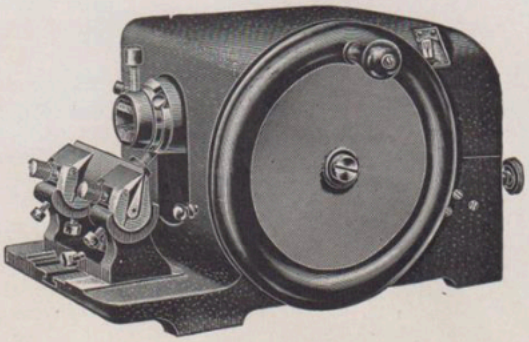
THIS new Microtome is a modification of our Rotary Microtome No. 815. The object clamp and method of holding the knife have been changed to conform with the type formerly made by the International Instrument Co. and approved by Dr. F. B. Mallory, Harvard Medical School.

Instead of the regular object clamp usually furnished in Spencer microtomes, metal discs are provided in order that the paraffin blocks may be cemented on to the discs. These discs are fastened to the end of a shank, the other end of which is a ball. These balls fit into a socket and are secured in any desired position by a screw, the large milled head of which is shown in the illustration above. These discs are easily oriented by a slight loosening of the screw; or removed entirely by a slightly greater turn. The knife is rigidly held in place by two very rigid swinging arms. The angle of the knife is adjusted by two screws with knurled heads. The knife holder is adjustable to and from the object as on all Spencer microtomes. Indeed, all of the exceptionally superior qualities involved in all Spencer Rotary microtomes are preserved in this new instrument.

The total excursion of the feed screw is 30 mm. Any thickness may be cut ranging from 2 microns to 40 microns, in steps of 2 microns.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateonsev	817	Spencer Rotary Microtome with one No. 942 knife, handle and back for sharpening and with three object discs as described	$175.00
		Object discs, large 1½″ diameter, medium 1⅛″ diameter, small ⅞″ diameter, each	1.00

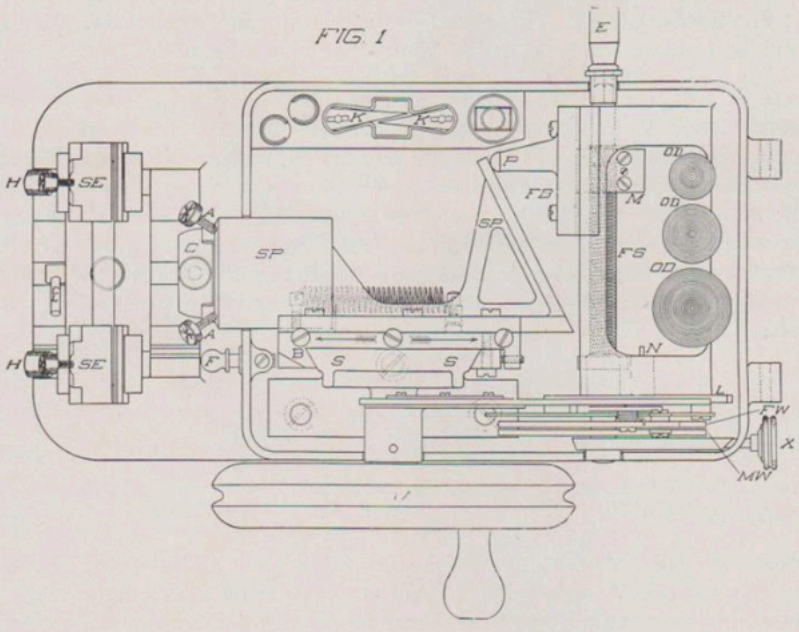
Spencer Precision Rotary Microtome No. 820



THIS rotary microtome has been designed after an entirely new construction, and is offered for the most accurate and careful work. An inclined plane feed attachment, which is absolutely independent of the up-and-down movement on the perpendicular support, overcomes the inaccuracies inherent in earlier types of construction of rotary microtomes. By all odds the most important element in a microtome is an accurate and reliable feed mechanism. This and rigidity are vital. These points are paramount in this instrument.

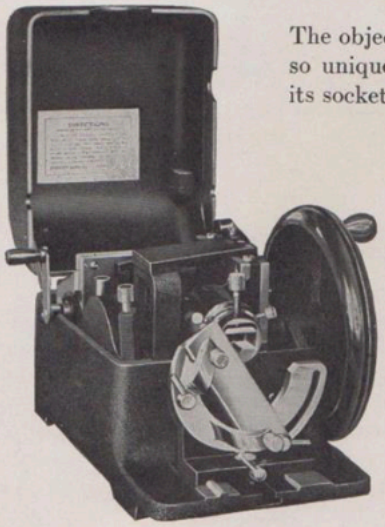
The feed is so arranged that it can be set for sections of any thickness, from 1 micron to 50 microns, by turning the knurled button at the back of the case until the number

FIG. 1



representing the desired thickness appears opposite the indicator at the small opening in the side of the case near the balance wheel.

The total excursion of the feed is 37 mm., allowing a sufficient range for cutting a complete series of a very large object without the necessity of a break in the series, due to resetting the knife and the feed mechanism.



SPENCER ROTARY MICROTOME No. 820
(Top of Case Open)
Also showing No. 825 Knife holder
for Celloidin sections

The object clamp is a part of a ball which fits into its socket so uniquely that it is clamped as solidly as though it and its socket were one piece.

The object is easily, accurately and delicately oriented to any desired angle. The angle can be changed in any plane without interfering with any desired angle already attained in any other plane. The object may easily be rotated.

When desired, the microtome is provided with an adjustable knife support (No. 825) which is especially adapted to celloidin sections. The knife holder of this support is adjustable from a horizontal position through 55° toward the perpendicular.

The up-and-down stroke of the object clamp is 2 inches, which permits the cutting of very large sections and gives sufficient stroke for celloidin cutting. The clamp is held at its upper limit for orienting or trimming the block by pushing in the pin F. (See Fig. 1, Page 75).

The knife is fastened by two clamps, each of which clamps the knife at the back and along 1¼ inches of the edge as well. It may be turned to any desired angle, and the clamps may also be moved toward one another to bring the clamps as near to the ribbon as desired to gain additional rigidity. When the clamps are thus drawn together, the knife may be moved in the clamps, so that practically all of the cutting edge can be used before the necessity of resharpening. The adjusting screws provide for knives of different widths. The whole knife support is adjustable to and from the object, and is very easily and conveniently clamped in any location by a lever connected with an eccentric cam.

The whole of the feeding mechanism is covered; protecting the wearing parts from dust and presenting a very neat appearance. The top of the case is hinged to the lower part, so that the case is easily opened.

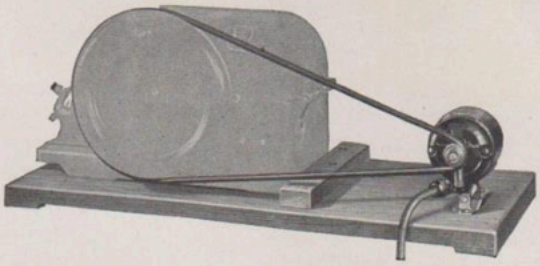
The balance wheel is grooved, so that the instrument may be run by a motor. (See Motor Drive No. 832).

The whole microtome is beautifully finished in a dull black alcohol-proof enamel. The smaller parts are heavily nickel-plated. It is accurately and substantially made in all its parts, and in every way it meets the demand for a microtome which will cut accurate

sections of a definite thickness, each section having the same thickness as its neighbor. *It is automatic.*

Telegraph Code	Catalog No.	DESCRIPTION	Price
Atuo	820	New Spencer Rotary Microtome with one knife, handle and back for sharpening, and with three object discs	~~$240.00~~
		Object discs, large 1½″ diameter, each	.60
		Object discs, medium 1⅛″ diameter, each	.30
		Object discs, small ⅞″ diameter, each	.30
Atufiv	825	Knife holder for celloidin sections, extra	25.00
Atetusev	827	Adjustable knife holder	25.00
Ninforto	942	Knife for paraffin sections, extra	10.00
Ninforthre	943	Knife for celloidin sections, extra	10.00

A New Motor Drive for Microtomes Nos. 815, 817 and 820

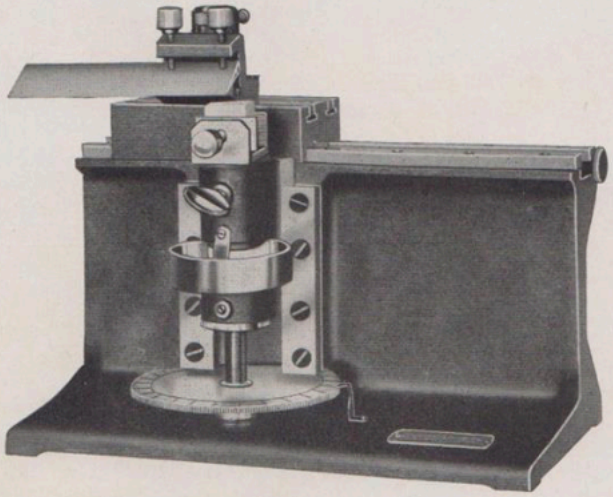


This equipment consists of a motor mounted at one end of a hardwood base.

Any microtome with a grooved balance wheel can be set on the other end with a round belt connecting the two. The whole may be placed on any convenient table. A variable resistance in series with the motor is placed on the floor where the speed of the motor may be regulated by foot. This very convenient and inexpensive drive recommends itself to any who have any considerable amount of sectioning to do. It can be used anywhere with any microtome having a grooved balance wheel. The same motor works on either direct or alternating current, but the voltage must be 110 unless a No. 834 special resistance for 220-volt current is used.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Atethreto	832	Motor drive, complete with belt	$30.00
Atethrefor	834	Special resistance for 220-volt current	5.00

Spencer Student Sliding Microtome No. 845



THIS microtome is designed to meet the constantly increasing demand for an inexpensive sliding microtome—yet one with sufficient accuracy to do well the more elementary work.

The microtome is very rigidly built with a feed screw as accurate as is used on any microtome.

The periphery of the wheel attached thereto is divided into 250 notches, each notch representing an upward feed of the object of two microns. A click working into these notches provides a means by which the operator may feel and hear the amount of the upward feed. This click is easily relieved from the notches when a rapid movement of the wheel is desired, as when the object clamp is lowered to begin cutting on a new object.

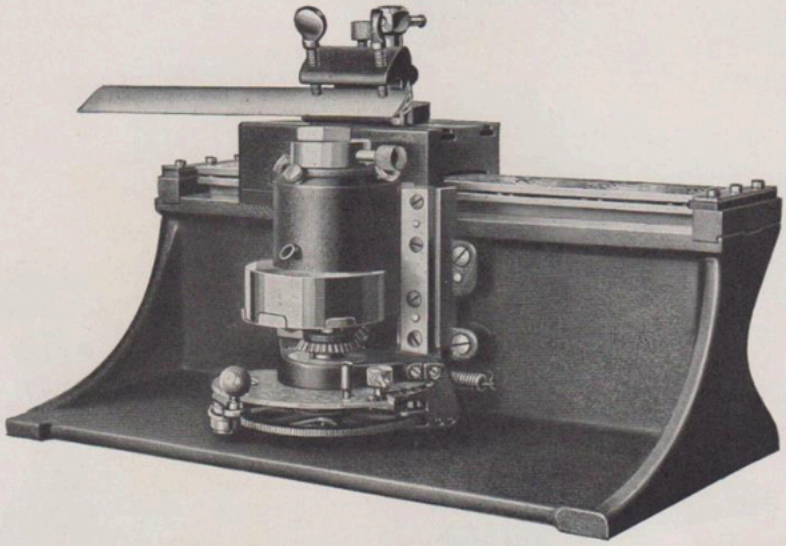
The bearings carrying the object are heavy, long and accurately fitted. The object clamp itself is a simple, rigid clamp. A small cup is placed below the clamp to catch the overflow of alcohol.

Next to the feed the bearing of the knife block on a sliding microtome is the important item. On this microtome the bearings are directly on top of the main frame, one of the bearings being as close as possible to the object clamp, so that there may be no springing of the knife block to vitiate the accuracy of the cutting. The bearing is so constructed that the block is held down so that it can not jump or be forced upward. As shown in the illustration, the block is a solid rectangular piece of iron with two T slots for holding the knife clamp. The knife clamp may be placed at any angle on the block. This clamp is rigid. The knife is held by two set screws and may be tipped to any desired angle for cutting different kinds of tissue.

All told, it is the most satisfactory instrument for anything like the price charged for it. The instrument is ten inches long and five inches high up to the knife block bearing.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateforfiv	845	Spencer Student Sliding Microtome, complete with knife clamp and No. 940 knife	$75.00

Spencer New Medium Sliding Microtome No. 850



IN these microtomes are incorporated the great features which have accounted for the unusual success of all Spencer Sliding Microtomes: i. e., the sturdy main frame, the inflexibility of the knife and knife block, and the accuracy and rigidity of the feed mechanism.

These microtomes are designed to meet the need for a moderate priced high-grade sliding microtome, and the demand for one low and compact. It is especially efficient for botanists and wood technologists who want to cut woods, and for any one having difficult tissue to cut.

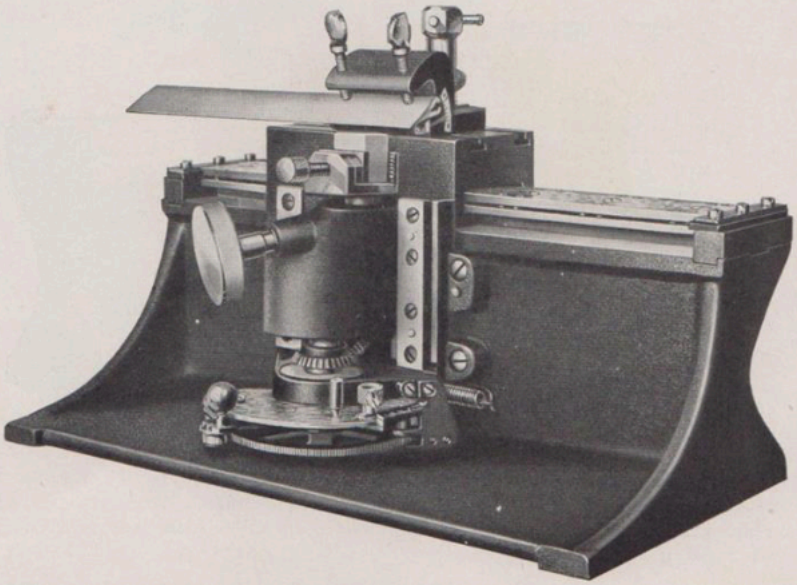
The main body of the instrument is 14½″ long, 5¾″ high, and 7½″ wide at the base. As on all sliding microtomes the knife block, which is 5¼″ long, 3″ wide and 1⅞″ high, rides on a horizontal surface at the top of the main casting. Referring to the accompanying line drawing, B-B represents the oil contact between the main frame and the knife block. The cohesion of nearly 12 square inches (three times as much as on any ordinary microtome) of contact on the accurately scraped surfaces holds the block very firmly to the main frame. An additional fortification against any possible jumping of the knife block is provided by opposing bearings at CC.

This combination, which is on all Spencer microtomes only, insures accuracy in the movement of the knife block, which can be attained in no other way. The smooth even draw is a delight to the touch. These microtomes are regularly supplied with No. 861 knife clamp (as illustrated). The No. 862 knife clamp which grips the knife at both ends, and which supports the distal end of the knife may be substituted to advantage at an additional price of $15.00 list. On both knife clamps the knife is gripped by two heavy screws which hold it very rigidly. The declination of the knife is governed by the screws AA. The pointer P indexes the declination of the knife.

A rigid and free moving object block accurately fitted on carefully scraped surfaces insures feeding and holding the object, however hard it may be, definitely to the knife edge for accurate cutting of thin sections. The feed screw is ½″ in diameter. The notched wheel of this feed mechanism provides for cutting sections in steps of 2 microns up to 40 microns. The feed is operated by hand or automatically. There is no back lash or spring. The specimen must move up the distance for which the section thickness is set. The total upward excursion is much greater than on other makes of microtomes which are priced higher. On No. 850 this distance is 33 millimeters.

No. 850 is provided with the standard Spencer ball and flange object clamp which has been so popular. It is easily oriented by means of three screws. One reason for the accuracy of these microtomes is the fact that no split nut is involved. The nut is heavy and thick enough to cover twenty threads. When the upper limit is reached the object clamp is quickly lowered by means of a crank at the back of the microtome. This crank also provides a quick means for bringing the object into the desired relation to the knife edge before cutting.

Spencer New Medium Sliding Microtome No. 852

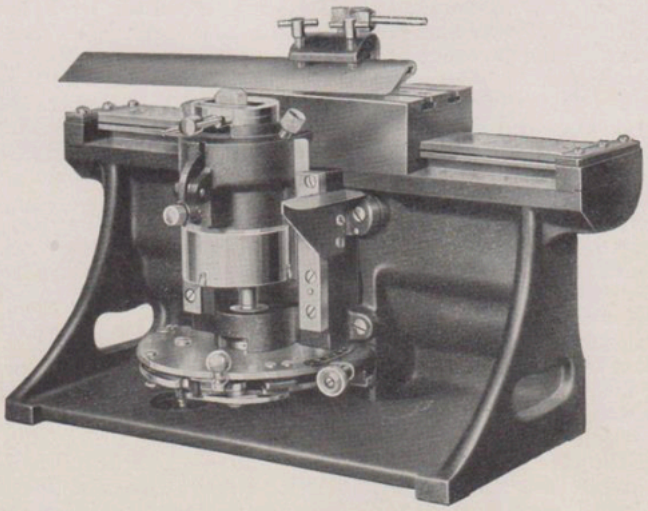


SPENCER No. 852 Microtome is exactly like No. 850 excepting for the object clamp. For those who prefer it we offer on this microtome an object clamp attached to a free moving ball for orienting as shown in the cut. This ball is held in a definite position by means of a heavy screw with a large knurled head. A slight loosening of the screw frees the ball and lets the clamp take any position; or on further loosening, the clamp may be removed entirely to allow substitution of any one of these discs of different sizes which accompany the microtome. The total feed on No. 852 is 23 millimeters.

Both microtomes 850 and 852 are sent out in heavy mission finish oak cases.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Atefivo	850	Microtome with 861 knife clamp, 945 knife with 185mm. cutting edge, with handle and back for sharpening	$200.00
Atefivto	852	Microtome equipped as above	200.00

Spencer Precision Sliding Microtome No. 860



THIS microtome is designed to cut sections of accurate thicknesses, one section after another being the same thickness, of not only the soft tissue usually cut but of the harder tissue usually found very difficult to cut on any microtome. It will also cut sections of large diameter (3½″) one after another until 1⅛″ of the object is consumed without the necessity of lowering the object and resetting the feed for further sectioning.

The above qualities are brought about by combining with a heavy main frame, a knife support which holds the knife edge rigidly in one plane while moving to and fro, and a substantial object clamp fed upward by a feeding mechanism of unvarying accuracy.

¶ The main frame is a single rigid casting 14″ long and 7″ high. The bed for the sliding knife block is 16″ long, providing ample movement for the use of the longest knives. The knife block which is 6″ long, 3½″ wide and 2″ thick moves on a horizontal scraped bearing surface on top of the main frame. There are two of these bearing surfaces (BB on line drawing) each 1¼″ wide, making 15 square inches of oil contact surface between the knife block and the main frame. The cohesion thus produced holds the knife block firmly to the main frame. In addition to this provision for holding down the knife block there are opposing bearings (at CC) adjustable to provide an absolutely smooth and accurate movement of the knife block with no possibility of its raising. This exceptionally rigid and accurate construction is common to all Spencer sliding microtomes.

The knife clamp is fastened to the broad upper surface of the block by a substantial bolt. It is made of heavy bronze casting with a hinged lower lip on which the knife rests. This lip is controlled by screws (AA) to tip of the edge of the knife to any desired declination. This permits a very delicate and accurate placing of the knife edge relative to the object for different tissues requiring different declinations. An indicator at the side of the clamp permits replacing of the knife again at the same angle. Two screws hold the knife securely.

The bearings for the support of the object clamp are heavy, and wide; and as nearly as possible in a vertical plane passing through the center of the object clamp. The object clamp proper is our patented ball-and-socket device in which the object may be oriented to any desired relation to the knife by means of three screws. When these three screws are tightened, the clamp and its support are as though they were one piece of metal. The loosening of any one screw permits the revolving of the clamp on its perpendicular axis. When fully opened, the clamp is large enough to take in a block 1⅝″ square. The

movable jaw of the clamp is so constructed that there is no moving of the object when tightly clamped.

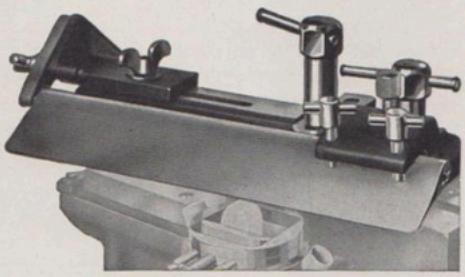
The feed screw is steel ½″ in diameter with threads ½ mm. lead. It works in a very heavy bronze nut — no splice nut. The return movement — or a quick adjustment of the object to the knife is accomplished by a set of gears in connection with a crank on the back side of the microtome. The screw is turned by a toothed wheel which is fastened to its lower end. This wheel has 250 teeth which means that each tooth represents a feed of two microns.

A pawl on a lever which is pivoted on the axis of the screw engages the teeth of the wheel as the end of the lever is drawn toward the operator. The number of teeth engaged is regulated by a cam to cut any thickness from 2 microns to 40 microns in multiples of two. The cam is adjusted by means of a worm gear. No clamps are necessary. Simply turn the button on the end of the worm shaft until the indicator points to the thickness of section desired.

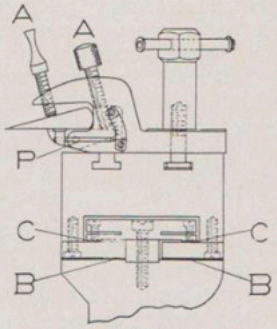
The pawl lever always goes to the full length of its stroke and the pawl *recedes* from the tooth engaged instead of being *lifted out* of and away from the tooth. This is an important element in an accurate feed. Different thicknesses are determined by the point where the pawl engages the tooth. If the section is to be thin, the pawl does not engage a tooth until nearly at the end of its stroke. The pawl returns free from the teeth on the back stroke.

The feeding may be done by hand or automatically. An adjustable arm projects downward from the knife block to engage a lever which is connected with the feeding mechanism. This adjustable arm should be so set that the feeding occurs after the knife passes back over the object. The total excursion of the feed is 1⅞″.

At the side of the object clamp next to the operator is a support whereon one may rest the left hand to steady it while manipulating a delicate section. The object stands out and away from the mechanism so that one can easily get to it for any manipulation, and when our special knife clamp, which supports the knife at *both ends*, is used, one has a knife as well supported as could be desired. This clamp, which is similar to the regular clamp, has an extension whereon is placed a clamp which supports the distal end of the knife in such a way that it does not interfere with the section passing over the upper surface of the knife at the extreme end. (Cut 4).



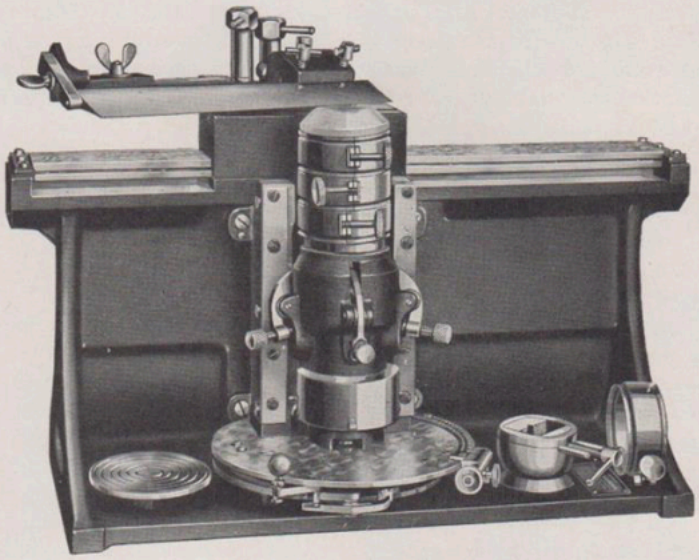
No. 862. Special Knife Clamp. Cut 4.



Section of Knife Block

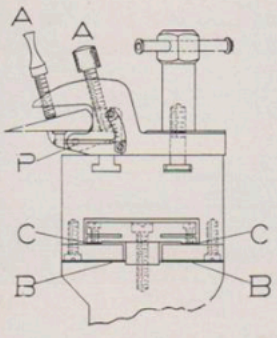
Telegraph Code	Catalog No.	DESCRIPTION	Price
Atesixo	860	Spencer New Precision Sliding Microtome with object disc, ordinary knife clamp No. 861, No. 950 knife with 250 mm. cutting edge, handle No. 957 and back for sharpening No. 963	$250.00
Atesixon	861	Spencer ordinary knife clamp, supplied regularly	10.00
Atesixto	862	Spencer special knife clamp for supporting knife at both ends	25.00
		Object disc for No. 860, 3½″ diameter	3.00

Spencer New Brain-Stem Microtome No. 865



THIS microtome has been designed especially for cutting brain-stems, or any other large bodies where it is desirable to cut a complete series without a break. It embodies the general principles involved in all Spencer sliding microtomes together with valuable suggestions from Dr. George B. Jenkins of the Medical Department of George Washington University, and others on the particular work for which it is designed. It is a massive instrument well suited to its purpose. The main frame is 21″ long over-all and 10″ high. The total excursion of the knife block is 14″—sufficient for the largest sections and the longest knives.

The knife block which is 6″ long, 3½″ wide and 2″ thick moves on a horizontal scraped bearing surface on top of the main frame. There are two of these bearing surfaces (BB on line drawing) each 1¼″ wide, making 15 square inches of oil contact surface between the knife block and the main frame. The cohesion thus produced holds the knife block firmly to the main frame. In addition to this provision for holding down the knife block there are opposing bearings at (CC) adjustable to provide an absolutely smooth and accurate movement of the knife block with no possibility of its raising. This exceptionally rigid and accurate construction is common to all Spencer sliding microtomes.



The No. 862 knife holder which is always listed with this microtome provides a rigid support for the knife at both ends. It is easily adjustable to any angle—and also to any declination of the edge by means of screws (AA). The pointer (P) provides an index by which the knife may be again set at the same angle.

No less important than the rigidity of the knife is the rigidity of the specimen and its feed. The bearings for the object block are broad and heavy. They are scraped and most accurately fitted. The upward movement is accomplished by turning a steel feed screw ½" in diameter and with a pitch of ½mm. The notched wheel attached to this screw provides for cutting sections in steps of two microns up to 120 microns. The feed is either automatic, or by hand, as the operator may elect. The setting for the desired thickness is simple.

The microtome is designed to provide a great total excursion for the feed screws—i. e., 4 inches. The problem of inflexibility holding the top of a tall specimen is solved on this microtome by a series of rings in connection with a supporting mass of paraffin. The specimen, which is usually embedded in celloidin, is fastened in the usual way to a plate 3 inches in diameter. Upon this is built up a series of four rings, one above the other, to form a hollow cylinder around the specimen. Melted paraffin poured into this cylinder surrounds and supports the specimen. The top ring is removed and the paraffin trimmed up to the specimen to remove the surplus as shown in the illustration. When the specimen is fed upward so that the second ring endangers the edge of the knife it, too, is removed—and so on until all of the rings are removed.

Beneath the base plate of this cylinder is a hemisphere with a flange projecting from it. The hemisphere fits into the socket at the top of the object block and is held there by three hooks or levers—one end of each impinging on the flange. The pressure on the flange is regulated by three screws at the other ends of the levers. By means of these screws the object is nicely oriented to any desired position and rigidly held there.

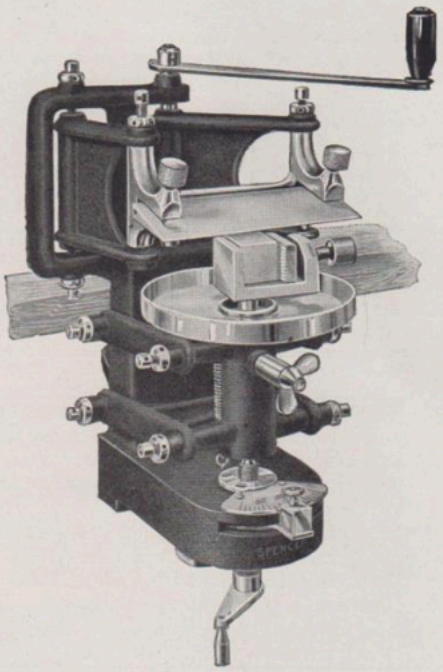
For cutting ordinary specimens this whole cylinder ensemble may be removed by loosening all of the screws, and the ordinary object clamp (shown in the illustration) put in its place, and oriented in the same way.

This means that the object block must be raised to bring this shorter clamp up to working position. This is quickly done by a crank at the back of the microtome. By this same crank the clamp is quickly adjusted to any desired height. There is no split nut to vitiate the accuracy of the feed. Instead the bronze nut is large and heavy. It supports the object block directly below the specimen. There is no chance for the object to spring away from the knife—no inaccurate feeding.

The microtome goes out in a very heavy oak case with receptacles for all the accessories.

Telegraph Code	Cat. No.	DESCRIPTION	Price
Atesixfiv	865	Spencer New Large Brain Stem Microtome with No. 862 knife clamp, No. 950 knife with 250mm. cutting edge, handle No. 957 and back for sharpening No. 963	$415.00

Spencer Automatic Laboratory Microtome No. 880



IN this microtome, the main supporting frame has a heavy clamp at the back by which it is securely fastened to the laboratory table. As will be seen by the cut, the upper part of this frame forms a support to which the two laterally swinging arms are attached by steel pivot screws with check nuts.

The knife carrier is held by these swinging arms at their outer ends, attached thereto by similar pivot screws with check nuts, and in order to give the proper movement, relieved from any pressure or strain, a detachable flexible lever handle is attached to the axis fastened to the longer arm on which the arm swings.

The extreme ends of the knife rest in the holder, and as the lever moves the swinging arms the blade describes the flattened curve corresponding to the double movement in free-hand sectioning. By this manner of holding the knife by arms which are not parallel, the entire length of its cutting edge is utilized, insuring uniform wear and permitting the cutting of larger sections than has heretofore been possible, except by using a very much larger blade. The swinging arms and knife holder are sufficiently rigid to avoid any deflection of the knife in its movements; thereby assuring an absolute uniformity of thickness in all the sections.

This peculiar motion of the knife makes this microtome especially desirable for cutting frozen sections, and when used with our CO_2 freezing chamber it has no equal. Sections may be cut, stained and mounted in one and one-half minutes from the time the tissue is placed on the freezing plate. This microtome does excellent work with celloidin, also, the movement of the knife is not so well suited to paraffin work, but it does very well with that medium.

The object clamp supporting socket is raised or lowered by a vertical feed screw with fine micrometer thread, having a crank at the bottom for independent movement.

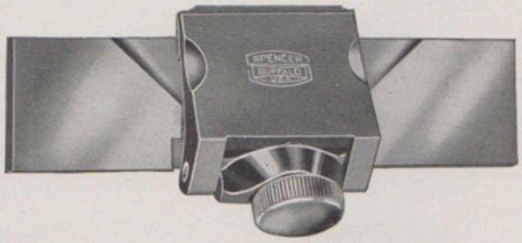
This screw is firmly held in double nut bearings which provide for taking up lost motion and for eliminating any wear that may occur. At its upper end, this feed screw supports the object-supporting socket which is firmly held down thereon by a strong steel spiral spring.

The automatic feed mechanism consists of an accurately cut ratchet wheel, keyed to the vertical feed screw, in the teeth of which a hardened steel pawl engages. By means of a lever extending to the graduated scale shown on the front of the main frame base, this pawl may be thrown out of action by turning the index finger to the extreme left, or it may be set to cut sections of any desired thickness. Each division of the graduated scale marks 5 microns.

The whole feed mechanism is simple in construction and, being covered by the extended base of the main frame, is protected from dust and drippings. It may easily be reached from below and it can not easily get out of order.

A convenient drip pan, at the top of the socket in which the object clamp sets, may be quickly unscrewed and as easily replaced. It is best to remove it when the freezing chamber is attached. This is heavily nickel-plated, as are all the screws and exposed parts, while the frame and swinging arms are handsomely and durably finished.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateateo	880	Automatic Laboratory Microtome complete, with one knife and usual object clamp for paraffin or celloidin, in packing case	$100.00
Ateatefiv	885	Usual object clamp for paraffin or celloidin, if ordered separately	3.00
Ateateate	888	Automatic Laboratory Microtome No. 880, with one knife, object clamp, and fitted with No. 930 freezing attachment for CO_2	116.00
Ateatenin	889	Automatic Laboratory Microtome No. 880, with one knife, object clamp, and fitted with No. 915 ether freezer	110.00



Spencer Holder for Safety Razor Blades No. 966

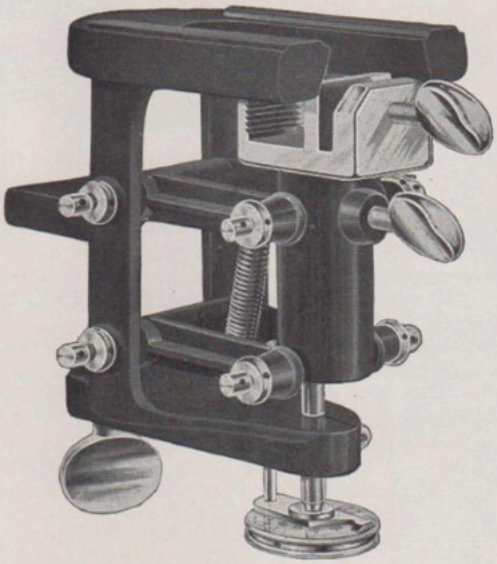
THIS holder for safety razor blades can be used on any rotary microtome provided with a knife clamp. It is made of a substantial brass casting with a rigid swinging member hinged thereon, to grip the razor blade between the two at the edge of the blade. A heavy screw operating against the swinging member insures the blade being held most securely.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninsixsix	966	Spencer holder for safety razor blades	$ 9.00
Ninsixate	968	Spencer holder for safety razor blades for use on Sliding Microtomes Nos. 845 and 860	10.00
Ninsixnin	969	Pike Microtome Oil—per can, 3 oz.	.50
Ninninfor	994	Red Fibre Blocks ½ x ½ x ¾″, per 100	4.50
Ninninfiv	995	" " " ⅝ x ⅝ x ¾″, " "	9.00
Ninninsix	996	" " " ¾ x ¾ x ¾″, " "	10.00
Ninninsev	997	" " " 1 x 1 x ¾″, " "	11.00

Spencer Hand and Table Microtomes



No. 905



No. 900

Spencer Hand Microtome

IN this convenient but inexpensive microtome the object is placed in a clamp in the upper end of the tube, and is raised through the hole in the glass plate by an accurately cut screw which is entirely enclosed and protected from dust and injury. The feed is accurate and finely graduated. Each division represents 10 microns. The plate at the top over which the knife is drawn is very large (3 inches in diameter), making a firm support for the knife.

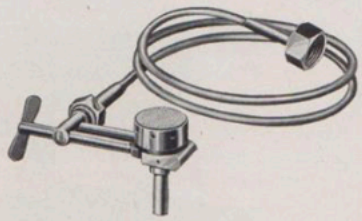
Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninofiv	905	Hand Microtome	$15.00

Spencer Table Microtome

THIS microtome, as will be seen from the cut, may be firmly attached by a screw-clamp to the laboratory table or other support. The round shank of the object clamp or paraffin blocks set in a vertically movable socket, held by hardened steel pivot screws in two vertically swinging arms which are similarly attached to the main frame; thus providing a movement upon the parallelogram principle regulated by a micrometer screw with graduated disc and index plate by which any desired thickness of sections may be cut. Glass surface plates provide traveling ways upon which the knife slides. These are extra long, so that the knife will not be drawn off from the ends, thereby endangering its edge.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninhun	900	Table Microtome as shown without knife	$20.00
Ninotu	902	Table Microtome No. 900 fitted with No. 930 freezing attachment for CO_2	36.00
Ninofor	904	Table Microtome No. 900 fitted with No. 915 ether freezer	30.00

Spencer Freezing Attachment for CO_2 No. 930



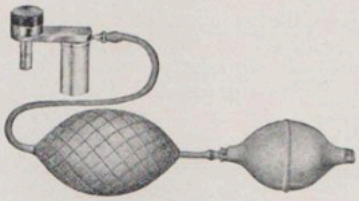
THIS freezing attachment incorporates a hard rubber non-conducting ring (the suggestion of Dr. L. D. Wilson of St. Mary's Hospital, Rochester, Minn.) between the corrugated plate to which the object is frozen and the rest of the apparatus. This prevents the conduction of the cold from the specimen to the other parts; thus saving time and gas.

The chamber is provided with a pin, like that on the object clamp, which fits into the same socket on the microtome. The chamber is connected with the CO_2 cylinder by a flexible copper tube. This can be used on Nos. 845, 860, 880 and 900 microtomes.

In operating, the valve at the chamber should first be closed and the valve at the cylinder be slightly opened to admit the gas into the tube, then by opening and closing the small valve at the chamber three or four times in quick succession, the tissue is frozen without any waste of gas or inconvenience caused by the chamber or connections freezing up.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninthreo	930	Complete with copper tube connections	$16.00

Spencer Ether Freezer No. 915



IT consists of a freezing chamber of hard rubber which so prevents the radiation of the cold that the tissue is quickly frozen. It will freeze tissue, 15 mm. in diameter and 3 mm. thick, in one minute, using only 5 cc. of ether.

The ether is held in the metal tank. Any excess of ether which does not evaporate is drained back into the metal chamber from which it came. There are no bottles or entangling tubes and no waste of ether. It is simple, compact and efficient. It can be used on any sliding microtome.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninonfiv	915	Ether freezer	$10.00

Spencer Hones

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninsevo	970	Yellow Belgian, 10 in. by 2¼ in.	$7.50
Ninsevon	971	Yellow Belgian, 6 in. by 1½ in.	3.50
Ninsevtu	972	Yellow Belgian, 4 in. by 1 in.	2.50
Ninsevfiv	975	Blue-green, 10 in. by 2¼ in.	2.50
Ninsevate	978	India oilstone, 3 in. long by ⅞ in. wide; an excellent stone for scalpels, cuts fast	1.00

Spencer Microtome Knives

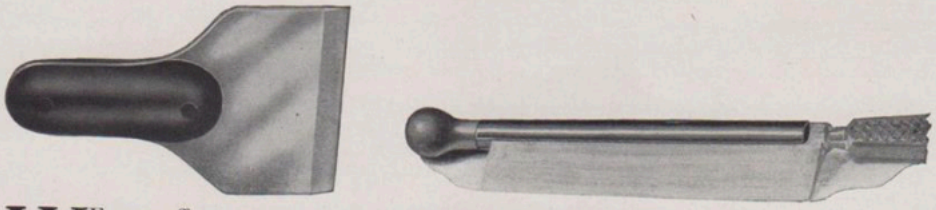


WE manufacture our own microtome knives, and in so doing have given the most careful attention not only to the selection of the steel best suited to this particular purpose, but to grinding and tempering to produce an edge which is not brittle and at the same time hard enough and tough enough to retain its keenness. The knives are comparatively easy to sharpen and are evenly tempered throughout their length. They are broad and heavy; making them very rigid. By our especially designed machinery they are ground perfectly true, so that when one is laid upon an absolutely plane surface the edge touches along its whole length, while the back does the same. This is a very important advantage in sharpening, and is also necessary to the cutting of true sections when a long knife is used with a long sweep as in cutting celloidin.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninthrefiv	935	50 mm., no handle	$6.00
Ninforo	940	110 mm., no handle	8.50
Ninforto	942	120 mm., no handle	10.00
Ninforthre	943	120 mm., no handle	*10.00
Ninforfiv	945	185 mm., no handle	15.00
Ninforsix	946	185 mm., hollow ground, no handle	15.00
Ninfivo	950	250 mm., no handle	22.00
Ninfivfiv	955	Handle for sharpening knives up to 185 mm. in length	2.25
Ninfivsev	957	Handle for sharpening 250 mm. knives	4.00
Ninsixo	960	Back for sharpening No. 940 knife	1.75
Ninsixon	961	Back for sharpening No. 942-943 knife	1.75
Ninsixto	962	Back for sharpening No. 945-946 knife	2.00
Ninsixthre	963	Back for sharpening No. 950 knife	2.00

All makes of microtome knives carefully reground and sharpened. Price, depending on size of knife and condition ..... $1.00 to $3.00
*Ground for celloidin.

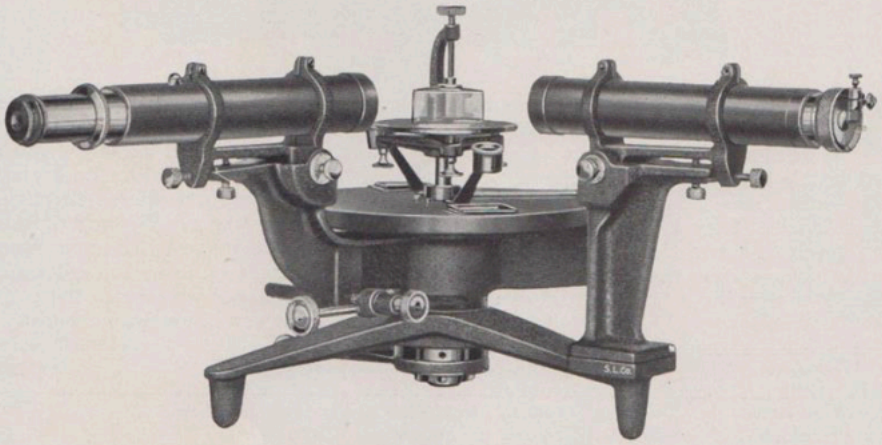
Spencer Handle for Knife Backs No. 964



WE now offer a new, very neat and efficient handle device, made at the suggestion of Mrs. I. M. Way, Department of Anatomy, University of Colorado, Denver, by which the knife may be held firmly on the hone or strop with both hands. This short handle becomes a part of the knife back which projects from the end of the knife opposite that of the regular handle, thus providing a handle on both ends of the knife.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninsixfor	964	Handle for knife back fitted to any above knife back	$1.75
Ninsixfiv	965	Microtome knife, chisel blade form, cutting edge, 88 mm., for use on table microtome, especially where a freezing chamber is used	6.00

Spencer Medium Spectrometer



GREAT care was taken in the design of this Spectrometer to produce a rugged instrument. It is built unusually low and compact. Its three point support with the points far apart insures against its being accidentally upset. The central bearings that are the heart of a spectrometer are massive enough to withstand all ordinary abuse and still function perfectly. The supports for the telescope and collimator are designed to hold them in perfect alignment even when subjected to the constant knocks of unskillful handling. The clamping device for the vertical tilt adjustment is one of the chief factors in securing this rigidity. When clamped it locks the telescope or collimator to its support as securely as though they were one piece. This clamp is easily manipulated and will not creep and spoil the adjustment when it is tightened.

The clamps and slow motions for the telescope and prism tables are made with the same skill and care that goes into the fine adjustment of a microscope. These clamps are also designed and constructed to prevent creeping, with its attendant annoyance. The screws of the slow motion are carefully lapped into their nuts and turn with a smoothness that is a joy to feel.

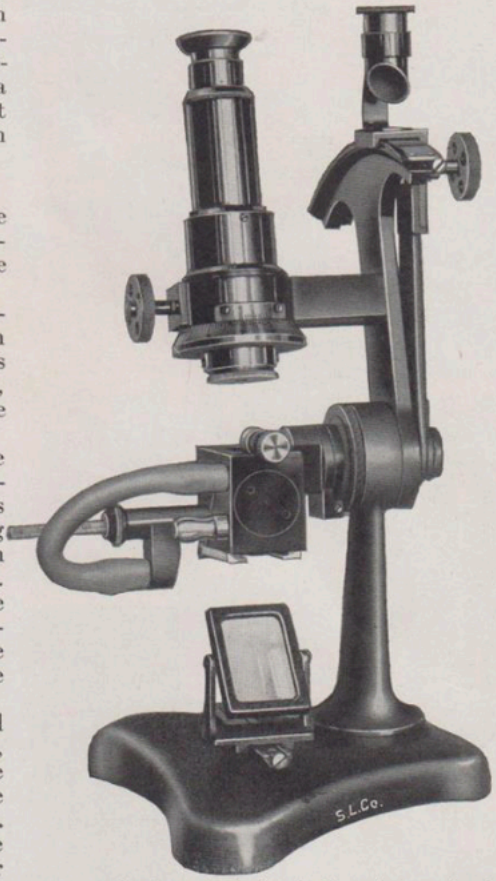
The circle is graduated to half degrees on a brass disc that has been finely tempered and will not warp. The verniers read to single minutes. They are mounted to rotate on the same level as the circle graduations. This construction eliminates paralax. The close fit of the circle and verniers allows the verniers to be read easily and rapidly. The circle and verniers are enclosed in a dust tight cover having glass windows through which the verniers can be read by means of magnifiers held conveniently above them.

The optics of this instrument are of the finest quality. The telescope and collimator objectives have a focus of six inches and are one inch in diameter. These dimensions insure more illumination than is usually needed.

The telescope eyepiece is of the usual Gauss type having a focus of one inch. The magnification of the telescope is therefore six diameters.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Onootofiv	10025	Spectrometer complete, as described above	$110.00
Onoothreo	10030	Prism clamp	3.50
Onoothreto	10032	Grating clamp	3.50
Onoothrefiv	10035	Comparison Prism	7.00
Onooforo	10040	Prism, 60° 18 mm. high by 36 mm. wide. Index, about 1.65	7.00
Onooforfiv	10045	Hollow prism, 18 mm. high by 36 mm. wide, cemented without metal frame	10.00

Spencer Refractometer



OF the well-known Abbe type, with water jacket for controlling temperature of the prism case, designed for obtaining the following data on all transparent substances (except gases) whose indices (N_d) fall between 1.30 and 1.71:

N_d and Δ_n $(-N_f - N)$

The first of these is read directly. The other is obtained by a very simple computation from tables furnished with the instrument.

Graduations on the index scale are numbered in both directions to be read from either side. Readings are direct in indices of the D line, to the third decimal place, with opportunity for estimating the fourth decimal place.

Setting of the cross line on the index scale is accomplished by rack and pinions operated by a knurled head. This constitutes a distinct improvement over the sliding motion, with or without slow motion screw, that has heretofore been employed. It provides a control extending over the full length of the scale; sufficiently accurate for the most refined work, and at the same time fast enough to prevent its use becoming tedious.

Two triple sets of Amici prisms, rotated in opposite directions by a knurled head, serve to achromatize the dividing line under observation and also provide the necessary data for determining Δ_n and V. The latter values are determined from the graduated drum which is read by vernier to 18 minutes of arc, corresponding in accuracy to the fourth decimal place in required values.

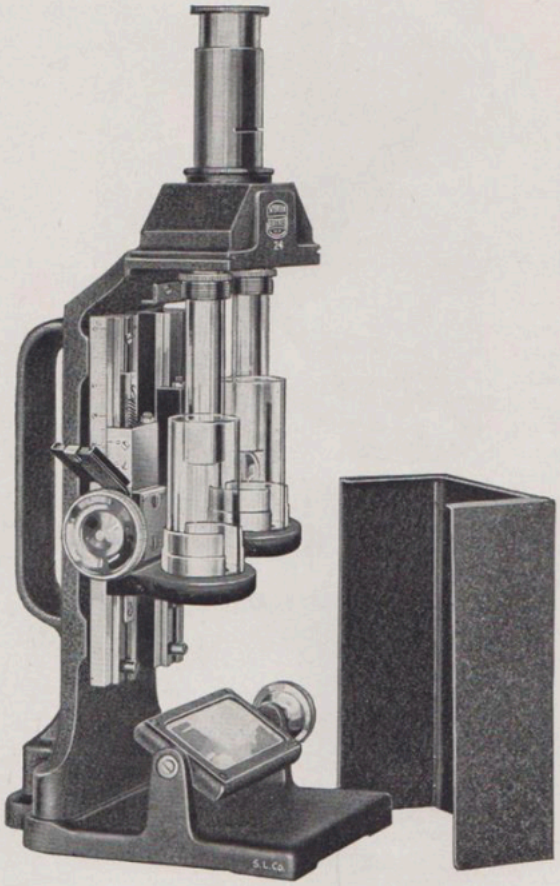
An achromatic objective sharply focuses an image of the dividing line in the plane of two crossed hairs at the upper end of the body tube. On these the eye lens is focused by a sliding tube.

The mirror slides on a horizontal bar which greatly facilitates obtaining light from various positions.

A thermometer (No. 10078) and a small bottle of monobromonapthalene, for making immersion contact in measuring solids, is supplied with each instrument.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Onoosevfiv	10075	Refractometer complete, as described, including thermometer	~~$222.00~~
Onooatefiv	10085	Same with scale for reading directly in percentages of sugar solution	~~237 00~~
Onoosevate	10078	Stem thermometer for use with refractometer 0-100° C. graduated to degrees	2.50
Onooateo	10080	Stem thermometer for use with refractometer 0-75° C. graduated to fifths	12.75

The Spencer Duboscq Colorimeter No. 10125



THERE are three very good reasons for the readily apparent tendency to use colorimetric methods in place of gravimetric and volumetric methods in chemical and biochemical analysis, namely:

(1) Simplicity of procedure
(2) Accuracy of determination
(3) Economy of time.

Constantly increasing appreciation of the advantages of colorimetric methods has given impetus to the development of innumerable new ones and to the further improvement of colorimeters.

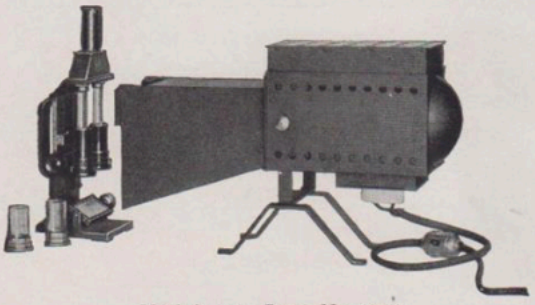
Colorimetric methods of analysis are possible wherever a characteristic and more or less stable color may be produced which is proportional in intensity to the concentration of a substance in solution. For the analysis of blood, urine, spinal fluids, sputum, etc., rapid colorimetric methods of great sensitiveness and almost unbelievable accuracy have come into general use and no modern clinical laboratory is without one or more good colorimeters.

The Spencer Colorimeter has been designed to permit utilization to the utmost degree of the inherent advantages of colorimetric methods. It is constructed on the Duboscq principle, though so many refinements have been added to the design that the prototype is hardly comparable with the present development.

In the operation of this instrument, light is reflected upward from a mirror at the base and passes axially through cylindrical cups 50 mm. in length. The light rays from each cup are then brought together by a prism system for comparison in one field of view, a suitable eyepiece being provided to magnify this field.

A quantitative determination of the coloring component in a solution of unknown concentration, by comparison with a standard solution of known concentration, can be quickly and accurately made with the instrument. First, by varying the heights of the cups relative to the fixed plungers until the colors transmitted by the solutions in the cups are evenly matched in the field of view. Secondly, by making a simple calculation on the basis that the relative concentrations of the coloring component in the solutions are inversely proportional to the respective depths of the solutions as read on the scales of the colorimeter.

Use as a Nephelometer



Nephelometer Lamp No. 10135

IN comparing turbidities of fluids the instrument is modified; first, by placing cylindrical shields over the plungers, and second, by introducing beneath the cups opaque stops to shut off light from below. Illumination for making comparisons is obtained from a specially constructed lamp designed to project through the walls of the cups an intense beam of parallel light. This lamp consists of a 400-watt stereopticon bulb with mogul base, and a special hood and shield. The lamp is backed by a curved glass mirror and supplied with a pair of 4½" condensing lenses, which combine to give the beam of parallel light required. It is mounted on a rigid support, which holds it in a horizontal position at the required height. Five feet of heavy cord, with plug and switch, and a hood especially designed to fit with approximately light-tight connections against the colorimeter, is included as a part of the outfit.

If the cups are empty, or if they contain fluids free from solid matter, light directed horizontally through them will not be observed in the field of view of the instrument, but if there are present in the cups fluids holding solid particles in suspension, such particles will diffuse light into the ends of the plungers and the fields will become illuminated. If the cups are then adjusted to such a level that both halves of the field are equally illuminated, the relative concentrations of suspended particles per unit of fluid will be inversely proportional to the depths of the fluids required to produce equal intensity of illumination in the field of view of the instrument.

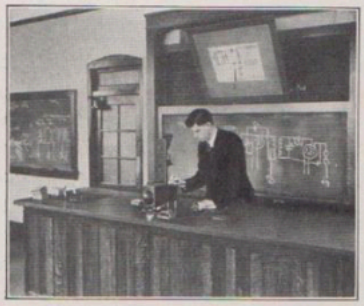
The method of making haemoglobin tests is analogous to that employed in making color comparisons. A disc of specially prepared glass is placed beneath one of the cups and clear water is used in this cup to a depth approximately, not necessarily exactly, the same as that in the other cup containing the diluted blood. The blood is diluted by a fixed percentage, and the depth of fluid necessary to produce a shade matching that of the glass is an index of the percentage of haemoglobin present.

Full directions for making haemoglobin determinations accompany each instrument.

Tel. Code	Cat No.	DESCRIPTION	Price
Onoontofiv	10125	Duboscq colorimeter	$80.00
Onoontosix	10126	Case for Duboscq colorimeter	3.00
Onoontosev	10127	50 mm. cups, with base for Duboscq colorimeter	5.00
Onoontonin	10129	50 mm. plungers with threaded adapters	5.00
Onoonthrefiv	10135	Nephelometer lamp, with one 400-watt bulb	50.00
Onoonthresev	10137	Plunger shields, with opaque stops for cups, per set of two shields and two stops	2.00
Onoonforo	10140	Newcomer glass disc	3.50
Onoonforthre	10143	20 cmm. pipettes for blood dilutions for use with Newcomer disc and Duboscq colorimeter	1.50
Onoonforfiv	10145	5 cc. pipette for blood dilutions for use with Newcomer disc and Duboscq colorimeter	.50

Small diameter plungers and cups can be supplied.

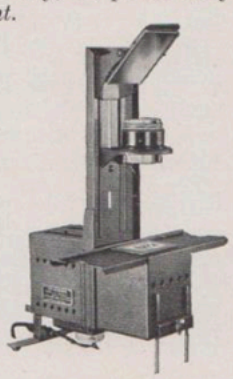
Spencer Table Delineascope Model B



The lantern which permits the lecturer to—
project in a light room—
face his class—
have his slide right side up in front of him—
and to have the picture clearly visible to the entire class.

{Note Illustration}

AN ideal lecture lantern, which may be left on the lecture table permanently, at hand for immediate use at any time during the period. This model was designed after suggestions submitted by Prof. Chas. A. Kofoid, University of California, Berkeley. When it is desired to illustrate any part of the discussion, simply place the slide in place on the track, snap on the switch and the illustration will appear on the screen to the view of the class, just as it appears before you on the slide track. A pencil, or any small pointer, may be used to indicate any particular object to be brought to the attention of the class. In this way the minds of the whole class are focussed at one time on the point you wish to emphasize. If more slides are to be used they follow along the track, one at a time, as you need them, there being room for three at one time—the one just used, the one being projected and the next one to be shown. After the necessary slides have been shown, snap off the switch and proceed with your lecture. No time is lost either in setting up or taking down this equipment. An entirely darkened room being unnecessary, no preliminary preparations are required. *Model B may be used as a daily assistant.*

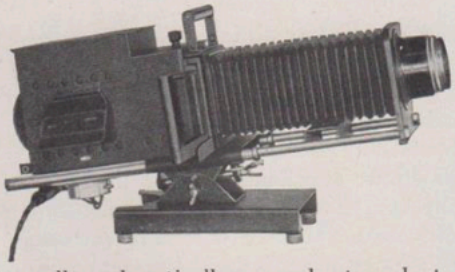


Model B has the hinged lamphouse (an exclusive Spencer feature) making lamp easily accessible. It is equipped with a 500-watt, 115-volt precentered base bulb which insures the proper position of the filament, which is essential for the best screen results. Unless otherwise specified a 6½″ focus objective is supplied but other objectives from 4¼″ to 10″ focus may be used successfully, to meet various conditions, and requirements. A 15′ detachable cord with plug and snap switch is regularly supplied. To prevent the keystone effect because of the beam of light being projected above the horizontal, it is necessary to tip the top of the screen outward from the wall. This necessitates a solid back screen to avoid any sagging. (Note list of Solid screens on page 101). For those who desire to project filmslides or micro-slides, the objective may be removed from its collar and the attachment substituted. (For filmslides and micro-slides interchangeably, order 3672 or for micro-slides only 9174.) The support is then lowered as far as it will go to accommodate either of these attachments. The same reflecting mirror is used. When this substitution is made the instrument becomes Model BA. When BOTH the filmslide attachment and objective for glass slide work are required, the instrument becomes a Model BC.

The upright support is easily detachable, as are also the slide table and the lengthened foot at the back for more compact packing and transportation in the metal case regularly furnished.

Cat. No.	DESCRIPTION	Price
3375	Spencer Delineascope Model B, with objective 2½″ diameter, 5½″, 6½″ or 8½″ focus. (Objective of 6½″ focus will be sent unless another focus is ordered.)	$ 75.00
3378	Spencer Delineascope Model B, same as 3375, but with objective of 2½″ diameter, 10″ focus	70.00
3380	Spencer Delineascope Model BA, same as 3375, with filmslide attachment 3672 substituted for the 2½″ objective	85.50
3385	Spencer Delineascope Model BC, with BOTH filmslide attachment 3672 and 2½″ diameter objective of 5½″, 6½″ or 8½″ focus	113.50
3388	Spencer Delineascope Model BC, with BOTH filmslide attachment 3672 and 2½″ diameter objective of 10″ focus	108.50

Spencer Classroom Lantern Model D



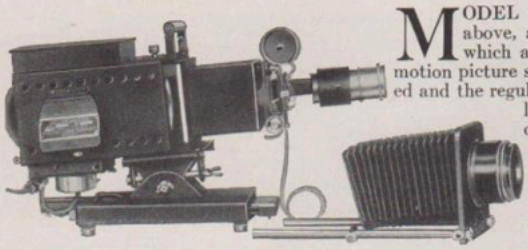
THIS, without question, is the most popular, general purpose lantern obtainable. It has no equal. The instrument is the result of an effort to embody, in one outfit, the many features which had, in the past, been found of particular value by teachers in their daily work with projectors. These special advantages comprise, in addition to the usual Spencer quality, a *double* tilting device for adjusting the screen picture both horizontally and vertically; a non-heat conducting carrying handle; hinged lamphouse permitting easy access to the lamp and condensers; a reading aperture in the side of the lamphouse for illuminating manuscripts in dark room projection and a prefocussed bulb, making adjustment thereof unnecessary. The illumination obtained with this model is far superior to that of any other outfit. In fact, even on the ordinary opaque screen, a satisfactory picture can be obtained with Model D without entirely darkening the room, it being only necessary to diminish the bright sunlight.

Model D is regularly equipped with a 500-watt, 115-volt prefocussed Mazda lamp; standard double slide carrier; a 15′ detachable cord with snap switch and plug for use on any standard socket. Where necessary, this and other Spencer projectors may be equipped for use on other voltages, on 6-volt storage batteries and on Prest-o-lite and acetylene tanks.

Cat. No.	DESCRIPTION	Price
3472	Spencer Delineascope Model D, as described, objective 1⅝″ diameter, 4¼″ to 10″ focal length, complete in metal carrying case	$ 62.00
3475	Spencer Delineascope Model D, as described, objective 2½″ diameter, 12″ focal length STANDARD CLASSROOM EQUIPMENT, complete in metal carrying case (Other foci supplied if desired—10″ to 20″*).	70.00
3480	Spencer Delineascope Model D with complete Pastel type acetylene burner and pressure regulator for attaching to Prest-o-lite tank, complete in metal carrying case	78.00
3482	Spencer Delineascope Model D, with multiple jet acetylene burner for use with generator, complete in metal carrying case	78.00
3484	Spencer Delineascope Model D, for use on either a standard electric current or with a Prest-o-lite tank, 500-watt lamp and Pastel acetylene burner with pressure regulator, to be used interchangeably, complete in metal carrying case	86.00

*Projection objectives of short focal length for use with daylight screens 2½″ diameter and 5½″, 6½″ or 8½″ focal length can be supplied for the addition of $5.00.

Spencer Combination Lantern Model DC



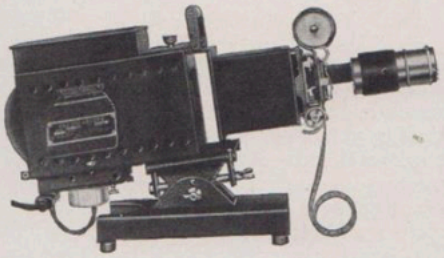
MODEL DC is a combination of Model D, fully described above, and a Spencer Filmslide Attachment No. 3671, which accommodates both the standard width (35mm.) motion picture stock on which still pictures have been reproduced and the regular 3″ x 1″ micro-slides. This gives a three-purpose lantern at a very nominal cost. The change from one type of material to the other occupies but a moment's time. To be exact—eighteen seconds are needed to remove the glass slide equipment and to insert the filmslide attachment while it only takes five seconds to change from filmslides to micro-slides.

Cat. No.	DESCRIPTION	Price
3488	Spencer Delineascope Model DC, as described, glass slide objective 2½″ diameter, 12″ focal length; and complete filmslide unit with 1⅝″ diameter, 4″ focus objective, complete in metal case	$108.50
3489	Spencer Delineascope Model DC, as described, but with complete Pastel type acetylene burner and pressure regulator for attaching to Prest-o-lite tank, complete in metal case	116.50
3490	Delineascope Model DC—as described—but for use on either a standard electric current or with a Prest-o-lite tank,—500-watt, 115-volt, Mazda bulb and Pastel type acetylene burner with pressure regulator to be used interchangeably. Complete in metal case	124.50

Spencer Filmslide Projectors Model DA

AN adaptation of Models D and DC for filmslide and micro-projection only.

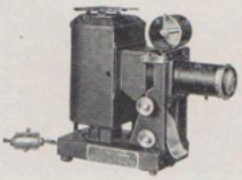
It has all the special advantages of Model D and is unquestionably the most efficient classroom filmslide projector made by any one. It will give exceptionally fine screen results even in a semi-light room. If, at any time, it is desired to add equipment for glass slide projection, the accessories listed below may be added.



Catalog No.	DESCRIPTION	Price
3486	Spencer Delineascope Model DA—as described, objective 1⅝″ diameter, 4″ focal length*, complete in metal carrying case	$78.50
3485	Spencer Delineascope Model DA—as described, but with complete Pastel type acetylene burner and pressure regulator for attaching to Prest-o-lite tank, complete in metal carrying case	86.50
3487	Spencer Delineascope Model DA, as described, but for use on either standard electric current or with a Prest-o-lite tank; 500-watt, 115-volt, precentered lamp and Pastel acetylene burner with pressure regulator to be used interchangeably, complete in metal carrying case	94.50
3493	Bellows unit, including front board, rods, tubes, etc., to convert a Model DA into a DC	8.50
	(Objective not included—from $15.00 to $28.00 additional depending on focus).	

*Projection objective 1⅝″ diameter, 2″ or 3″ focal length for use with "daylight" screens may be specified without extra charge.

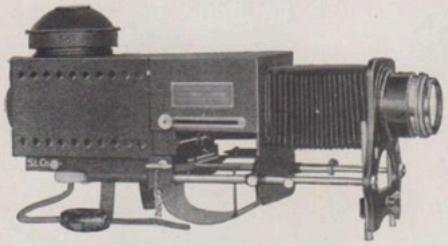
Model I



THIS high quality Filmslide Projector is a very simple, compact and portable lantern for projecting still pictures made on standard width, non-inflammable film. It has been designed especially for small class room use to accommodate filmslides which may be used advantageously to supplement the work of the regular curriculum. It is a complete unit in itself and may be easily carried from room to room, being of light but sturdy construction. Equipped with 15 feet of cord and standard plug, it may be connected to a light socket anywhere, ready for operation with no preliminary adjustments. This lantern will give excellent results with a daylight screen, eliminating the necessity of darkening the class room.

Catalog No.	DESCRIPTION	Price
3665	Spencer Delineascope Model I, with 200-watt, 115-volt precentered, Mazda bulb, objective 2″, 3″ or 4″ focus as desired, complete in leatherette carrying case, including container for 12 film cans,	$60.00

Spencer Lecture Lantern Model H



MODEL H is especially valuable for college and general lecture purposes where brilliancy, rigidity and efficiency are required.

The Spencer Patented Transposer on this instrument gives a particularly pleasing effect on the screen. The new picture replaces the old on the screen with a suddenness and smoothness which makes the change almost indiscernible. The slide marked S^1 on the cut is in projecting position. The new slide S is placed on the fork, F. When the change is desired the key, K, is turned through 90°. This swings the fork upward as indicated until the new slide intercepts the line of light just before it trips the slide S^1 to fall into the pocket below and assume the position S^2 when the fork is returned to the horizontal position. All the handling of the slide is done from the operator's side of the Delineascope. (This Transposer is an exclusive Spencer feature, used on Models H, J, N, R and RA for the handling of glassslides).

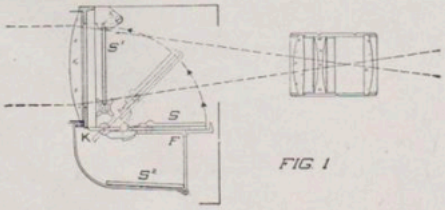
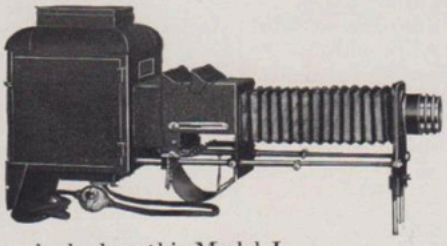


FIG. 1

Cat. No.	DESCRIPTION	Price
3550	Spencer Delineascope Model H—as described—with 500-watt, 115-volt, Mazda lamp; and objective 1⅝″ in diameter, 4¼″ to 10″ focal length as selected, complete in metal carrying case	$ 67.00
3553	Spencer Delineascope Model H—as described—with 500-watt, 115-volt, Mazda lamp; and objective 2½″ in diameter and 10″ to 20″* focal length as selected, complete in metal carrying case	75.00
3556	Spencer Delineascope Model H—same as No. 3553—but with complete Pastel type acetylene burner and pressure regulator for attaching to Prest-o-Lite tank, complete in metal carrying case	83.00
3559	Spencer Delineascope Model H—same as No. 3553—but with multiple jet acetylene burner for use with acetylene generator tank, complete in metal carrying case	73.00
3562	Spencer Delineascope Model H—same as No. 3553—but for use on either a standard electric current or with a Prest-o-lite tank—500-watt, 115-volt, Mazda lamp and Pastel acetylene burner with pressure regulator, to be used interchangeably, complete in metal carrying case	91.00

Spencer Auditorium Lantern Model J



THIS Auditorium Lantern is especially designed for projecting lantern slides at long distances, where large screen pictures are required. It may be operated with utmost satisfaction from a balcony. The 1000-watt, 115-volt Mazda lamp in the lantern gives a brilliant picture even at the long distances required for auditorium use.

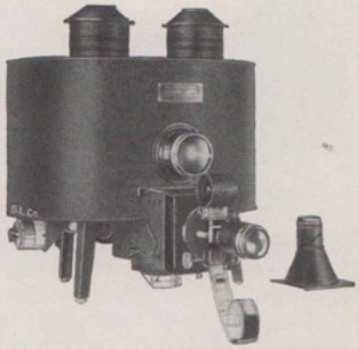
Either the standard double lantern slide carrier or the Spencer Patented Transposer may be had on this Model J.

Cat. No.	DESCRIPTION	Price
3572	Spencer Delineascope, Model J, as described, objective 1⅝″ diameter, 8″ or 10″ focus as selected, with Spencer Slide Transposer, complete in metal carrying case	$ 97.00
3575	Spencer Delineascope Model J, as described, objective 2½″ diameter, 10″ to 24″* focus as selected, with Spencer Slide Transposer, complete in metal carrying case	105.00
3577	Spencer Delineascope Model J, as described, objective 1⅝″ diameter, 4¼″ to 10″ focus as selected, with standard slide carrier, complete in metal carrying case	87.00
3578	Spencer Delineascope Model J, as described, objective 2½″ diameter, 10″ to 24″* focus, as selected, with standard slide carrier, complete in metal carrying case	95.00

*Projection objectives of short focal length, for use with daylight screens, 2½″ diameter and 5½″, 6½″ or 8½″ focus can be supplied for the addition of $5.00.

Spencer Daylight Combination Lanterns

MODELS
S—SA—SAC



MODEL SAC
Four-Purpose-Delineascope

THE instrument shown is a Model SAC—equipped for opaque material, filmslides or micro-slides, interchangeably, with the glass slide cone and lens shown at the side. To use glass slides the filmslide attachment is removed and the cone inserted in its place. A standard slide carrier is also furnished which fits into the opening just back of the attachment.

This group of Delineascopes is constructed especially for use with a translucent screen (see Translux and Luminex listed on page 101). This permits the setting up of the entire equipment in front of the class, allowing the professor to remain in his usual position in front of the room and at the same time, operate the lantern himself. After placing the material in position he can step to the screen and indicate on the projected picture the point to be discussed.

This is accomplished by having the lantern a few feet behind the screen, the picture being projected from the rear. By having the outfit set up in a shadowed corner of the room to eliminate light penetrating the space between lantern and screen, it is unnecessary to completely darken the room. If the ordinary shades are partially drawn to shut out the bright sunlight, very satisfactory results will be obtained and the room will be light enough to take notes, etc.

Model SA is identical to the outfit shown excepting that it does not include the Filmslide Attachment—being a projector for opaque material and glass slides only.

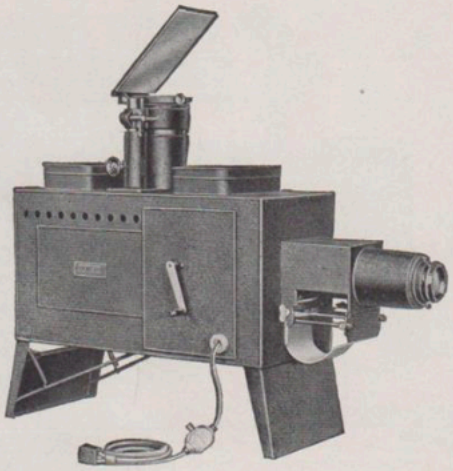
Model S accommodates opaque material only.

All of these outfits are equipped with two 500-watt, 115-volt Mazda bulbs for the opaque work and a 250-watt, 115-volt Mazda bulb for the other types of material, providing ample illumination for any needs. An opening of 6″ x 6″ allows the use of books, cards, charts or any opaque material up to that size. Of course, larger material may be used and a 6″ area shown at one time. Two post-card holders are furnished for convenience in handling post cards and other small illustrations. A 15′ cord with snap switch is a part of the regular equipment.

Cat. No.	DESCRIPTION	Price
3770	Spencer Delineascope Model S—for opaque material only—2½″ diameter, 10″ focus objective, complete	$110.00
3775	Reversing mirror, in mount, for use on Model S when used with an ordinary opaque screen	15.00
3774	Reversing mirror, in mount, for use on lantern slide section of Models SA or SAC when used with an ordinary opaque screen. (Not required if slides can be reversed, as of course they can easily be with convenience if not used interchangeably with opaque material, which would require reversing the machine each time)	10.00
3780	Spencer Delineascope Model SA—for opaque material and glass slides. Lantern slide objective 1⅝″ diameter, 4¼″ focus, opaque projection lens 2½″ diameter, 10″ focus, complete	140.00
3782	Spencer Delineascope Model SAC—for opaque material, glass slides, filmslides and micro-slides; objectives 2½″ diameter, 10″ focus for opaque material; 1⅝″ diameter, 4¼″ focus for lantern slides and 2″ focus for filmslides and micro-slides, complete	178.50

Spencer Combination Opaque Projectors

MODEL R



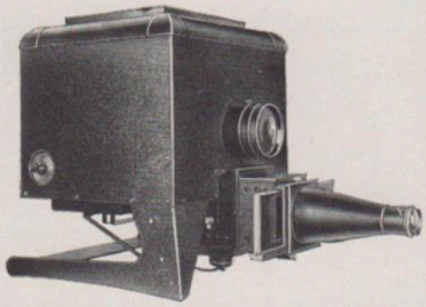
MODEL R has long been a favorite for use in larger classrooms in schools, colleges, lodges, Sunday Schools and the like. Simple in operation, this outfit is equipped with a 1000-watt, concentrated filament Mazda bulb, insuring a brilliant screen picture at longer distances, approximately 25′ to 30′. It will also accommodate larger opaque material, having an opening of 6½″ x 9″. Three post card holders are included with regular equipment.

Another large instrument—Model RA—is designed for long distance projection up to 45′ or 50′. Details upon request.

Cat. No.	DESCRIPTION	Price
3760	Spencer Delineascope Model R, lantern slide objective 1⅝″ diameter, 8″ focus, opaque projection lens 4″ diameter, 18″ focus, complete with three post card holders	$200.00
3763	Spencer Delineascope Model R, lantern slide objective 2½″ diameter, 10″ focus, and opaque projection lens 4″ diameter, 18″ focus, complete with three post card holders	209.00

(No. 3673 Filmslide Attachment permits the use of filmslides and micro-slides on Models R and RA)

MODEL W



THIS 1931 Model gives to the world the means of projecting the most brilliant screen picture ever obtained from opaque material. In fact the illumination is of such quality that an entirely dark room is not necessary.

This combination outfit justly takes its place as the leader of all opaque outfits for brilliancy and general satisfaction.

It is equipped with two 500-watt, 115-volt, precentered base bulbs to illuminate the opaque material and one 250-watt precentered base bulb of the same voltage for the lantern slides. A 16″ focus opaque objective and an 8″ focus for the lantern slide work answers all general requirements up to approximately 30 feet.

In addition to the spring tray for supporting books, photographs, drawings, etc. Model W is supplied with three post card holders for use when small illustrations are used. This model is designed so that any opaque material or part thereof up to 6″ square may be projected at one time.

While the heat generated by the illuminant in this instrument is not sufficient to cause damage to ordinary material, a cooling device is furnished for use where unusually valuable colored illustrations are to be projected.

Cat. No.	DESCRIPTION	Price
3740	Spencer Delineascope Model W with lantern slide objective 1⅝″ diameter, 8″ focus for lantern slides; opaque projection lens 4″ diameter, 16″ focus, complete with cooling device	$ 200.00

(No. 3674 Filmslide Attachment permits the use of filmslides and micro-slides on Model W. See page 100)

Spencer Opaque Combination Classroom Delineascope Model QA



A COMBINATION opaque and glass slide projector produced to answer the extensive demand for such an outfit for classroom work. It is so designed that the one 500-watt, 115-volt precentered base bulb gives remarkably brilliant results on the screen, *without the necessity of completely darkening the classroom*. If the ordinary window shades are drawn, a good, clearly defined picture will be obtained even from the opaque material.

Any opaque material may be used in this model, books, drawings, photographs, typewritten or hand-written sheets, post cards, etc. The field is unlimited. While the opaque aperture is 6″ x 6″, larger material up to 23″ may conveniently be inserted, a 6″ area being shown at one time.

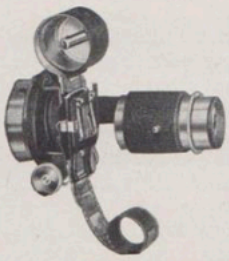
A tray is furnished for loose sheets and two post card holders permit the use of small illustrations or cards.

Model QA may be used up to about 26′ quite satisfactorily with the 16″ focus opaque and the 8″ focus lantern slide objectives. At 26′ a 9′ 3″ picture will be obtained from the opaque and a 8′ 9″ picture from the lantern slides.

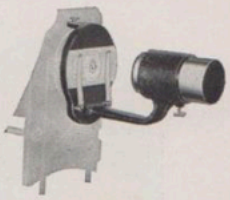
Ordinarily the comparatively low wattage of the one bulb in Model QA makes any cooling device unnecessary, but where one wishes to be doubly cautious, a cooling device may be added to the outfit.

Other variations of this equipment may be secured as listed below. (Further details on either sent upon request).

Cat. No.	DESCRIPTION	Price
3710	Spencer Delineascope Model Q, for opaque material only, objective 4″ diameter, 16″ focus, with 15′ cord and two post card holders, complete	$ 75.00
3715	Spencer Delineascope Model QA (illustrated) for both glass slides and opaque material; lantern slide objective 1⅝″ diameter, 8″ focus; opaque objective 4″ diameter, 16″ focus; with 15′ cord and two post card holders, complete	110.00
	(No. 3674 Filmslide Attachment permits the use of filmslides and micro-slides on Model QA. See list below.)	
3720	Spencer Delineascope Model QB—Lecture Table Lantern—for both glass slides and opaque material; lantern slide objective 2½″ diameter, 6½″ focus; opaque objective 4″ diameter, 16″ focus; with 15′ cord and two post card holders, for use especially with Solid Beaded Screen. (See list page 101)	140.00
	(No. 3674 Filmslide Attachment permits the use of filmslide and micro-slides on Model QA. See below).	



Spencer Filmslide and Micro-Slide Attachments



THESE attachments are designed for the convenience of those who are already equipped for at least one type of projection. The filmslide attachment accommodates the standard width (35mm.), motion picture stock on which still pictures have been reproduced. All Spencer filmslide attachments are equipped with micro slideways, permitting the use of the 3″x1″ slides. The micro attachment is designed especially for the projection of the standard 3″x1″ micro-slides for gross work. It has been designed to meet the demand for a low priced micro-projector, having sufficient magnification for elementary Botany and Biology

Cat. No.	DESCRIPTION	Price
3671	Spencer Filmslide attachment for use on Spencer Delineascopes Models C and D or on any other standard projector from which the bellows can easily be removed*	$ 38.50
3672	Spencer Filmslide attachment for use on Spencer Delineascopes Models B, E, H and J, and on all other lanterns having the bakelite sleeve outside the bellows and from which the objective can be removed†	38.50
3673	Spencer Filmslide attachment for use on Spencer Delineascopes Models N, R and RA	38.50
3674	Spencer Filmslide attachment for use on Spencer Delineascopes Models SA, QA and W	38.50
9171	Spencer Micro-attachment for use on Spencer Delineascopes Models C and D, or on any other standard projector from which the bellows can easily be removed*	20.00
9172	Spencer Micro-attachment for use on Spencer Delineascope Model SA, QA and W	20.00
9173	Spencer Micro-attachment for use on Spencer Delineascopes Models N, R and RA	20.00
9174	Spencer Micro-attachment for use on Spencer Delineascopes Models B, E, H and J and on all other lanterns having the bakelite sleeve outside the bellows and from which the objective can be removed†	20.00
*3685	Metal adapter supplied when attachments are required for use on other than Spencer lanterns	No chg.
	†Bakelite adapter supplied when attachments are required for other lanterns	No chg.

Screens

The screens here listed are all guaranteed articles, each especially designed for particular requirements.

PLAIN WHITE (opaque) — Used where a part of the audience will be seated well to the side of the screen. Supplied on spring roller with brackets and backboard for hanging.

3860—4½′ x 4½′	$ 9.00 Net	3868—9′ x 9′	$30.00 Net
3862—6′ x 6′	11.00 "	3870—10′ x 10′	47.50 "
3864—7′ x 7′	14.00 "	3872—12′ x 12′	65.00 "
3866—8′ x 8′	18.00 "		

ALUMINUM COATED (opaque) — Used where the audience is seated directly in front of the screen in a long, narrow room. Supplied on spring roller with brackets and backboard for hanging.

3862—A–6′ x 6′	$14.50 Net	3868—A–9′ x 9′	$38.00 Net
3864—A–7′ x 7′	19.00 "	3870—A–10′ x 10′	52.50 "
3866—A–8′ x 8′	25.00 "	3872—A–12′ x 12′	80.00 "

RAVEN HAFTONE (opaque) — Used where a soft tone, clear cut picture is desired in a semi-lighted room and where the audience is seated at a wide angle. Supplied on spring roller with brackets and backboard for hanging.

3873—32″ x 42″	$10.00 Net	3876—48″ x 70″	$29.00 Net
3874—36″ x 48″	12.00 "	3877—70″ x 70″	41.00 "
3875—48″ x 48″	18.00 "		

BEADED (opaque) — Used where exceptional brilliancy is required. These screens will produce pictures of remarkable brilliancy, great depth, sharp definition and natural perspective under ordinary lighting conditions. Furnished in various forms as indicated below.

1. DeLuxe Model—in Leatherette Case—

3831—30″ x 40″	~~$23.00~~ Net	3832—36″ x 48″	~~$30.00~~ Net

2. In Black Crystalline Finished Metal Carrying Case—

3893—22″ x 30″	$15.00 Net	3897—39″ x 52″	$30.00 Net
3895—30″ x 40″	20.00 "		

3. In sturdy, transportation-proof wooden case—

3909—30″ x 40″	$15.00 Net	3911—36″ x 48″	$17.50 Net

4. Hanging wall type, on spring roller and in metal case—

3899—26″ x 34″	87.50 Net	3901—42″ x 56″	~~$19.50~~ Net
3900—30″ x40″	9.00 "	3901½—48″ x 64″	30.00 "
3900½—36″ x 48″	13.50 "	3903—54″ x 72″	40.00 "

5. Hanging wall type, on spring roller and on backboard—

3903½—4′ x 6′	~~$12.00~~ Net	
3905 —6′ x 8′	~~80.00~~ "	Made up
3907 —7½′ x 10′	~~120.75~~ "	on special
3907½—9′ x 12′	~~171.00~~ "	order only.

6. Solid backed screen (especially used with Models B and QB—pages 94 and 100).

3858—22″ x 30″	$12.50 Net	3859—30″ x 40″	$17.50 Net

TRANSLUX DAYLIGHT (translucent) — Used where "daylight" projection is desired—the lantern being placed behind the screen—the picture being projected through from the rear. Bound and supplied "knocked down" with frame and tripod.

3880—24″ x 30″	$25.00 Net	3884—36″ x 45″	$52.50 Net
3882—30″ x 36″	35.00 "	3888—4′ x 5′	80.00 "

Carrying cases for Translux screens may be obtained at $7.50, $10.00, $12.50 and $22.00 each, net, respectively.

LUMINEX DAYLIGHT (translucent) — A translucent screen used for daylight projection—the lantern being placed behind the screen, the picture being projected through from the rear. Bound and supplied with folding frame and tripod.

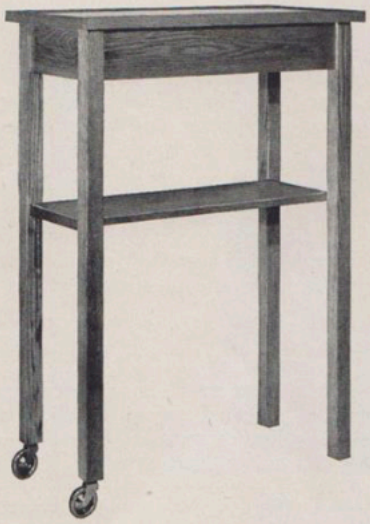
3894—22½″ x 30″	$22.50 Net	3890—30″ x 40″	$37.50 Net
3896—26¼″ x 35″	32.50 "	3898—33¼″ x 45″	50.00 "

Opaque Window Shades

We can furnish opaque black window shades on spring rollers and with brackets for hanging—prices on special sizes given upon request. A most satisfactory manner of completely darkening the room when projection requirements call for it.

Delineascope Tables and Tripods

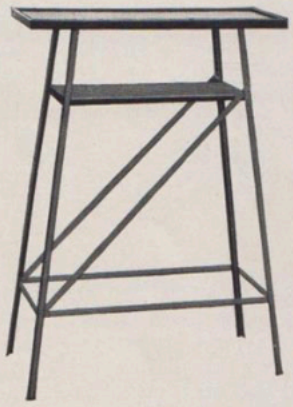
A proper support for your Delineascopes is a great convenience and from the list here shown we believe the ideal stand for your equipment may be selected.



3902—Classroom Stand—
A substantial oak stand, in natural wood finish, with shelf and 5″ castors, also handles for ease in moving. Table is shipped "knocked down" but is quickly put together by wing nuts.
Dimensions: 45″ x 16″ x 32″.
Price ..... $30.00 Net



3904–3906—Adjustable Tables—
A strong table with iron frame, oak top with convenient adjusting screws for inclining at any desired angle. Has iron shelf for accessories and is supplied with castors.
3904—Dimensions: 44″ x 19″ x 32″.
Price ..... $35.00 Net
3906—Same as 3904 but of lighter construction.
Dimensions: 42½″ x 14″ x 28½″.
Price ..... $26.00 Net



3908—Knock-down Table—
A support of exceptionally rigid construction, suitable for supporting any slide projecting lantern. Legs of angle iron are braced by strips of such size as to give requisite strength to withstand rough handling. Top is of wood, black finish.
Dimensions: 42″ x 12″ x 30″.
Price ..... $15.00 Net



3914 and 3682 Tripods—
A convenient rigid support for Delineascopes; supplied with heads and clamps for attaching to the instrument for which they are intended. Legs are collapsible and removable from the head for convenience in transporting.
3914—Tripod for Model H ..... $12.00 Net
3682—Tripod for " D ..... 12.00 "

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