SPENCER

CATALOG

OF THE MORE POPULAR

(Not complete)

SPENCER

Microscopes
Microtomes
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 Co. 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, the 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
U.S.A.

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.

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		16-4-2 Oil-imm.	10-44-90	5x-10x	
Onj	1J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x					
Toh	2H	16-4-1.8 Oil-imm.	10-45-95	6x-10x		16-4-2 Oil-imm.	10-44-90	5x-10x	
Toj	2J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x					

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



Spencer Binocular Microscope No. 4

THIS instrument, while somewhat simplified in construction, embraces the essential features of all our mon-objective binocular microscopes. The single tube and binocular body are interchangeable by the same methods and with the same results as on our larger instruments.

The stand is similar to that of the Spencer No. 44, which has already established its reputation as a most practical instrument for general laboratory purposes.

BINOCULAR BODY—The standard attachment optically identical with that employed in all other Spencer binoculars. It is slightly shorter than those of the large microscopes, to accommodate it to the smaller stand.

SINGLE TUBE—This tube is identical in size and length with that regularly used on the Spencer Microscope No. 44, so that the stand equipped with this tube is virtually identical in all particulars with No. 44.

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

STAGE—Rectangular, 110 x 105 millimeters; of new composition, solid throughout, harder and more durable than rubber, will not warp or fade. Supplied (when so ordered and at additional cost) with grooved-in mechanical stage No. 493.

FOCUSING ADJUSTMENTS—Diagonal cut rack and pinion and fine adjustment.

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

CABINET—Polished hardwood, with lock and key.

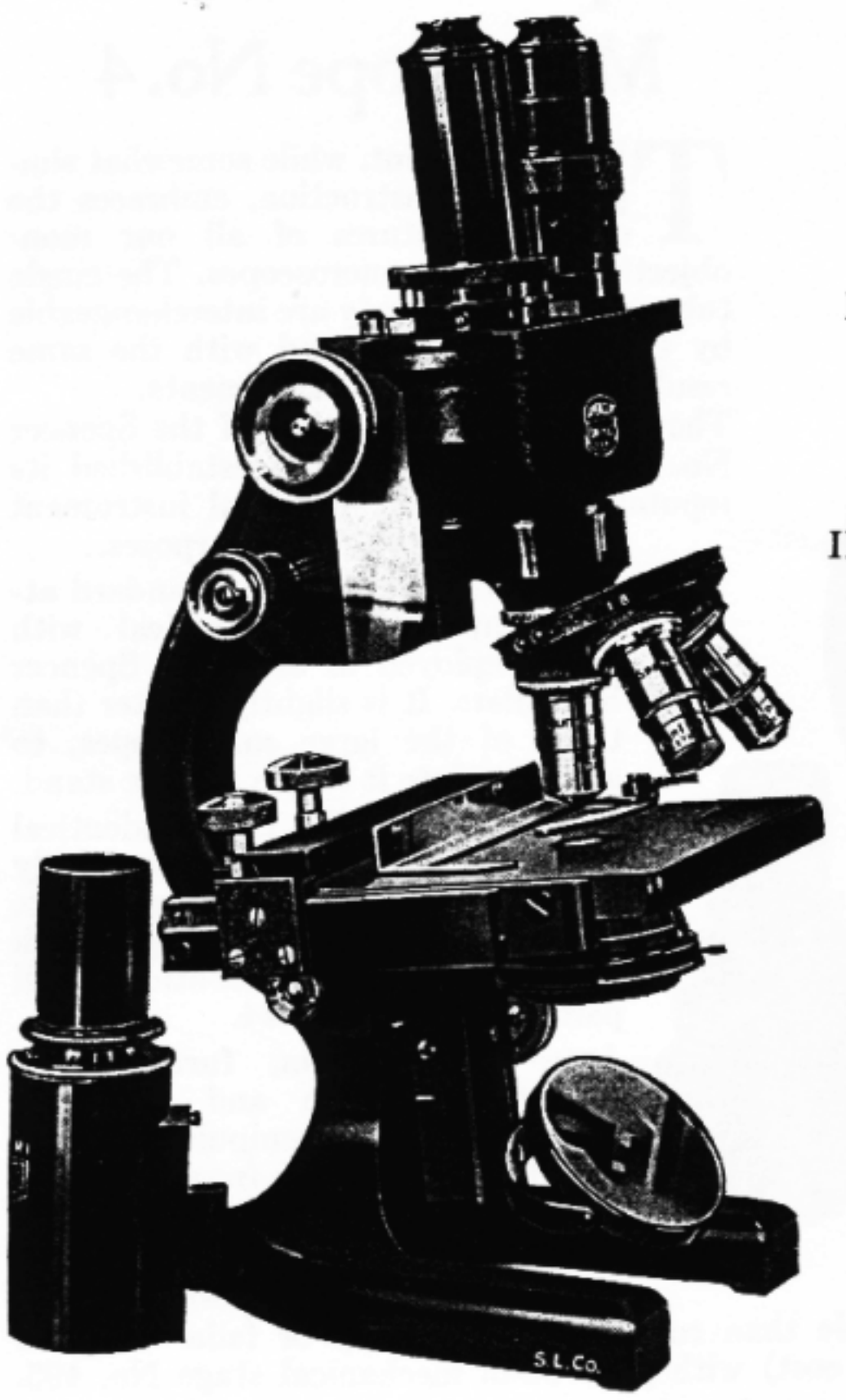
Code	Catalog No.	DESCRIPTION	Price
For	4	Stand only without condenser, binocular body, single tube or nosepiece . .	
Formob	4MOB	Binocular body	
Forsb	4SB	Single Tube	

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

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	
Forh	4H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	
Forj	4J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	

Forsb—Single body tube for above microscope extra . . . . . .

Spencer New Binocular Microscope No. 4-MH



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., 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.

It is identical with the Spencer new advanced laboratory and physicians' microscope No. 44-MH described on another page, but is fitted with the interchangeable binocular and monocular tubes. It thus has the advantages of the fork-type substage, the combined divisible substage condenser, the square mechanical stage, and a binocular body with converging tubes which are inclined at four degrees from the normal, giving them an angle of eight degrees to each other. This construction (patented by us) is not only scientifically correct but possesses a real value in relieving eyestrain and in conveying a correct impression of depth and perspective. It avoids the necessity of acquiring a new art in order to use binocular vision.

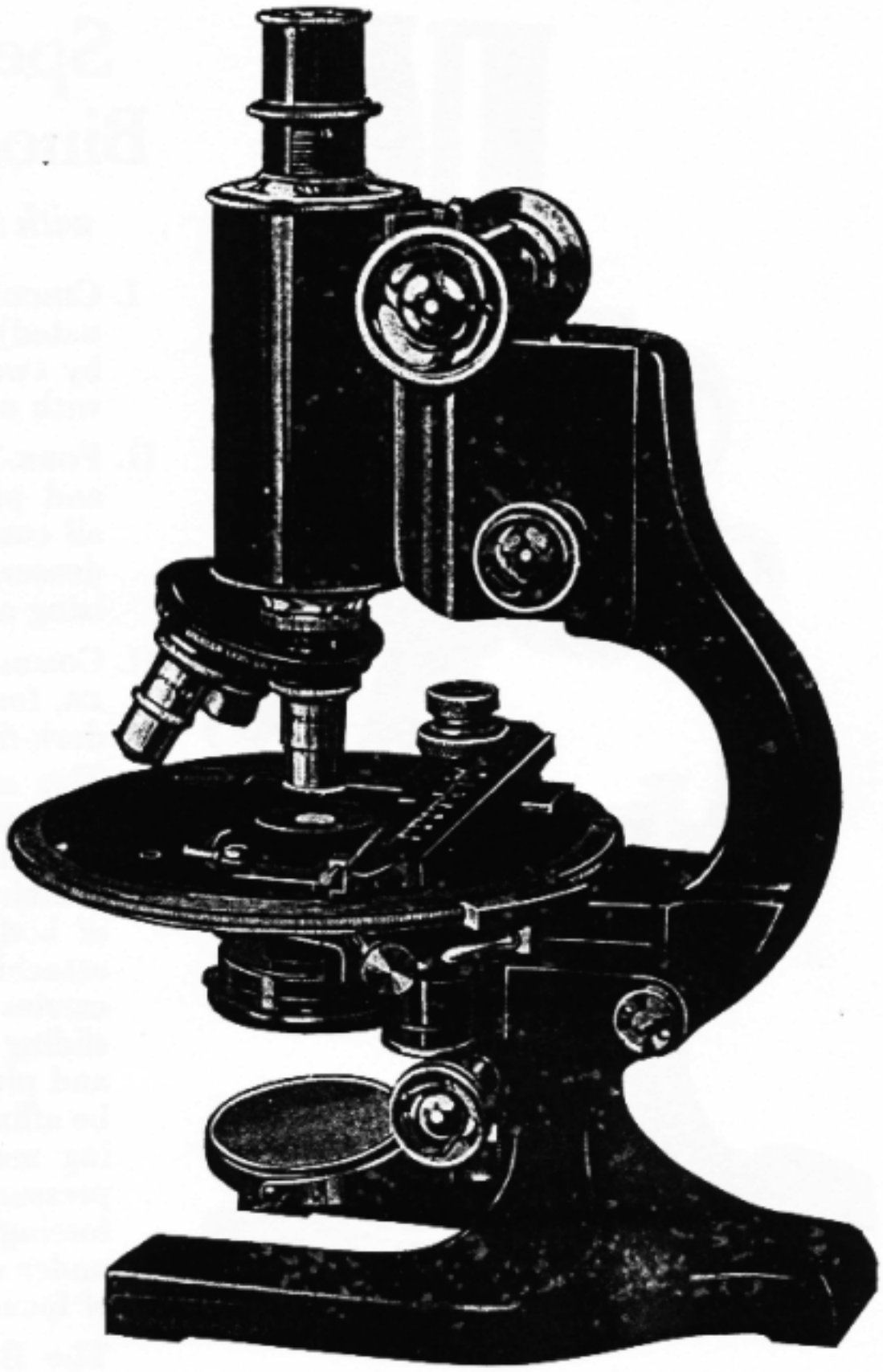
The mechanical stage affords a means by which the entire area of the slide can be systematically examined. Like all Spencer mechanical stages it has exceptionally rigid construction. The diagonal cut rack and pinions are of such size and rigidity as to insure a permanently smooth and uniform movement. It is so constructed that the two adjustment buttons retain a constant relative position, affording ease and convenience in operation. 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	
FormH	4MH *	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	
FormJ	4MJ	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	

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

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

Spencer Microscope No. 5



A SINGLE tube instrument of the highest type designed to meet the most exacting demands of technicians and trained investigators.

BODY TUBE of aluminum, 50 millimeters in diameter and so arranged as to permit the use of either standard objectives or special size photo-micrographic objectives for covering large fields without oculars. Has graduated draw tube fitting in cloth-lined sleeve.

ARM—Curved form, furnishing a convenient handle and providing ample space (100 millimeters) from the arm to center of stage.

STAGE—Revolving type, 150 millimeters in diameter, with centering screws. Equipped with large mechanical stage. Has graduated periphery with clamp and vernier reading to three minutes of arc.

FOCUSING ADJUSTMENTS—Diagonal cut rack and pinion and fine adjustment.

SUBSTAGE—Complete rack and pinion substage with centering screws for condenser, upper and lower iris diaphragms. Lower diaphragm decenterable by rack and pinion for oblique illumination.

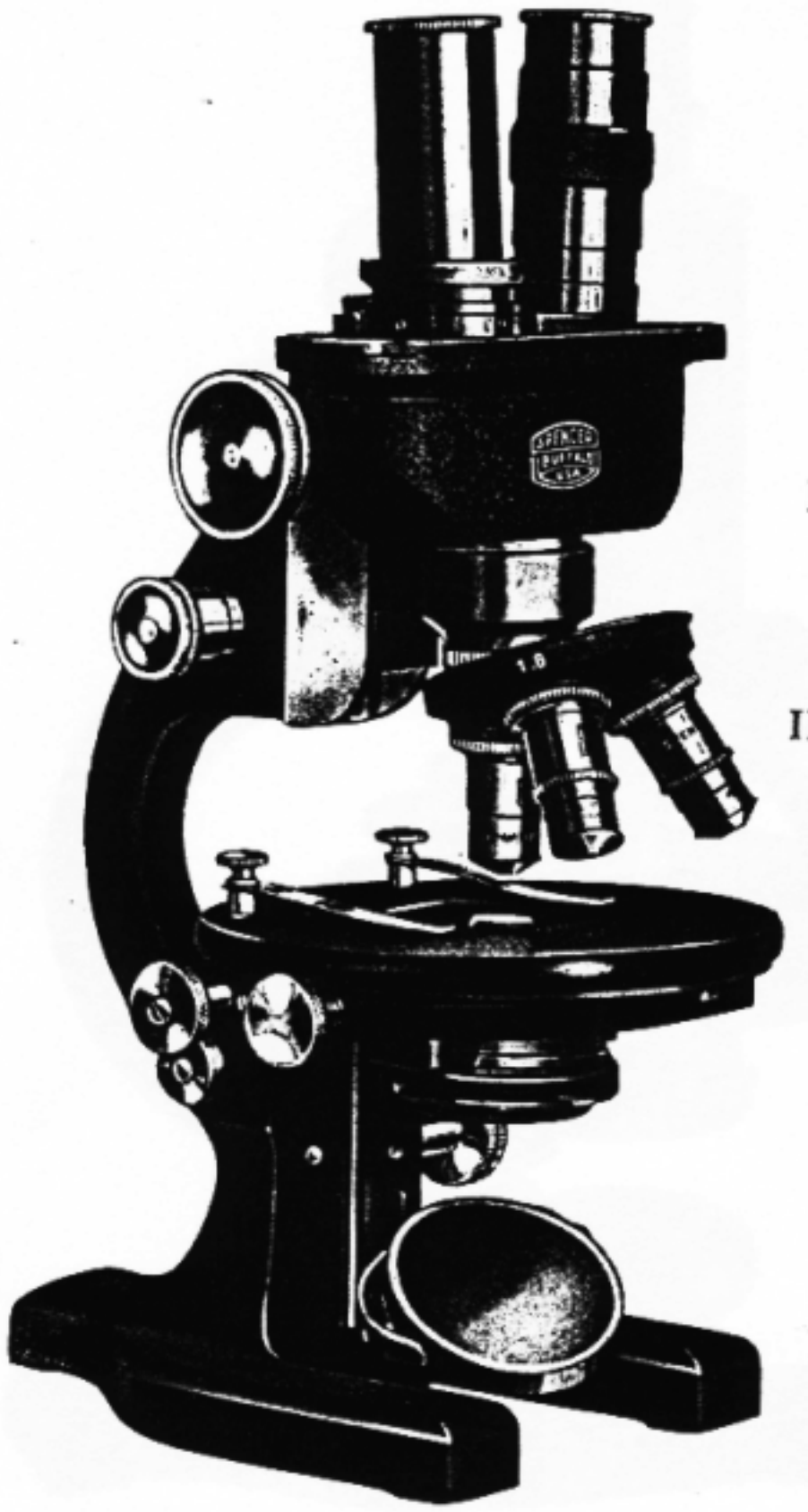
CABINET—Polished hardwood, with lock and key.

The following outfits include stand with wide angle condenser, N. A. 1.40, and revolving nosepiece suitable for the objectives listed.

Catalog numbers and code words refer to achromatic objectives with huyghenian oculars. If apochromatic objectives and compensating oculars are required, prefix " apo " to catalog number or code word.

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

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		
Five	5E	16-4	10-45	6x-10x		16-4	10-44	10x	
Fivf	5F	16-4	10-45	6x-10x		16-4	10-44	5x-10x	
Fivh	5H	16-4-1.8 Oil-imm.	10-45-95	6x-10x		16-4-2 Oil-imm.	10-44-90	5x-10x	
Fivj	5J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x					



Spencer New 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 eye-piece-tube. A similarly placed ring on the left-hand tube furnishes a means of focusing for one eye independently of the other.

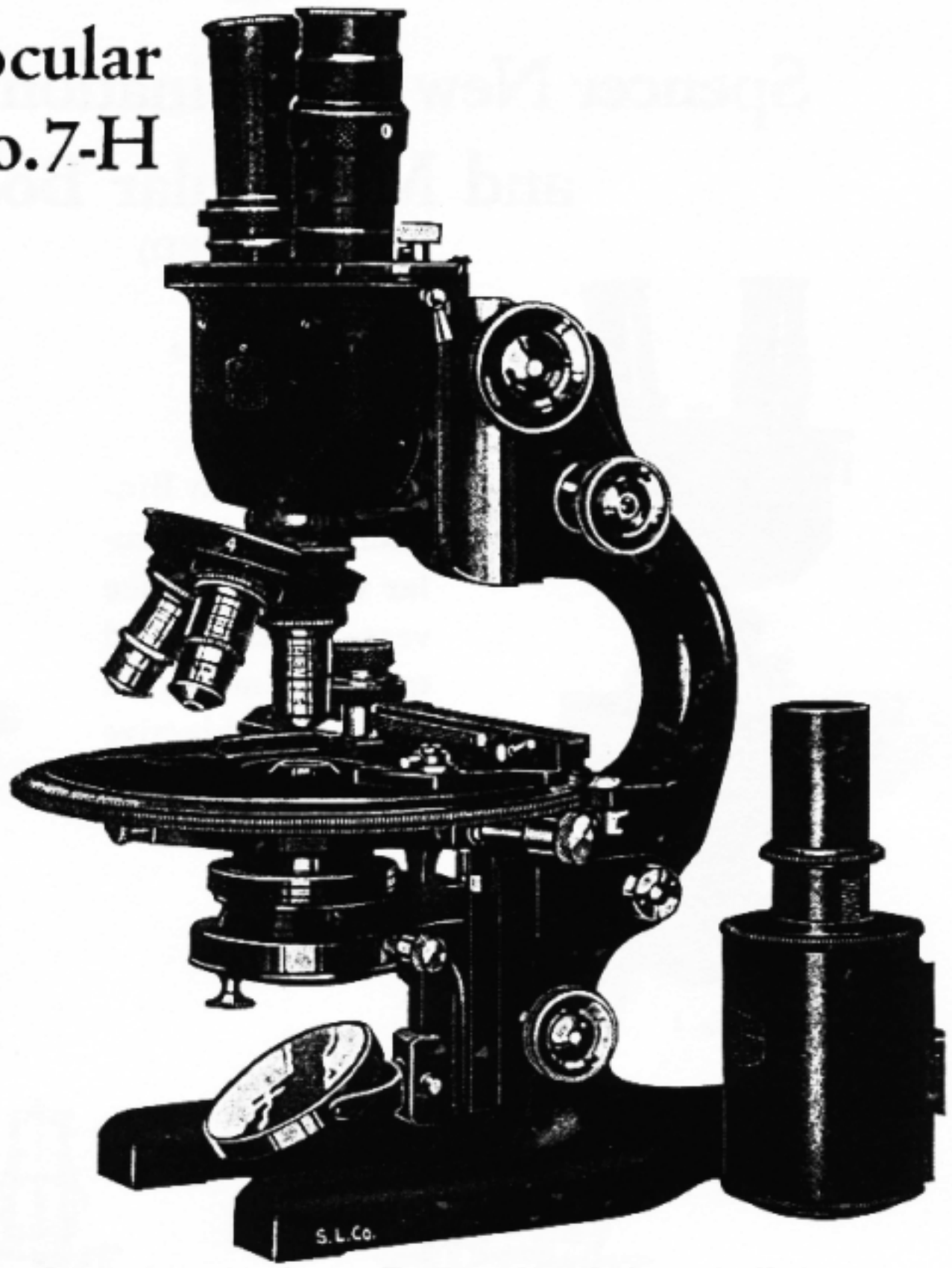
The following outfits include revolving nosepieces suitable for carrying the objectives listed.

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	
Sixh	6H*	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	
Sixj	6J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	

*With special leatherette case, extra, • Dark-Field Illuminator Element for Condenser, extra....

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

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.

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

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

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

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		16-4-2 Oil-imm.	10-44-90	5x-10x	
Sevj	7J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x					

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

Spencer New Combination Binocular and Monocular Body

(PATENTED)

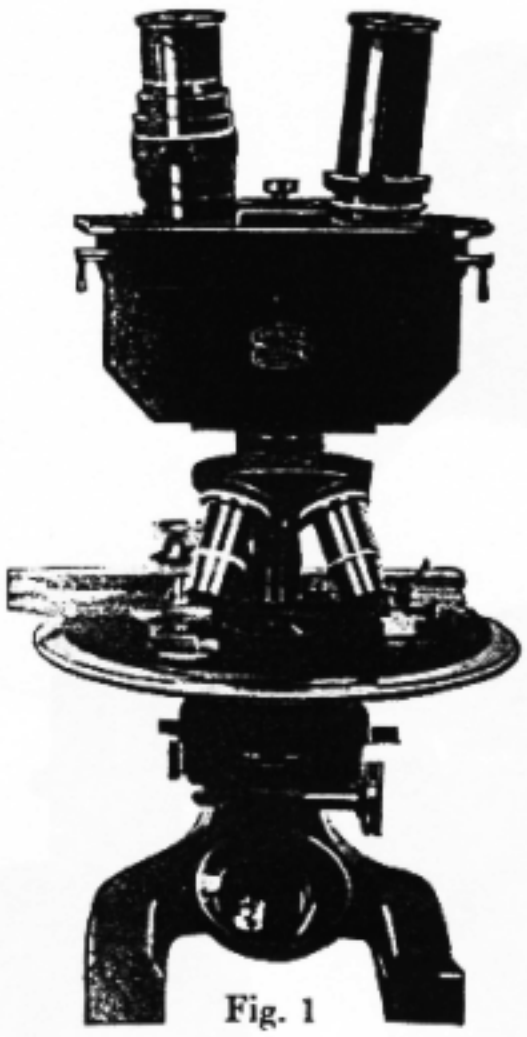


Fig. 1

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

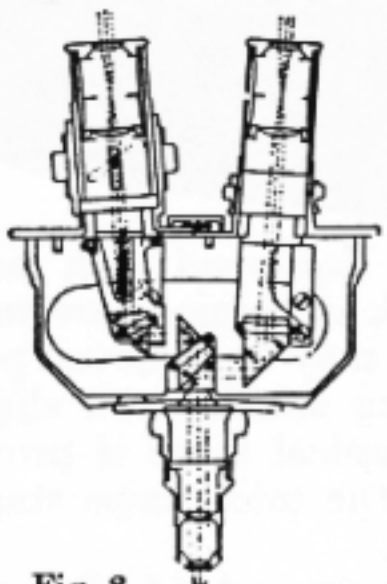


Fig. 3

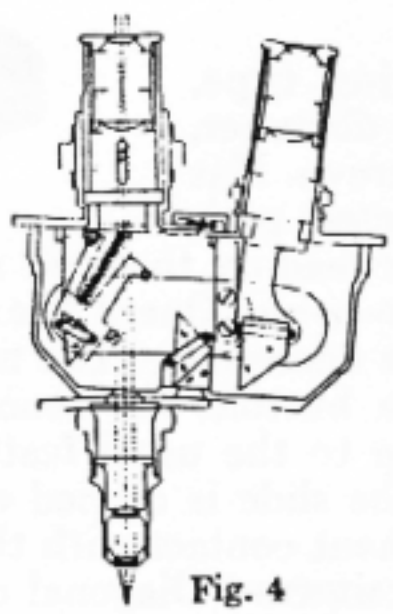


Fig. 4

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.

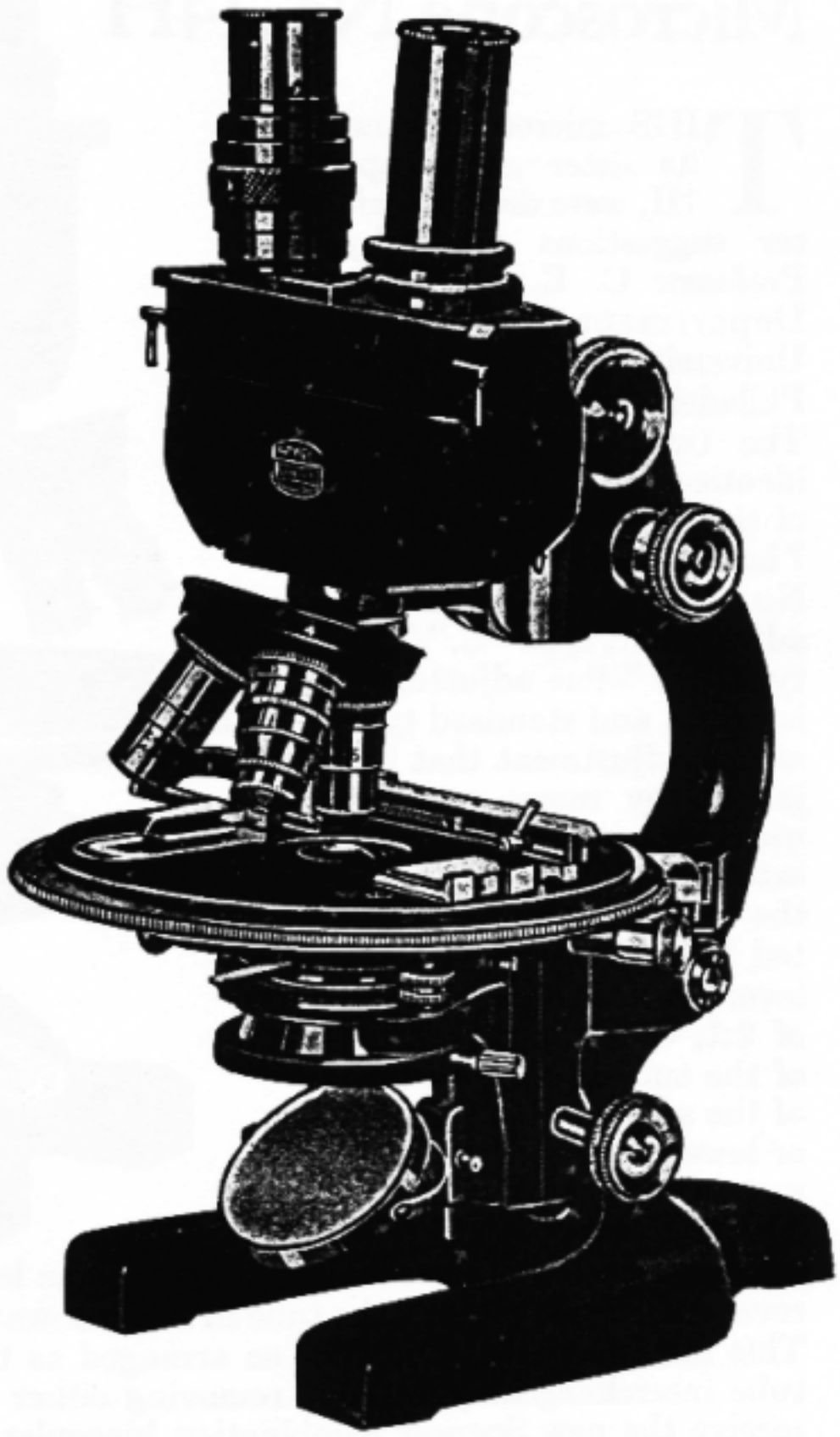
This new combination body may be used on Spencer Research Microscopes Nos. 1, 2, 3, 7 and 14. It is easily attachable to any of these.

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

As the regular individual binocular body (M. O. B.) lists at and single body tube (S. B.) at for the substitution of the Combination Body tube on any of the outfits previously listed (Microscopes Nos. 1, 2, 3, 7 and 14) add

Spencer Binocular Microscope No. 7 CB. H.

With Combination Body



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

With this research microscope equipped with the new 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 new 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, make 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.

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		16-4.2	10-44-90	5x-10x	
sevcbj	7CBJ	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x		Oil-imm.			

Spencer Binocular Microscope No. 14H



THIS microscope and its sister microscope 7H, 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 new 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.

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		16-4-2 Oil-imm.	10-44-90	5x-10x	
Onforj	14J	16-4-1.8 Oil-imm. Fluorite	10-45-97	6x-10x					

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

Spencer Chemical Microscope No. C42



THIS instrument is designed primarily for use in the *chemical laboratory* and is regularly equipped with the accessories required for chemical work, but it is entirely satisfactory for any work where a high-grade compound microscope is required. The optical equipment is of Spencer standard quality and serves equally well for use in either the chemical, biological or bacteriological laboratory.

BODY TUBE—Of standard size with graduated draw tube fitting in cloth-lined sleeve.

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

STAGE—Revolving type, 120 millimeters in diameter, with centering screws. The periphery is graduated to single degrees with vernier reading to three minutes. Can be supplied with chemical type mechanical stage at an addition of to list prices given below.

FOCUSING ADJUSTMENTS—Diagonal cut rack and pinion and fine adjustment.

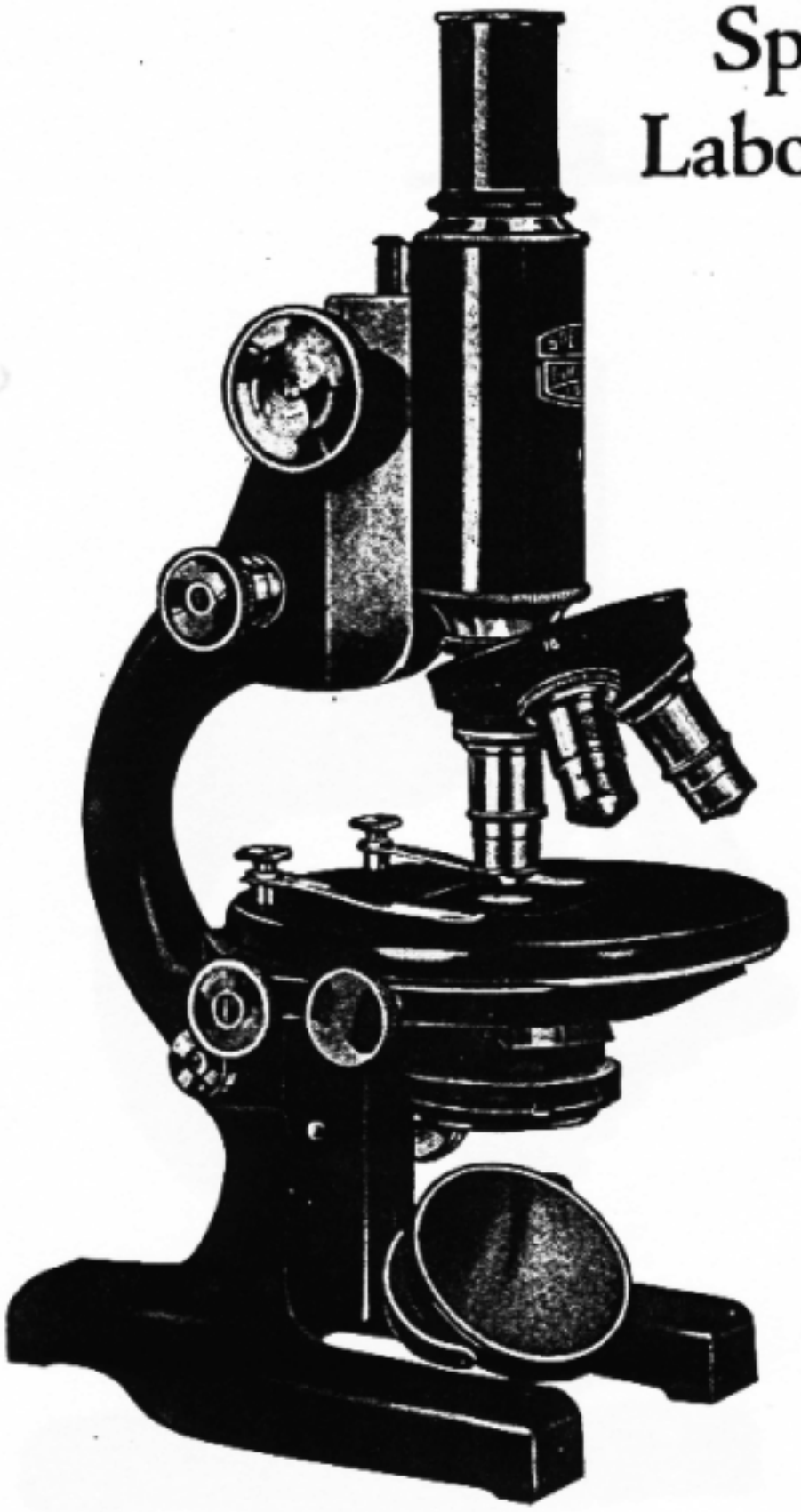
SUBSTAGE—Of standard " quick screw " form.

CABINET—Polished hardwood, with lock and key.

The following outfits include revolving nosepieces* suitable for carrying the objectives listed, *analyzer "B," polarizer "B,"* and *substage condenser*. The two latter attachments are readily interchangeable in the substage ring. If the instrument is desired with either condenser or polarizer and analyzer omitted, deductions may be made according to the price of omitted parts.

Telegraph Code	Catalog No.	Achromatic Objectives		Cross Hair Oculars	Price
		Equivalent Focus-mm.	Initial Magnification		
Cfortof	C42F	16-4	10-44	6x-10x	
Cfortog	C42G	16-8-4-1.8 Oil-imm.	10-20-44-95	6x-10x	
Cfortoh	C42H	16-4-1.8 Oil-imm.	10-44-95	6x-10x	
Cfortoj	C42J	16-4-2 Oil-imm. Fluorite	10-44-82	6x-10x	
Cforton	C42N	32-16-4	4-10-44	6x-10x	

*If objectives are preferred with short mounts and quick changing rings for use with vertical illuminators, they are so supplied instead of with nosepieces—no change in price.



Spencer New 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, darkfield 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 Condser N. A. 1.20	Achromatic Objectives		Huyg. Oculars	Price
			Equivalent Focus-mm.	Initial Magnification		
Fortib	40B	Not included	16-4	10-44	10x	
Fortid	40D	Not included	16-4	10-44	6x-10x	
Fortie	40E	Included	16-4	10-44	10x	
Fortif	40F	Included	16-4	10-44	6x-10x	
Fortih	40H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	*
Fortij	40J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	

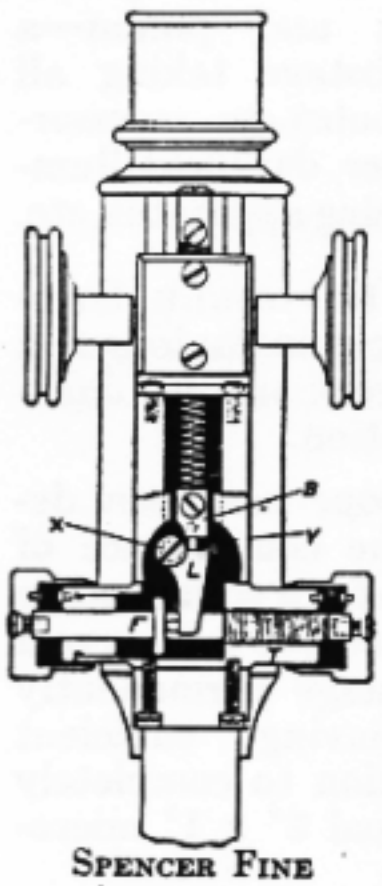
*With special leatherette case, $2.00 extra. Dark-Field Illuminator Element for Condenser, Extra .....

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.

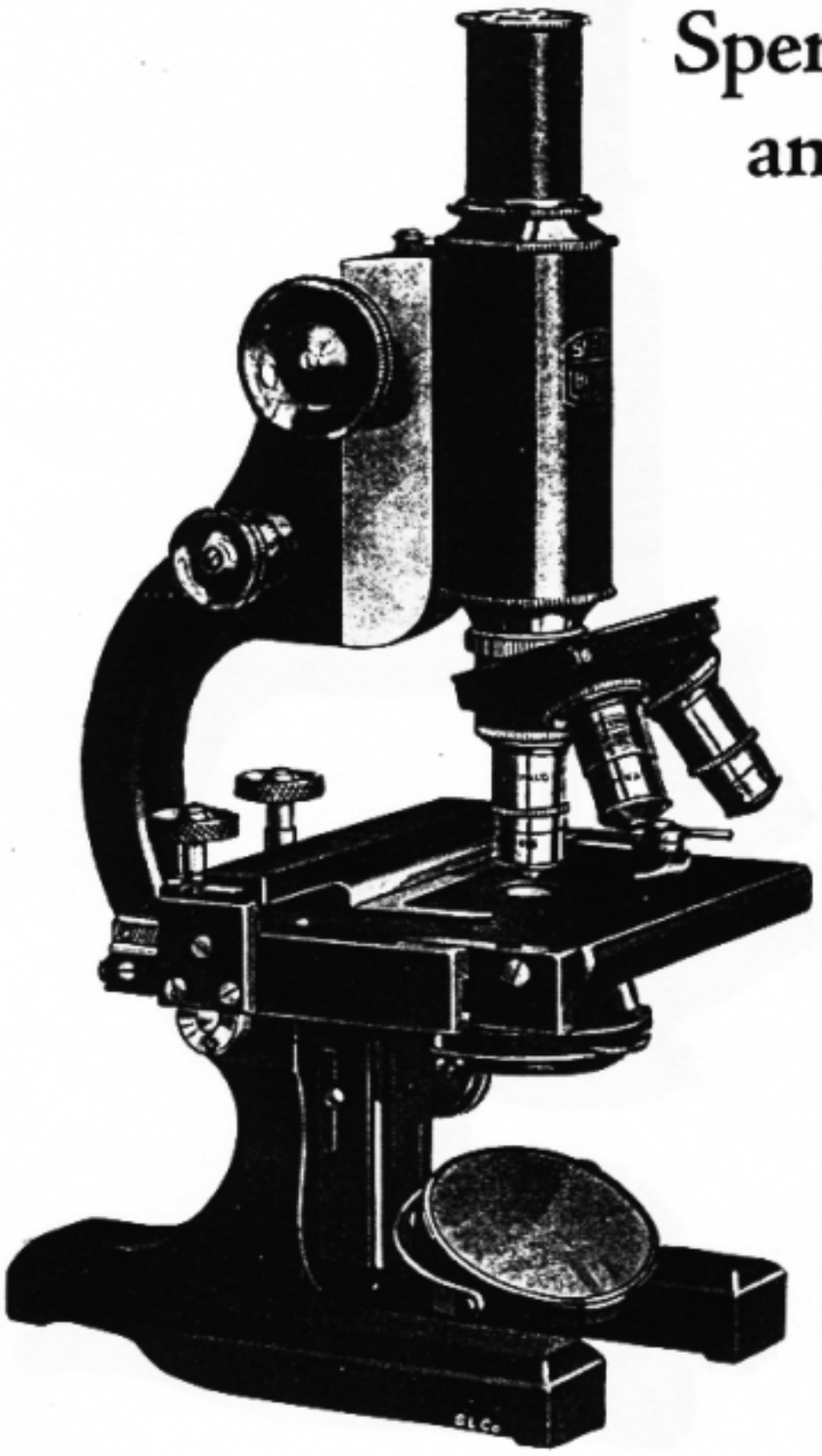
OPTICS—Objectives of the highest and best definition and resolution, corrected for tube length of 160 millimeters, accurately centered and parfocalized. All objective lenses burnished directly into metal cells.

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	
Fortiford	44D	Not included	16-4	10-44	6x-10x	
Fortifore	44E	Included	16-4	10-44	10x	
Fortiforf	44F	Included	16-4	10-44	6x-10x	
Fortiforh	44H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	*
Fortiforj	44J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	

*With special leatherette case, extra, Dark-Field Illuminator Element for Condenser, extra,



Spencer New Physicians' and Laboratory Microscope No. 44M-H

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, darkfield illuminator, polarizing apparatus, etc.

III. Combined Divisible Substage Condenser, for long and short focus work and for darkfield 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.

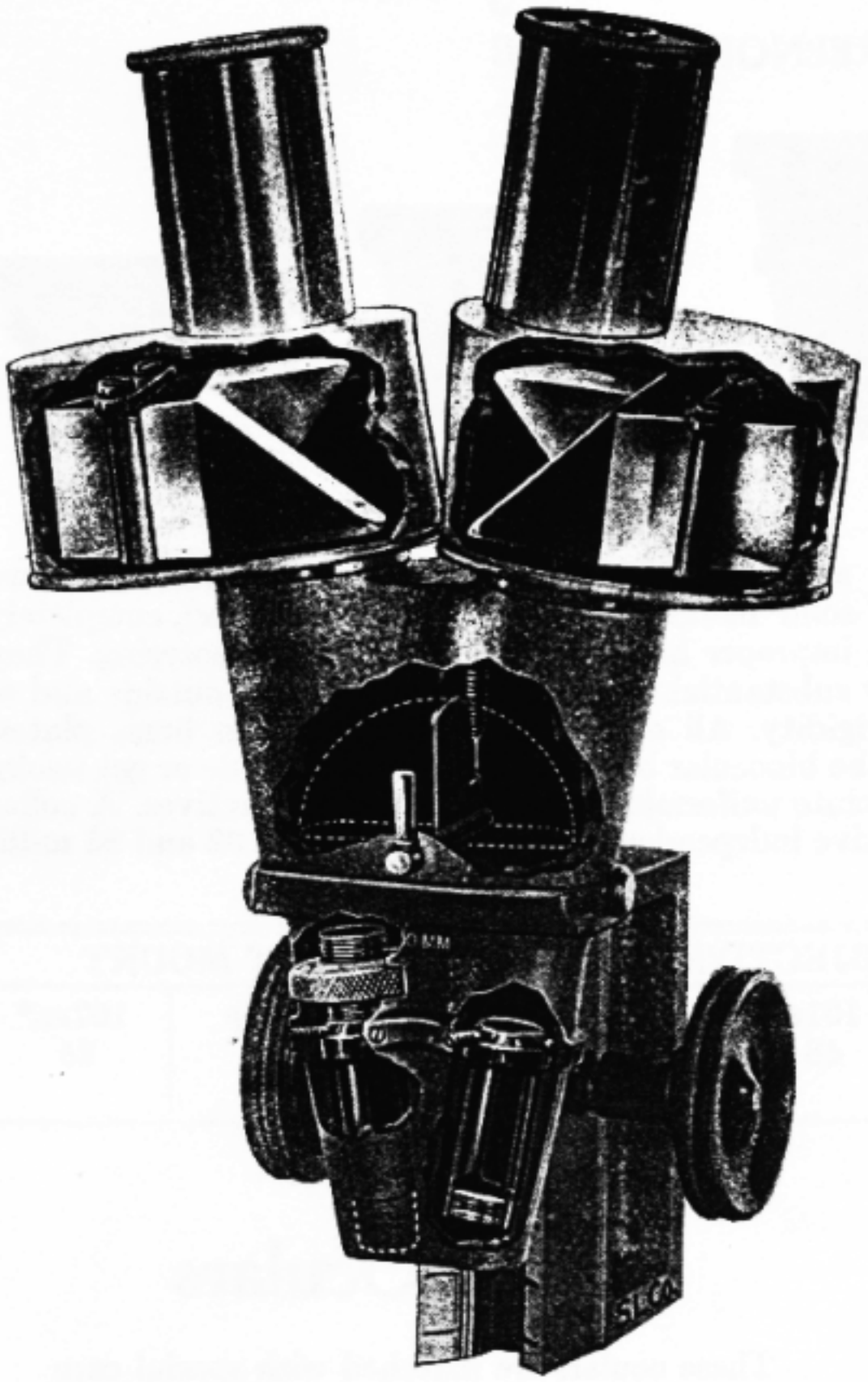
It is permanently attached to the Microscope stage and yet may be racked off, leaving a perfectly plain square stage.

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	
fortiformd	44MD	Not included	16-4	10-44	6x-10x	
fortiforme	44ME	Included	16-4	10-44	10x	
fortiformf	44MF	Included	16-4	10-44	6x-10x	
fortiformh	44MH	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	*
fortiformj	44MJ	Included	16-4-1.8 Fluorite	10-44-97	6x-10x	

*With special leatherette case, extra, Dark-Field Illuminator Element for Condenser, extra,

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 millimeters objectives.

PRICES—PAIRED OBJECTIVES IN PATENTED UNIT MOUNT

Catalog No.	100P	101P	102P	104P	107P	107PL*
Equiv. Focus-mm.	55	48	40	32	25	25
Price per pair						

*Water Immersion



Paired Oculars

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

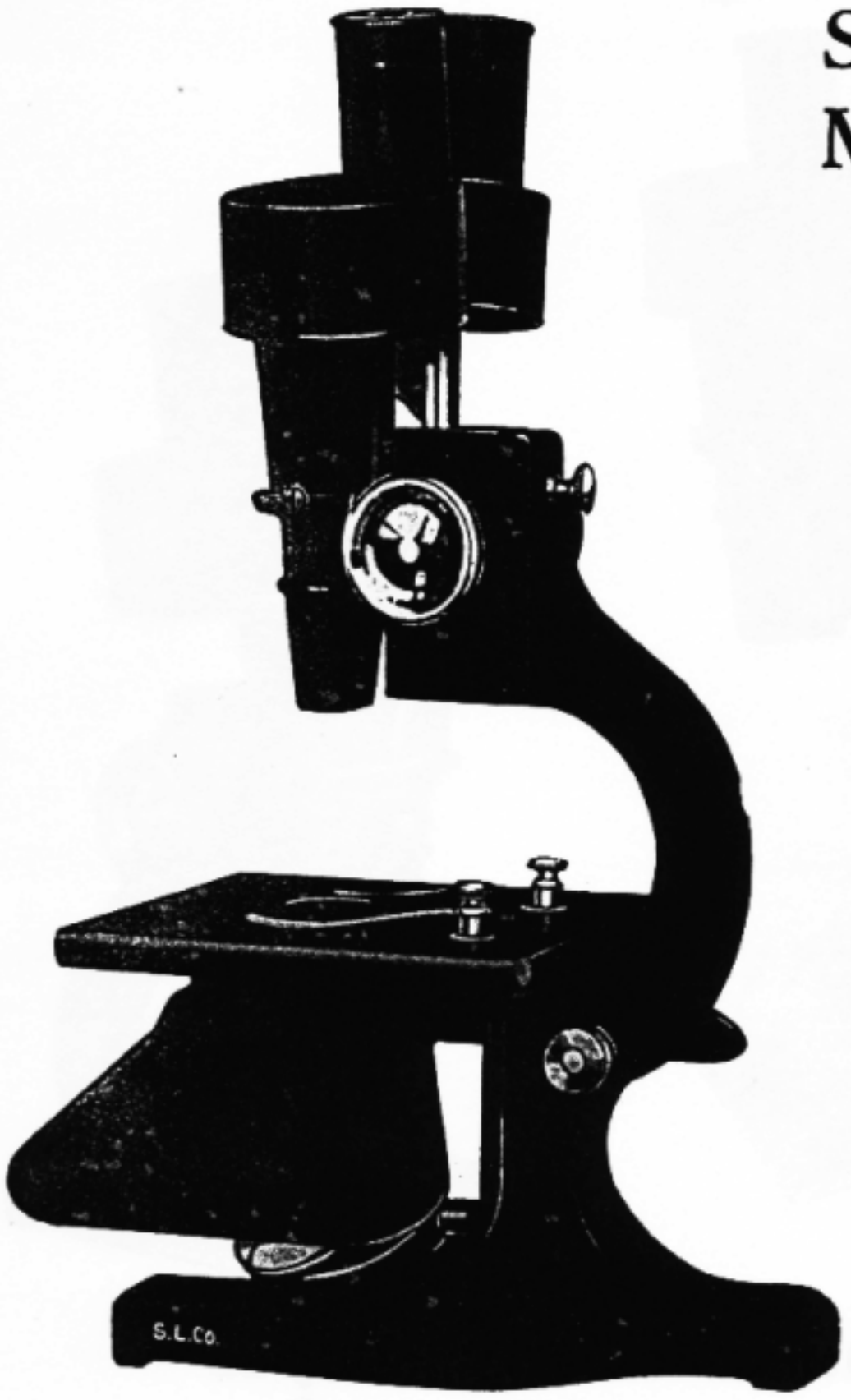
PRICES—PAIRED OCULARS

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

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.

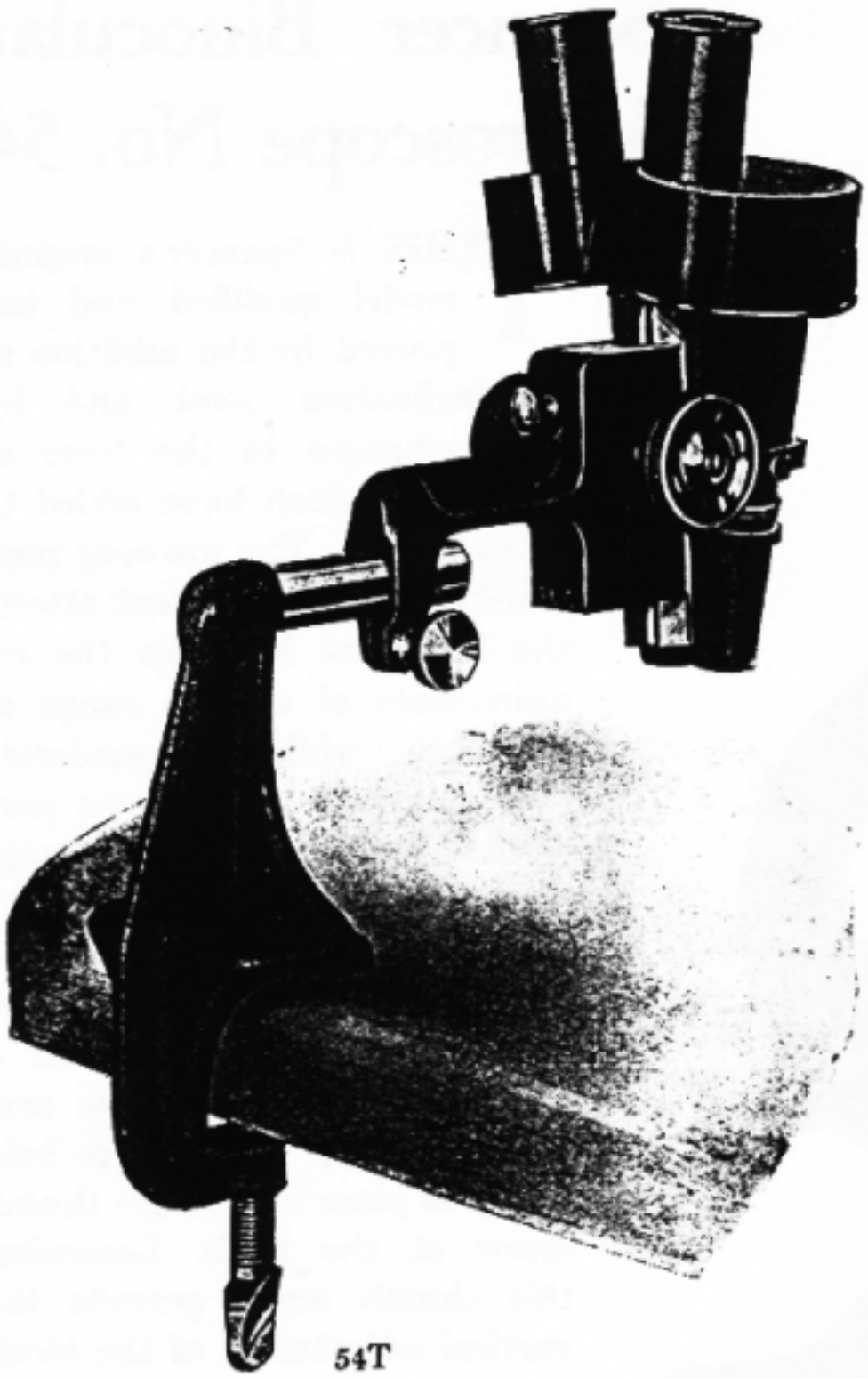
The binocular body is Spencer standard attachment with ample adjustment for pupillary distance and convenient shutter for stopping of either optical system.

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.

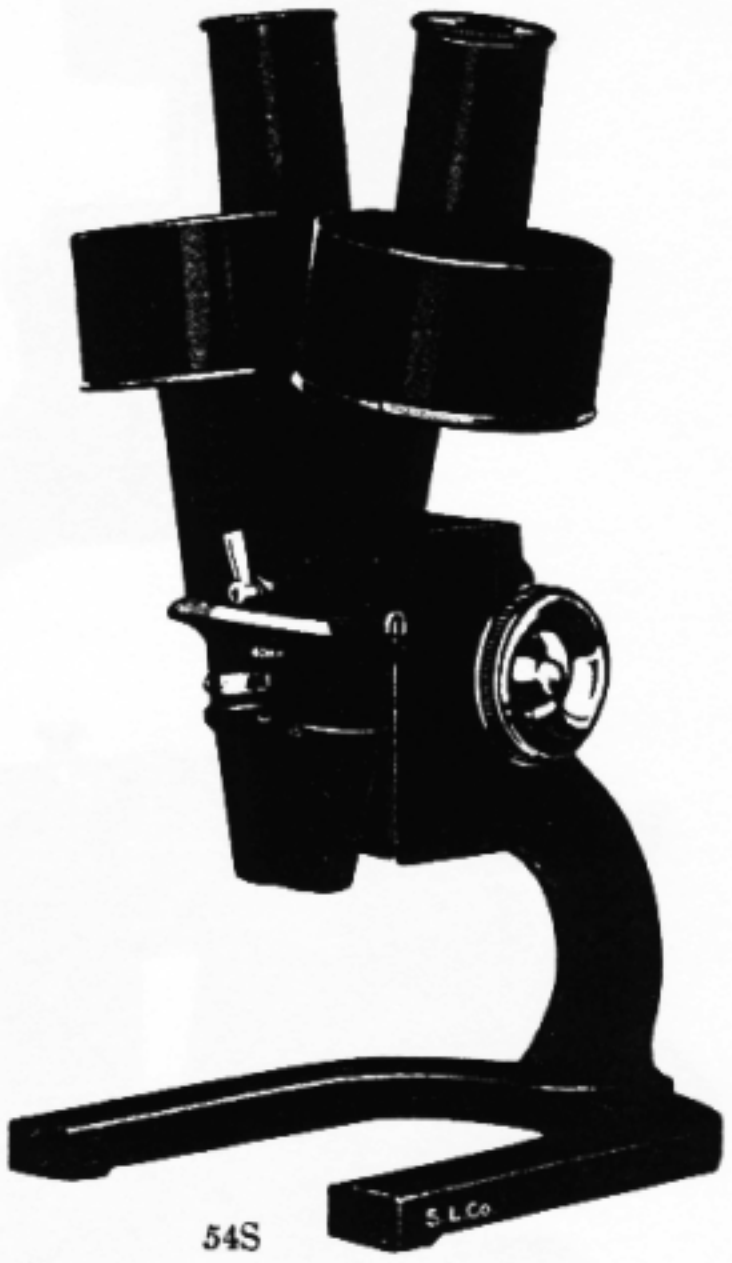
Standard hand rests, as shown in the illustration, are included. Extra-sized hand rests, reaching to the level of the table, may be substituted at an addition of $1.00 to the list price. Furnished hardwood cabinet, with lock and key.

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	
Fivforb	54B	48, 32	6x, 10x	
Fivforc	54C	55, 40, 25	4x, 6x, 10x	
Fivford	54D	55, 48, 32, 25	4x, 6x, 10x	
Fivfore	54E	55, 48, 40, 32, 25	4x, 6x, 10x	



54T



54S

Spencer Binocular Microscopes Nos. 54S and 54T

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.

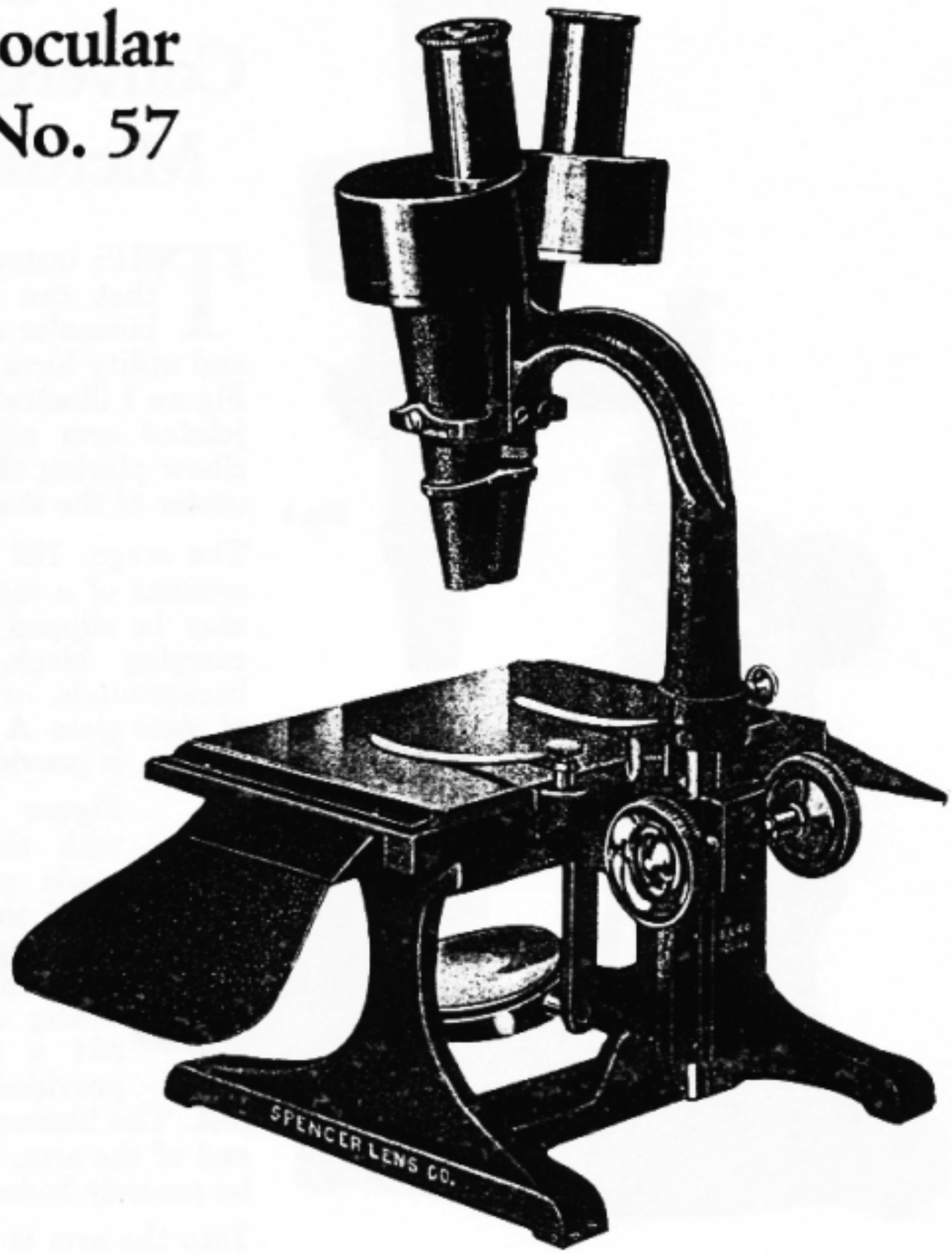
It will be observed that possessors of either of these outfits may purchase the larger stand, No. 54, as listed on the previous page, to convert their outfit into the standard instrument listed under that number.

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 17.*

Telegraph Code	Catalog No.	Price	Equipment		Telegraph Code	Catalog No.	Price
			Paired Objectives	Paired Oculars			
Fivforsa	54sA		40	10x	Fivforta	54tA	
Fivforsb	54sB		48-32	6x–10x	Fivfortb	54tB	
Fivforsc	54sC		55-40-25	4x–6x–10x	Fivfortc	54tC	
Fivforsd	54sD		55-48-32-25	4x–6x–10x	Fivfortd	54tD	
Fivforse	54sE		55-48-40-32-25	4x–6x–10x	Fivforte	54tE	

Cat. No. 54s—Small stand only, without case : .....
Cat. No. 54t—Clamp Stand only, without case .....
Binocular body in case.....

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 handrests, 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 17.*

Furnished in hardwood cabinet, with lock and key.

Code	Catalog No.	Paired Objectives Equivalent Focus-mm.	Paired Huyg. Oculars	Price
Fivseva	57A	40	10x	
Fivsevb	57B	48, 32	6x_10x	
Fivsevc	57C	55, 40, 25	4x_6x_10x	
Fivsevd	57D	55, 48, 32, 25	4x_6x_10x	
Fivseve	57E	55, 48, 40, 32, 25	4x_6x_10x	

Binocular body and arm, no objectives or oculars, without case .....

Combination base and stage, in case .....

Spencer Convertible Binocular Microscope No. 58

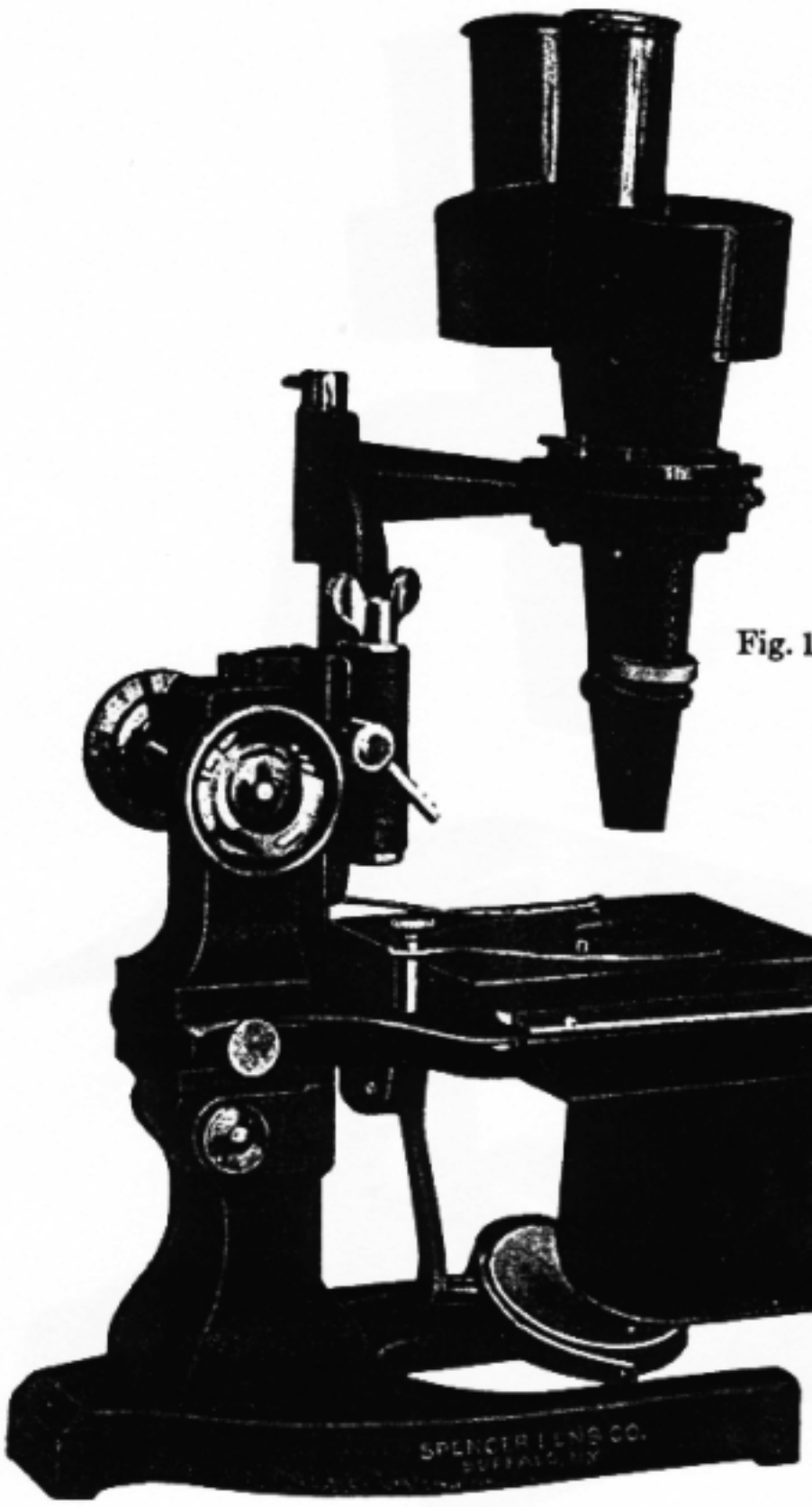


Fig. 1

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.

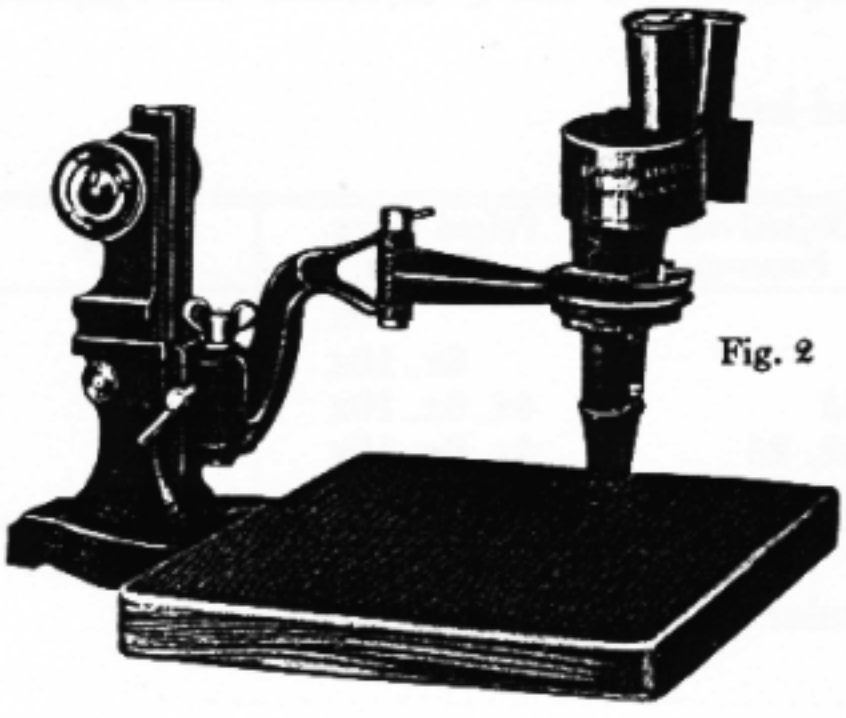


Fig. 2

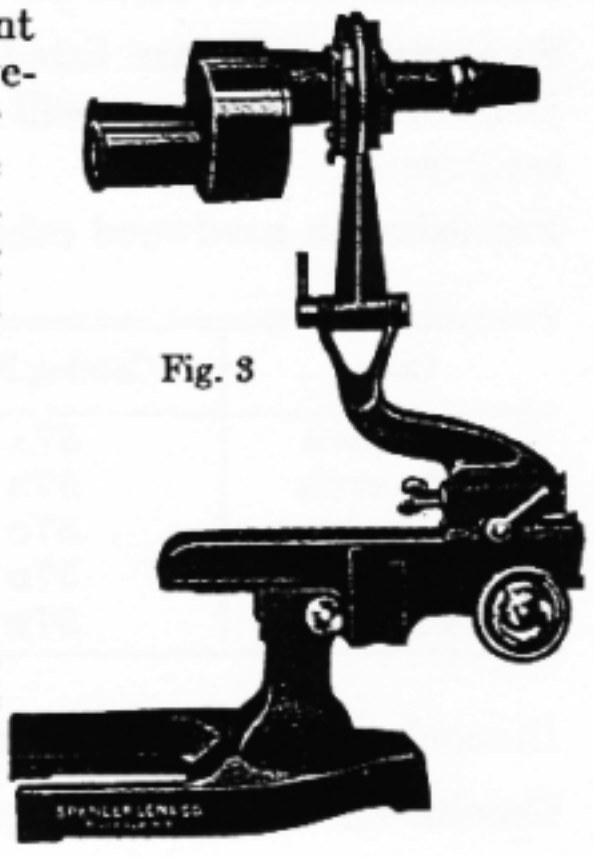


Fig. 3

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	
Fivateb	58B	48-32	6x-10x	
Fivatec	58C	55-40-25	4x-6x-10x	
Fivated	58D	55-48-32-25	4x-6x-10x	
Fivatee	58E	55-48-40-32-25	4x-6x-10x	

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 17.

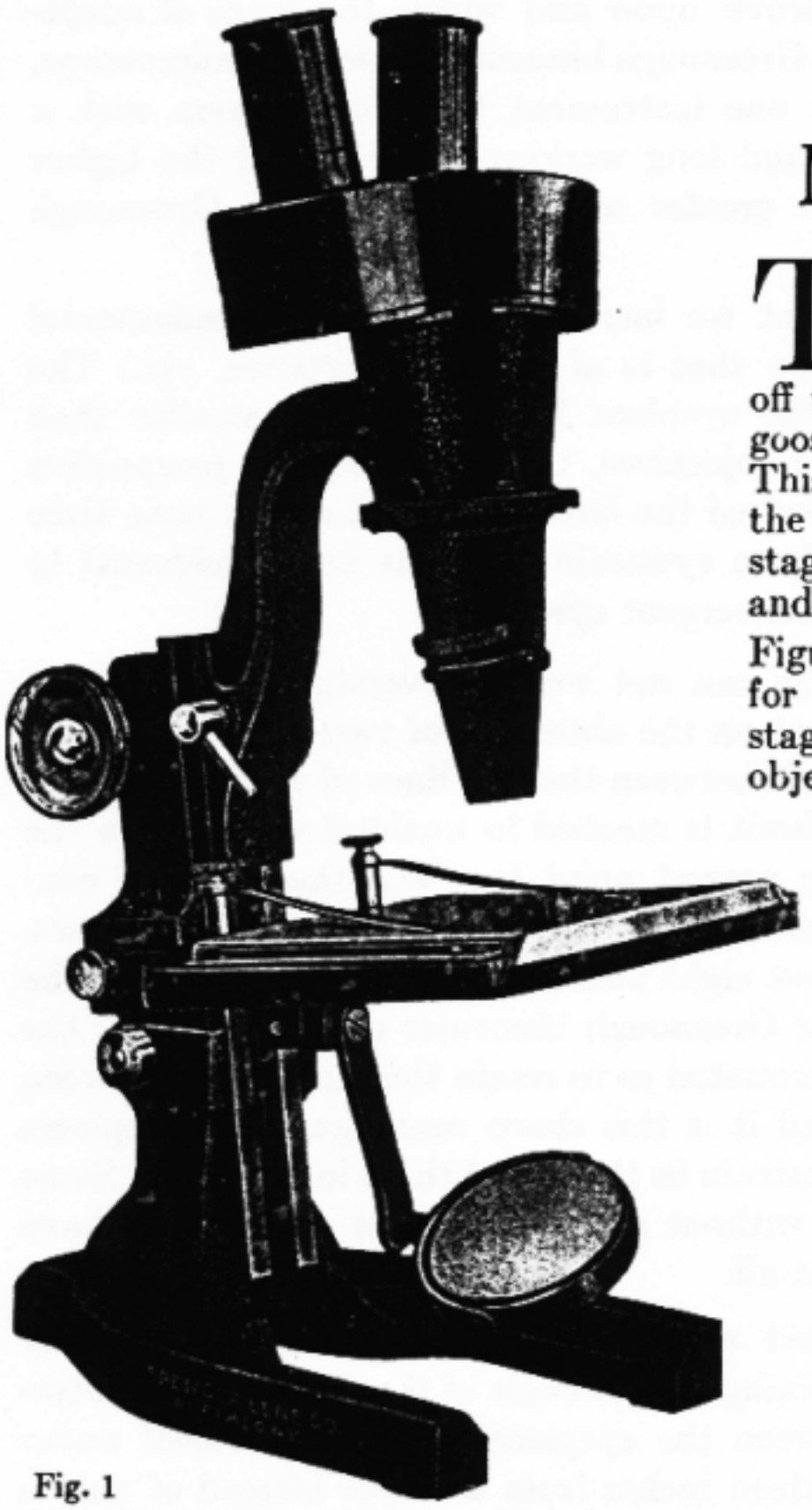


Fig. 1

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.



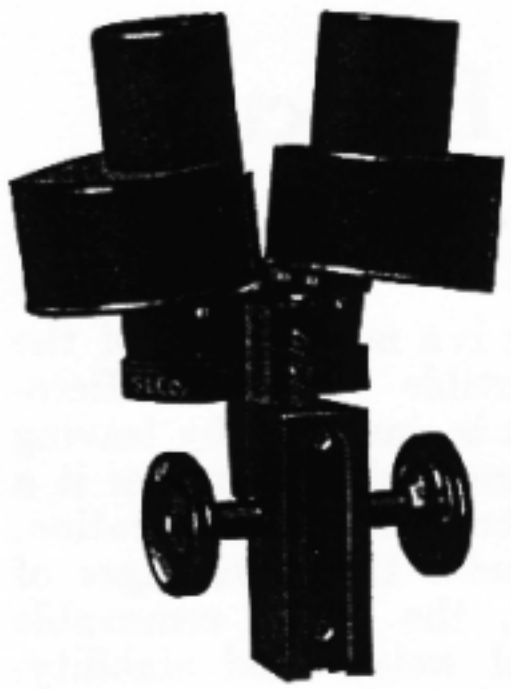
Fig. 2

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

Binocular body with arm, no objectives or oculars. Without case .....
Stand, only, in case .....
Substitutions in optical equipment may be made as desired. For prices of objectives and oculars, see page 17.

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 eyepiece 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 . .

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. Mounting	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.
.6x	99-P	.....	3.6	50	5.4	36	7.5	32	10.2	25
1.0x	98-P	285-P	6.0	30	9.0	22	12.5	20	17.0	16
1.7x	97-P	286-P	10.2	19*	15.3	13	21.2	12	28.9	9.5
1.7x	100-P	.....	10.2	19*	15.3	13	21.2	13	28.9	9.5
2.3x	101-P	288-P	13.8	13.5*	20.7	9.5	28.6	8.5	39.1	7.0
3.4x	102-P	289-P	20.4	9.0*	30.6	6.5	42.5	5.5	57.8	4.5
4.8x	104-P	290-P	28.8	6.5*	43.2	4.5	60.0	4.0	81.6	3.3
6.8x	107-P	291-P	40.8	4.5*	61.2	3.2	85.0	2.75	115.6	2.3
10.5x	108-P	292-P	63.0	2.75*	94.5	2.1	131.3	1.85	178.5	1.6

*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 six 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 285P	97P 286P	100P	101P 288P	102P 289P	104P 290P	107P 291P	108P 292P
Desig.	.6	1.0	1.7	1.7	2.3	3.4	4.8	6.8	10.5
Price									

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
Designation	6x	9x	12.5x	17x
Price per pair				



Spencer Universal Binocular Microscope No. 50

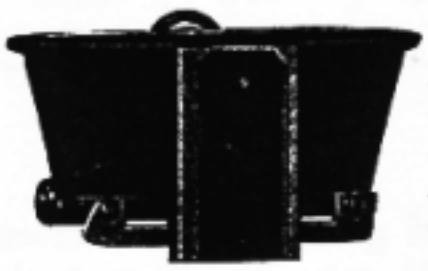
THIS is the accepted form of microscope stand, meeting satisfactorily the requirements of the average microscopist.

The stage is of standard size 112 x 115 mm. with a central opening of 55 mm. to permit the use of low power objectives on large transparent objects. Into this opening may be fitted at will, a mounted glass disc, a reversible metal disc, black on one side, and white on the other and a reducing ring to cut the size of the central opening from 55 mm. to 30 mm.

The horseshoe base, handle-arm with inclination joint, mirror, etc., are all standard parts. The metal hand-rests are included. Supplied in hardwood cabinet with lock and key.

CATALOG NO.	DESCRIPTION	PRICE
No. 50R	Universal Binocular Microscope, stand No. 50, binocular body No. 51BB, special low power paired objectives No. 99P, and paired eyepieces 12.5X, complete in cabinet	
No. 50P	Universal Binocular Microscope, stand No. 50, binocular body No. 51BB, paired objectives No. 99P and No. 97P, paired eyepieces 6X and 12.5X, in cabinet	
No. 50S	Universal Binocular Microscope, stand No. 50, binocular body No. 51BB, paired objectives Nos. 99P, 98P and 97P, paired eyepieces 6X, 12.5X and 17X, in cabinet	

Objectives Nos. 99P, 98P and 97P are the same price. Likewise eyepieces 6X, 12.5X and 17X are the same price. A selection without change in price is therefore permissible.



OBJECTIVE ADAPTER No. 51AA $7.50

Greenough Type Objectives (Listed Page24)

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 listed on page 24, may be added at the prices listed viz.:

No. 50R Outfit (above) .....

No. 51AA Objective Adapter .....

No. 102P Paired Objectives 3.4x .....

TOTAL _____



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	
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	
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	

Greenough type objectives may be added. See plan previous page

FORMS OF MOUNTINGS FOR OBJECTIVES AND EYE PIECES



97P



100P



101P



102P



99P

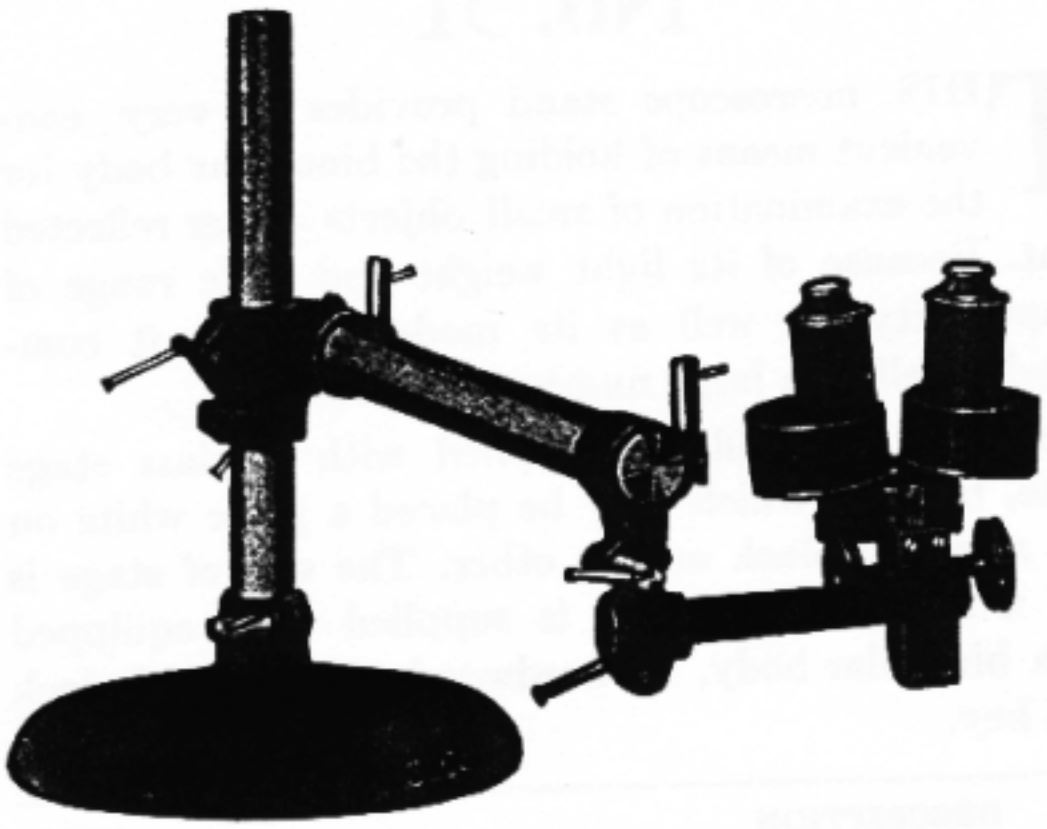


192P



194P

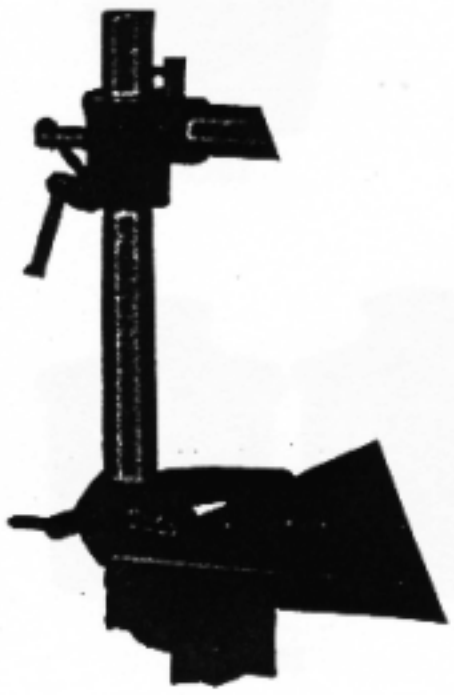
Spencer Universal Binocular Microscope
No. 52



THIS microscope stand designed particularly for anatomical work, provides practically unlimited adjustment. The vertical rod supported in a heavy castiron base is 13 inches in height. On it is supported a horizontal rod 18 inches in length and adjustable horizontally throughout its length and vertically from the top to the bottom of its support. On the end of this rod is attached an auxiliary arm 5 inches in length carrying the binocular body and revolvable about both horizontal and vertical axis. Rigid clamps are provided for clamping all the adjustments. Supplied in hardwood cabinet.

CATALOG NO.	DESCRIPTION	PRICE
No. 52	—Microscope Stand only without binocular body	
No. 52R	—Universal Binocular Microscope, stand No. 52, binocular body No. 51BB, paired objectives Nos. 99P and paired eyepieces 12.5X, in cabinet	
No. 52P	—Universal Binocular Microscope, stand No. 52, binocular body No. 51BB, paired objectives No. 99P and 97P, paired eyepieces 6X and 12.5X, in cabinet	
No. 52S	—Universal Binocular Microscope, stand No. 52, binocular body No. 51BB, paired objectives Nos. 99P, 98P and 97P, paired eyepieces 6X, 12.5X and 17X, in cabinet	

Greenough type objectives may be added. See plan page 25.

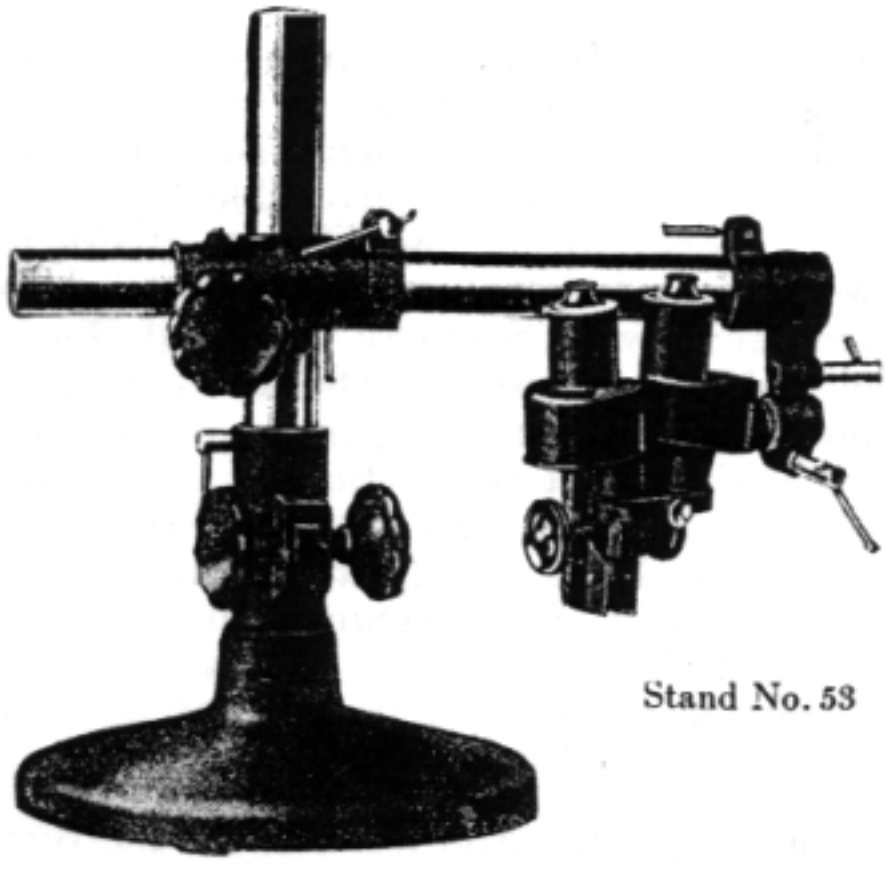


Spencer Table Clamp
No. 52T

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 .....

Spencer Universal Binocular Microscope No. 53



Stand No. 53

THIS microscope stand is identical with that of No. 52 except that it has an added feature of rack and pinion focusing adjustments on the upright and horizontal supports, with a spring counterbalance to insure easy adjustment.

CATALOG NO	DESCRIPTION	PRICE

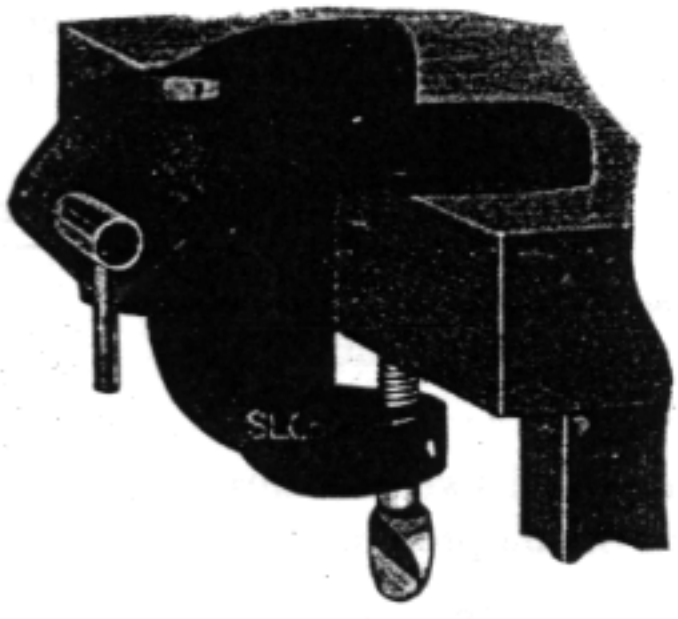
No. 53 —Microscope Stand only, without binocular body . . . . . .

No. 53R—Universal Binocular Microscope, stand No. 53, binocular body No. 51BB, special low power paired objectives No. 99P and paired eyepieces 12.5X, in cabinet . . . . . .

No. 53P—Universal Binocular Microscope, stand No. 53, binocular body No. 51BB, paired objectives No. 99P and 97P, paired eyepieces 6X and 12.5X, in cabinet . . . . . .

No. 53S—Universal Binocular Microscope, stand No. 53, binocular body No. 51BB, paired objectives Nos. 99P, 98P and 97P, paired eyepieces 6X, 12.5X and 17X, in cabinet . . . . . .

Greenough type objectives may be added. See plan page 25.



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 castiron base and inserted into this stand.

No. 53T Table Clamp for stand No. 53

Spencer Combined Convertible-Universal Binocular Microscope No. 58U



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. It is the stand of microscope No. 58 with the new Universal binocular body No. 51BB so adjusted as to become adapted to it. 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.

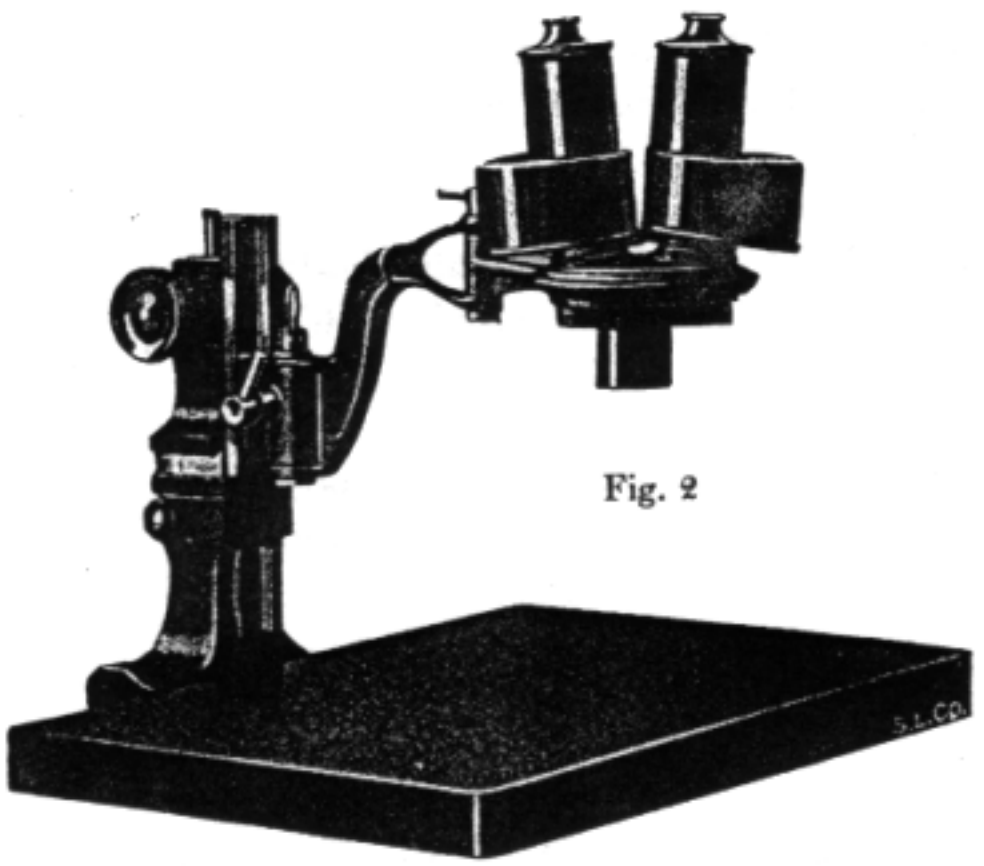


Fig. 2

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	

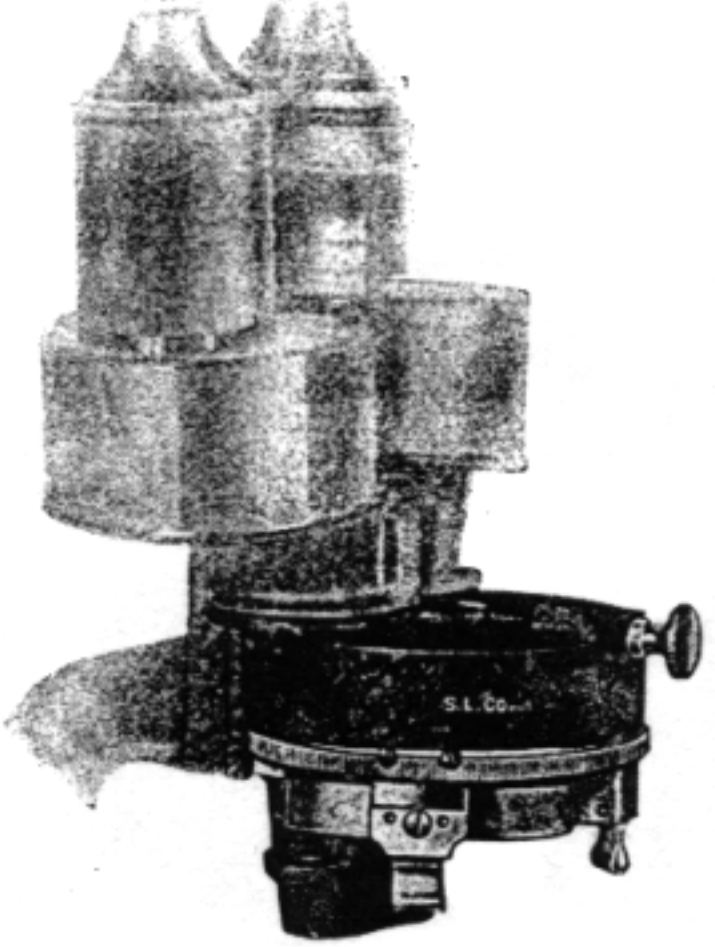
Other outfits with two and three objectives and two and three eyepieces at same additional prices as listed with outfits on preceding pages.

Greenough type objectives may also be added. See plan page 25.

Spencer New Multiple Revolving Nosepiece No. 445

For Carrying Three Pairs 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	

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.

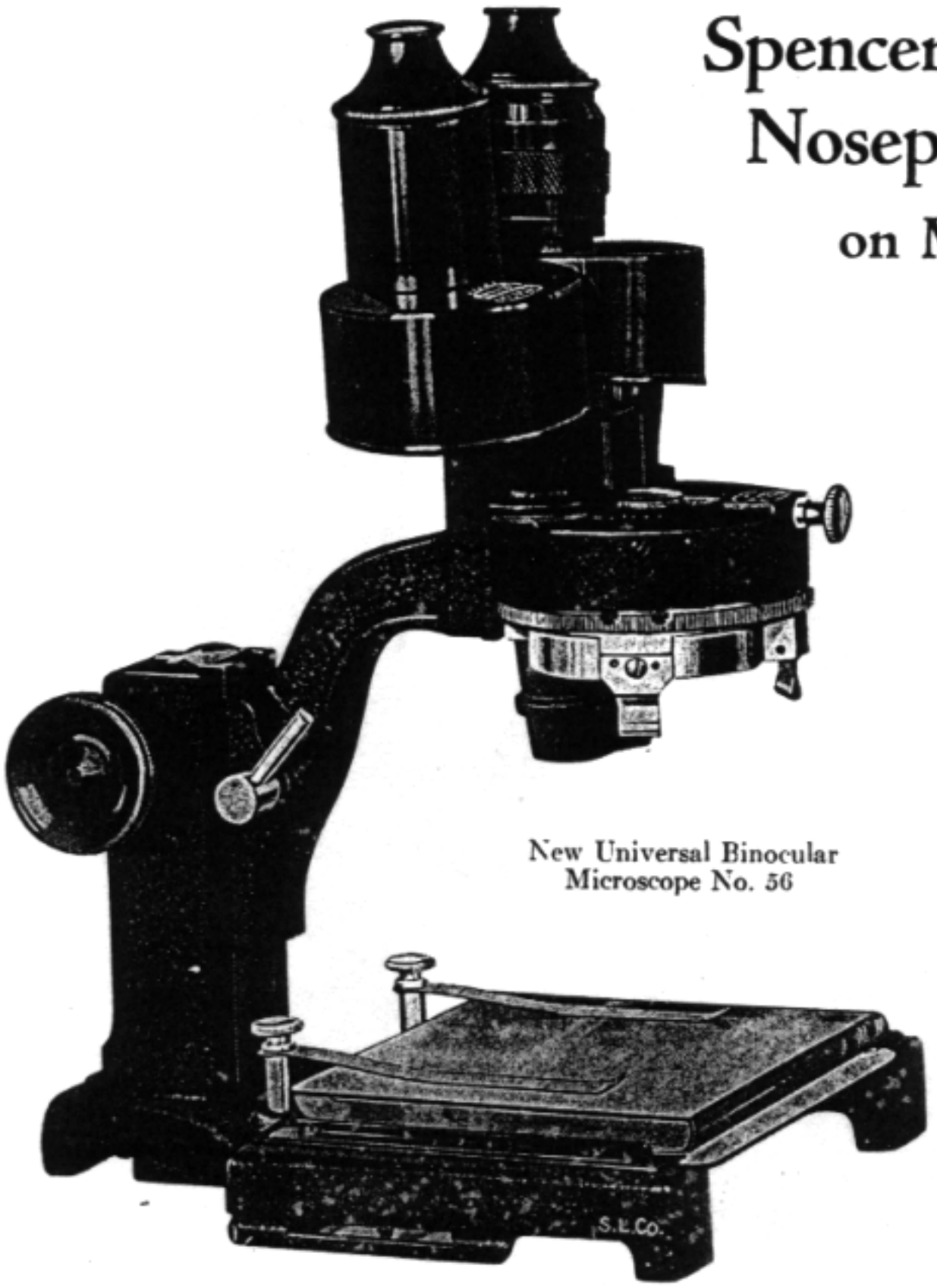
The base and pillar of No. 55 are low, to bring the stage as near to the table as possible. There is also an inclination joint. This base, joint and mirror are easily removable, and when removed the upper part of the instrument becomes No. 56.

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.

Telegraph Code

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 .....

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 .....

Fivfivs 55S—New Universal Binocular Microscope, convertible stand with 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 .....

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 .....

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 .....

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 .....

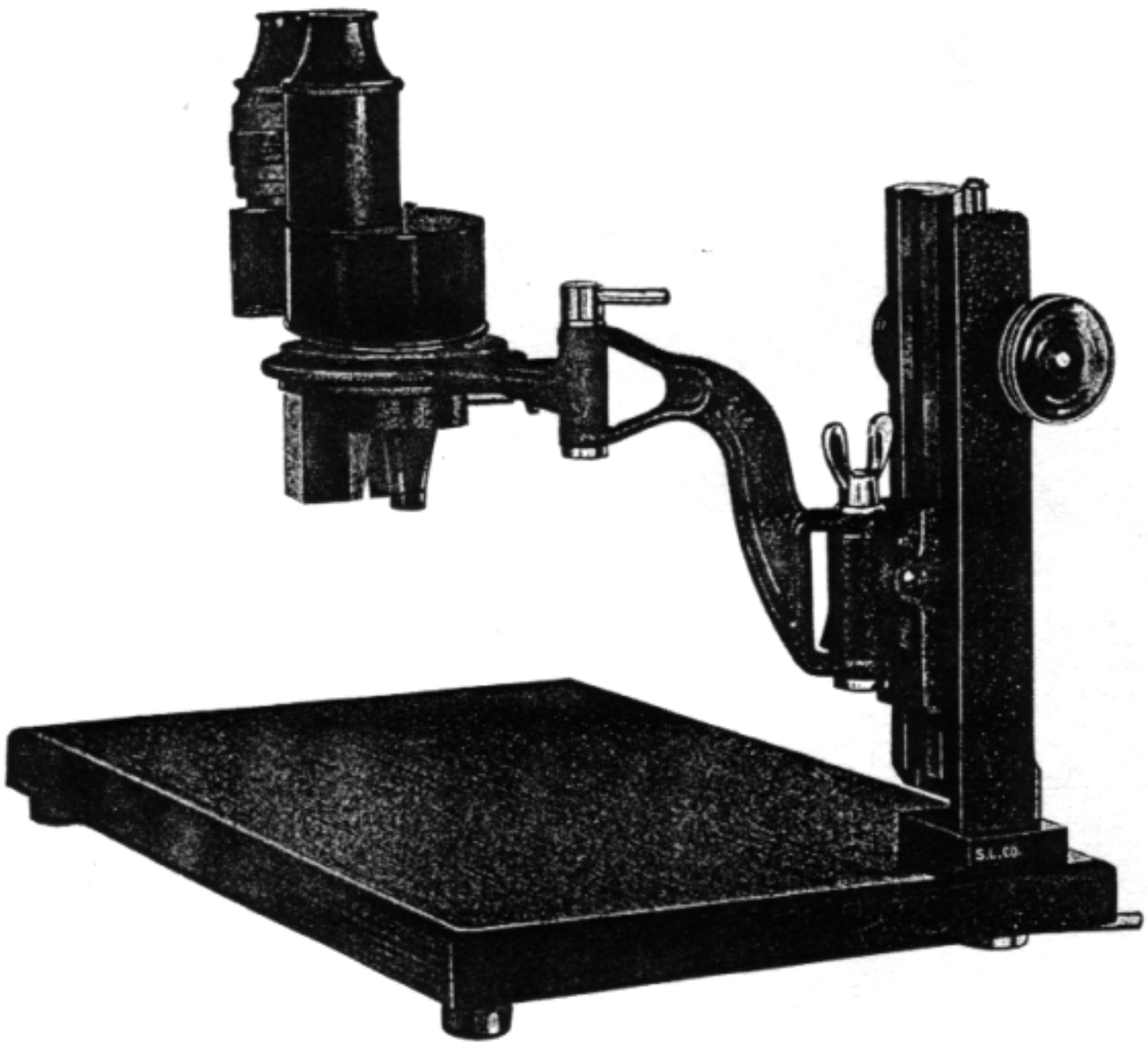
Fivsixs 56S—New Universal Binocular Microscope, stand (without horseshoe base), binocular body, low power paired objectives No. 99P, No. 98P and No. 97P, paired eyepieces 6X, 12.5X, and 17X, without multiple nosepiece, in cabinet .....

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 .....

Forforfiv 445—New Multiple Revolving Nosepiece (Triple) for carrying three low power paired objectives .....

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

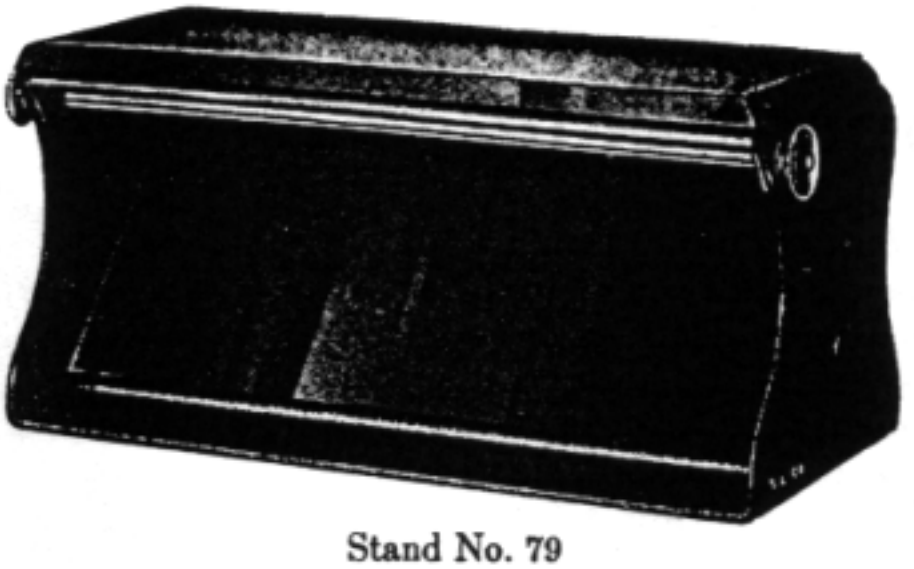
Spencer Universal Binocular Microscope
No. 59



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.

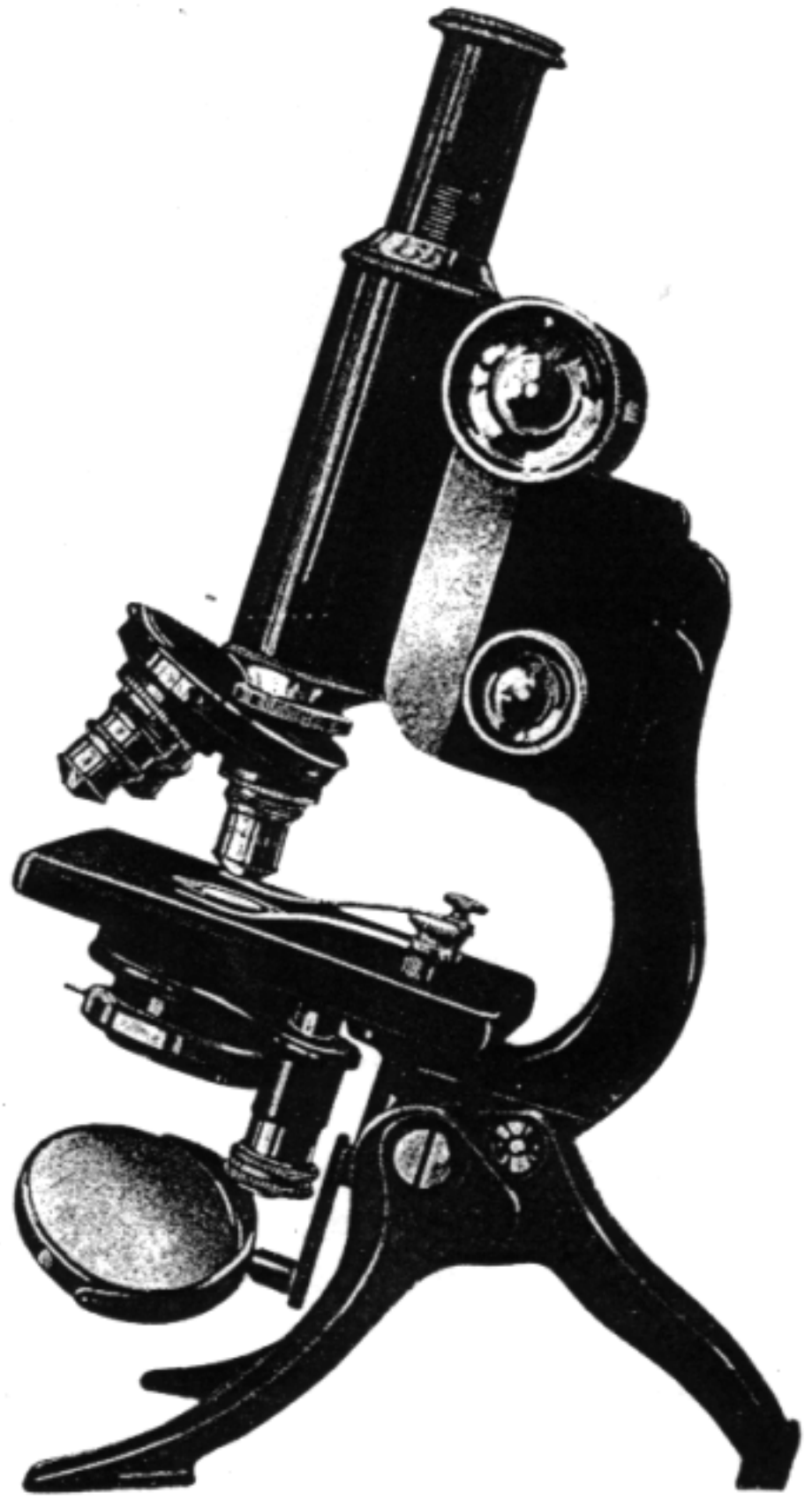
The illustration also shows the objectives mounted in the simple mount which is used when but one pair of objectives is used. Where two or three pairs of objectives are used, we strongly recommend the use of our new multiple nosepiece, by use of which any pair of objectives may be brought into use easily 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	
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	
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	
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	
Sevnin	79	—Stand for work on transparent objects	
		Bakelite base in place of wooden, extra	

Spencer Portable Microscope No. 60

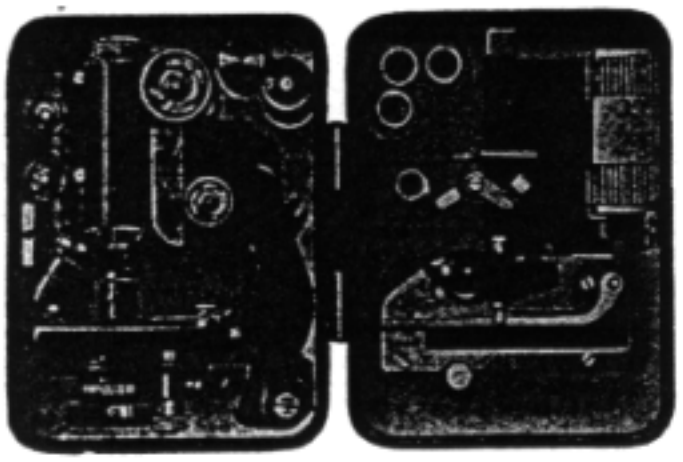


THIS is a *standard* compound microscope, equipped with a set of first-class achromatic objectives and huyghenian oculars. It is a thoroughly satisfactory instrument for use in the laboratory of the hospital, medical school or private practitioner, meeting all the requirements that are ordinarily made 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.



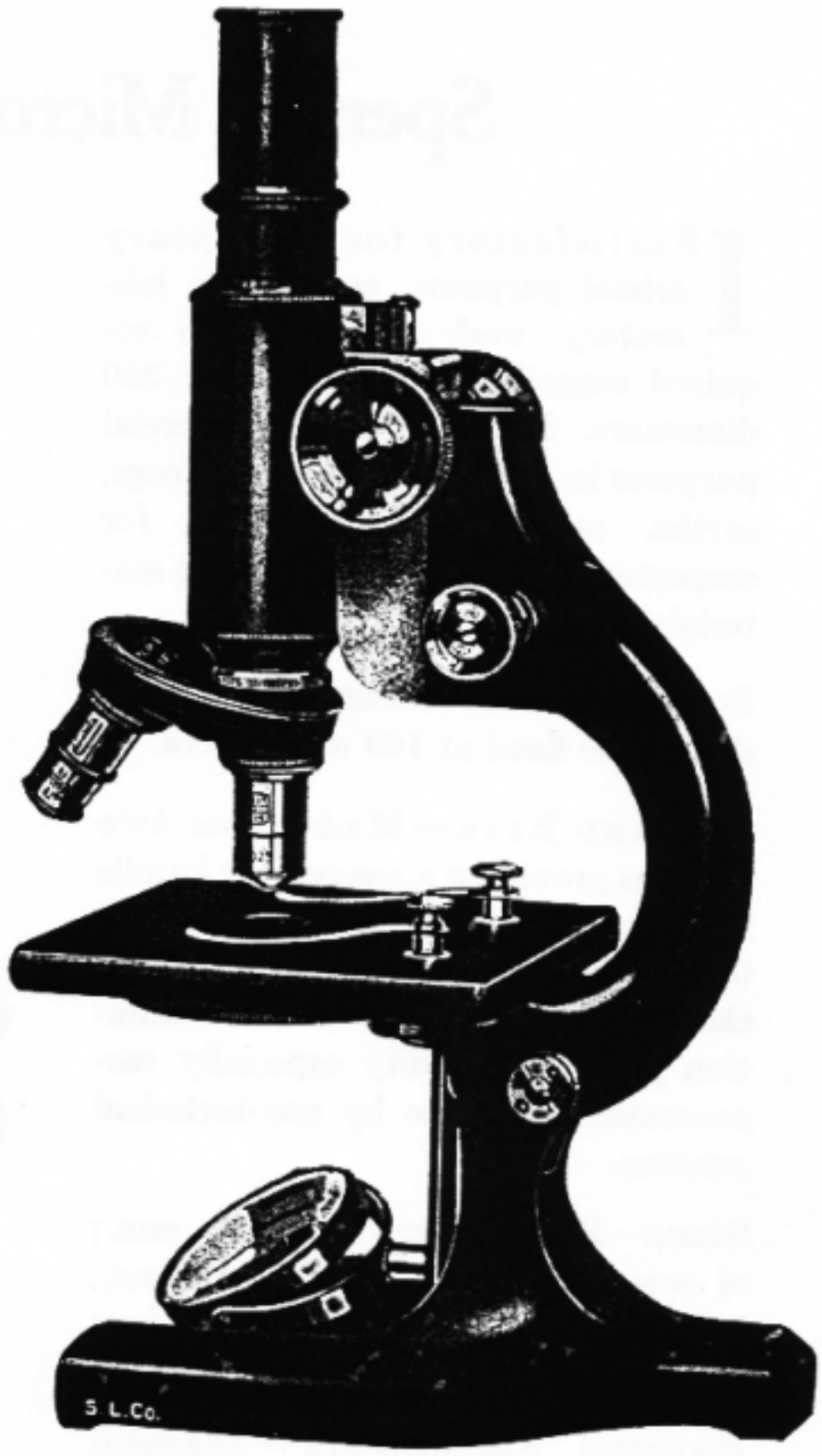
The case is made of aluminum and has lock and key. The outside dimensions are 8¾ x 6½ x 3¾ in. It is entirely dust-proof. Provision is made for carrying, in addition to the complete microscope, a special mechanical stage, a haemaglobinometer and a haemacytometer or special camera lucida.

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	
Sixod	60D	Not included	16-4	10-44	6x-10x	
Sixoe	60E	Included	16-4	10-44	10x	
Sixof	60F	Included	16-4	10-44	6x-10x	
Sixoh	60H	Included	16-4-1.8 Oil-imm.	10-44-95	6x-10x	
Sixoj	60J	Included	16-4-1.8 Oil-imm. Fluorite	10-44-97	6x-10x	

No. 485 Mechanical Stage modified to pack in case .....
No. 500 Camera Lucida modified to pack in case .....
No. 505 Camera Lucida modified to pack in case .....

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	
Sixford	64D	Not included	16-4	10-44	6x-10x	
Sixfore	64E	Included	16-4	10-44	10x	
Sixforf	64F	Included	16-4	10-44	6x-10x	
Sixforh	64H	Included	16-4-1.8 Oil imm.	10-44-95	6x-10x	

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	
Sevfory	74y	None	Divisible 32-14—Special 5	6x-10x	
Sevforz	74z	Double	Divisible 32-14—Special 5	6x-10x	
Onothre	103	Special	Special 32-14—Divisible objective		
Ononthre	113	Special	Special 5 mm.—Objective		

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.*

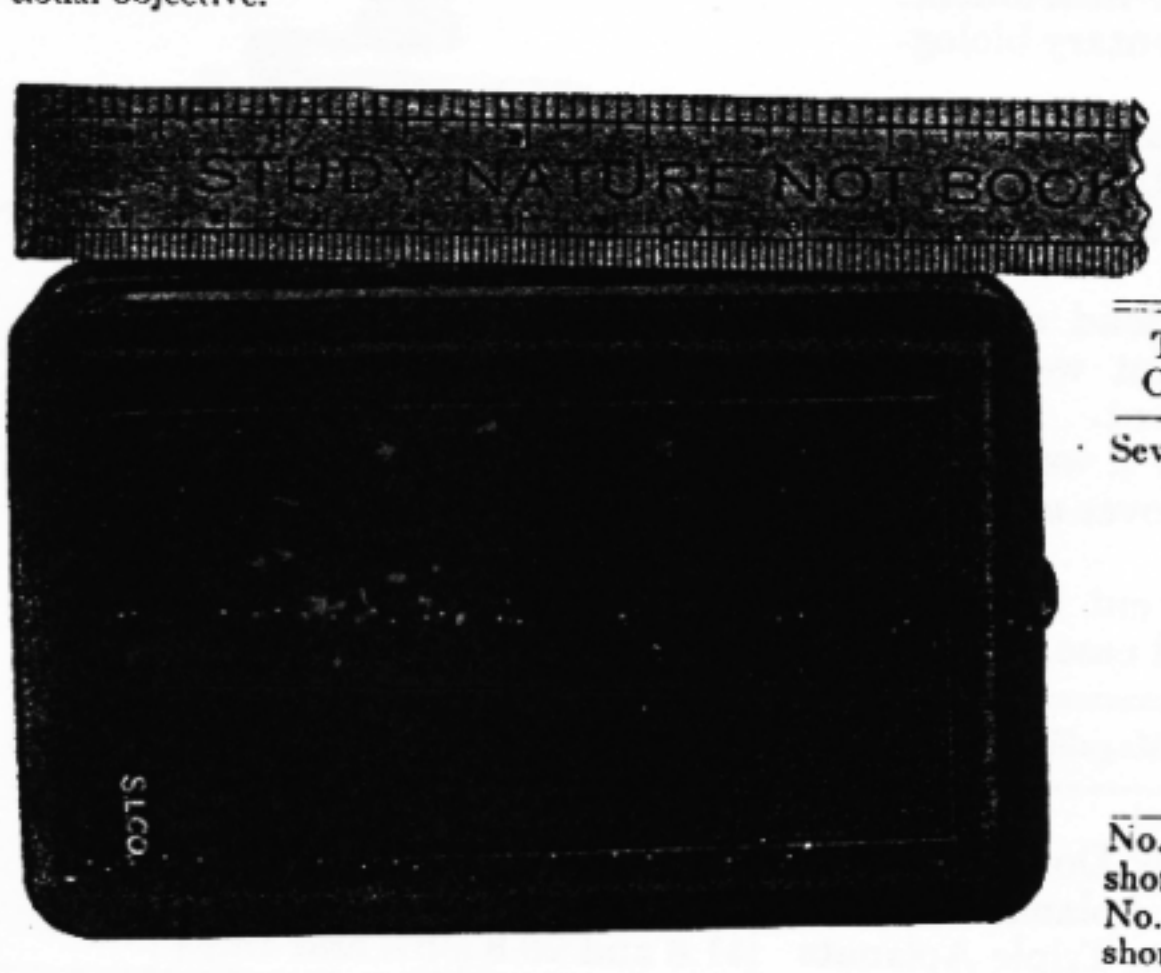
It is regularly equipped with a special divisible objective having a focal length of 6 millimeters when used complete, and 12 millimeters with the front element removed, and with a 10x huyghenian ocular. These combinations give powers sufficient for detecting minute botanical structures or for making 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.



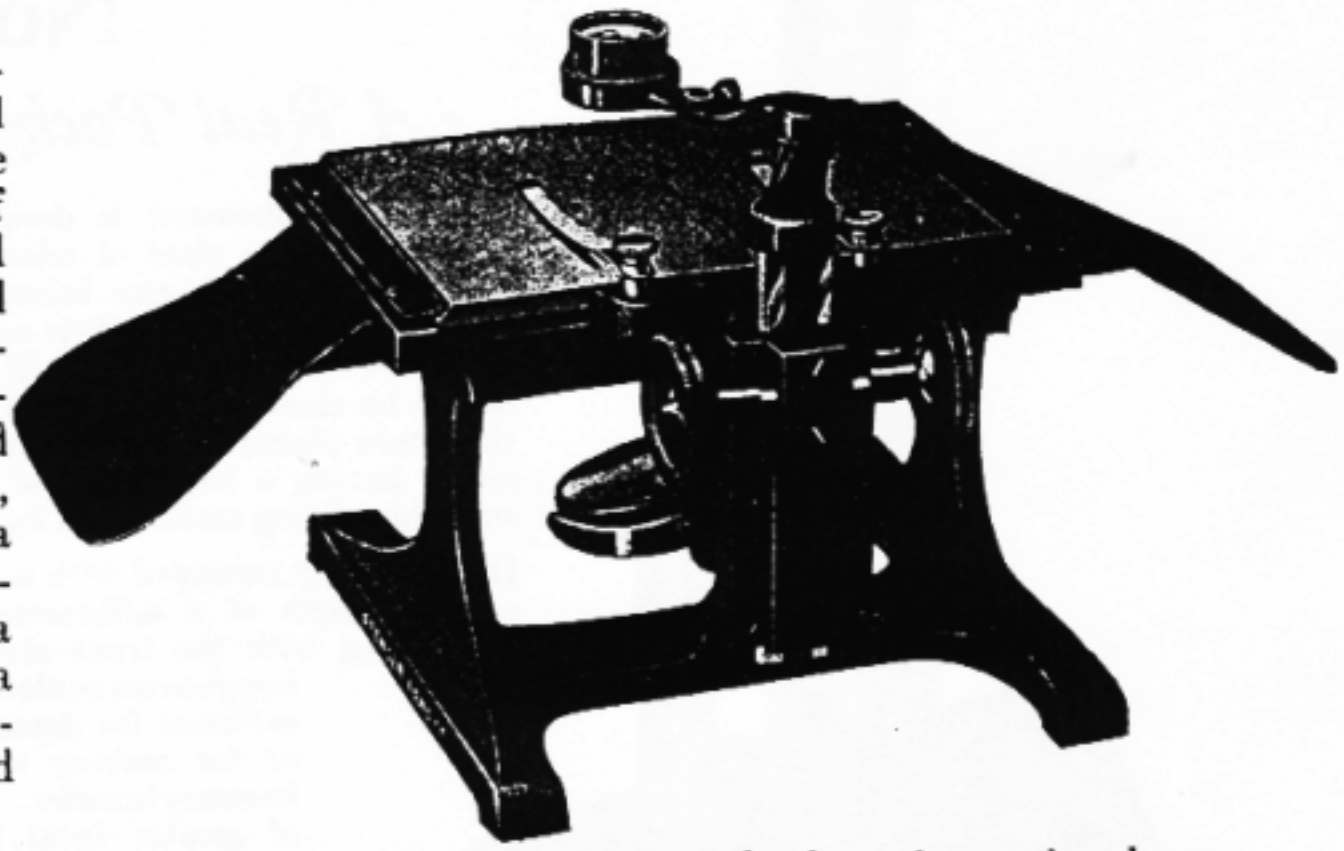
The instrument and case are entirely of metal, neatly finished in alcohol-proof black enamel.

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	

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

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.	
Ateob	80B	6x and 12x Doublets	41.6 and 20.8	22. and 12.	
Ateoc	80C	9x Triple Aplanat	27.8	24.5	
Ateod	80D	6x and 12x Triple Aplanats	41.6 and 20.8	36.8 and 18.4	

Spencer Dissecting Microscope No. 82

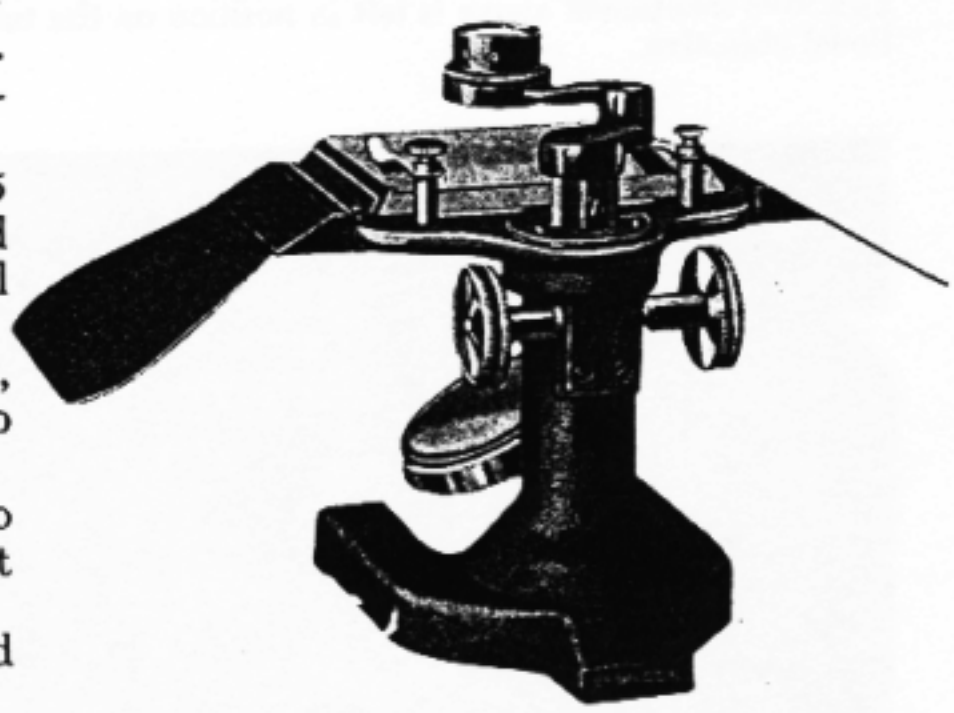
THIS is a well made, thoroughly serviceable and convenient instrument. It finds wide use in elementary biological laboratories.

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.

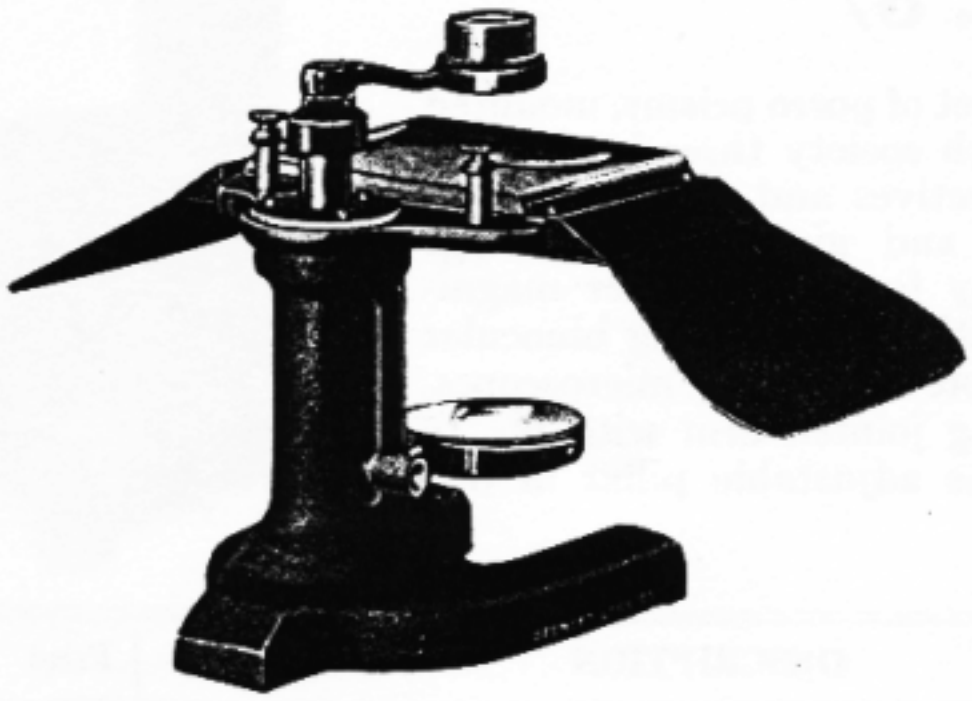
LENS ARM—is jointed in such a way as to permit the lens to be carried over any part of the stage.

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.	
Atetob	82B	6x and 12x Doublets	41.6 and 20.8	22. and 12.	
Atetoc	82C	9x Triple Aplanat	27.8	24.5	
Atetod	82D	6x and 12x Triple Aplanats	41.6 and 20.8	36.8 and 18.4	

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.

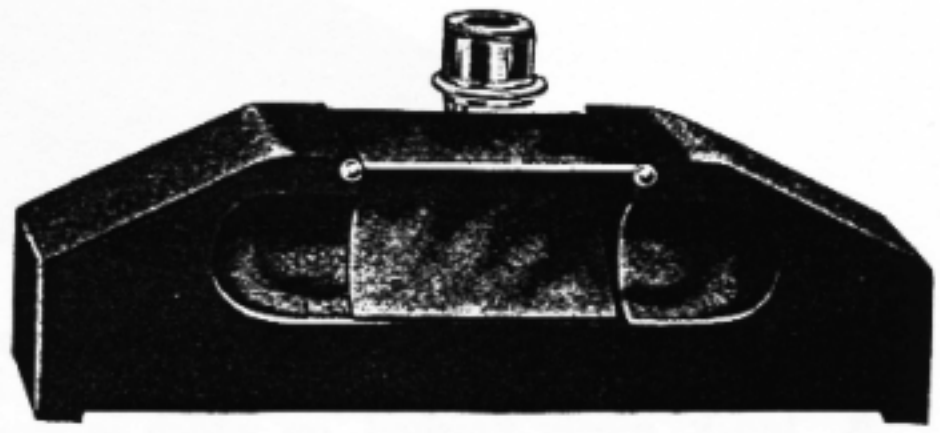
FOCUSING is accomplished by sliding the cylindrical support up or down in its bearing. This is actuated by a knob so placed as to be conveniently grasped by the right hand. A spring bearing at the lower end of the pillar insures a steady and uniform movement by which even the highest power magnifiers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

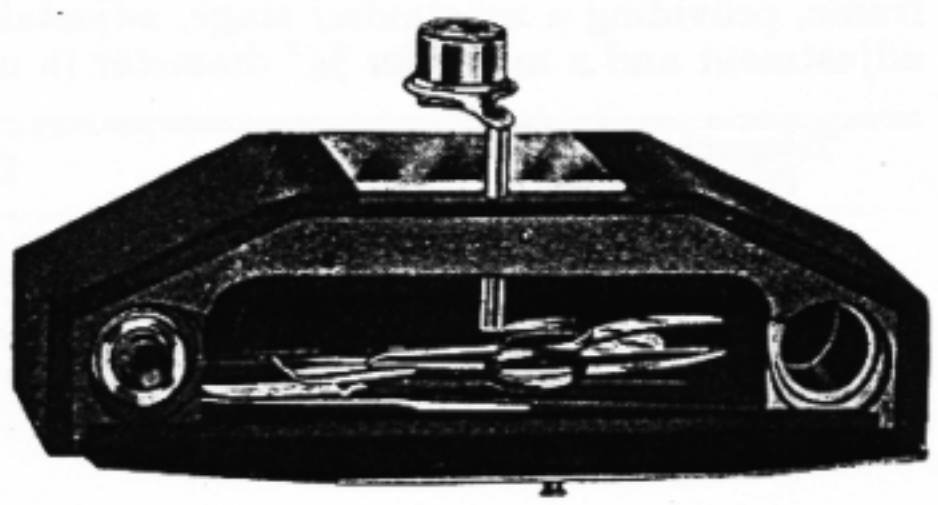
¶ Furnished in hardwood case.

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

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.	
Atesixb	86B	6x and 12x Doublets	41.6 and 20.8	22. and 12.	
Atesixc	86C	9x Triple Aplanat	27.8	24.5	
Atesixd	86D	6x and 12x Triple Aplanats	41.6 and 20.8	36.8 and 18.4	

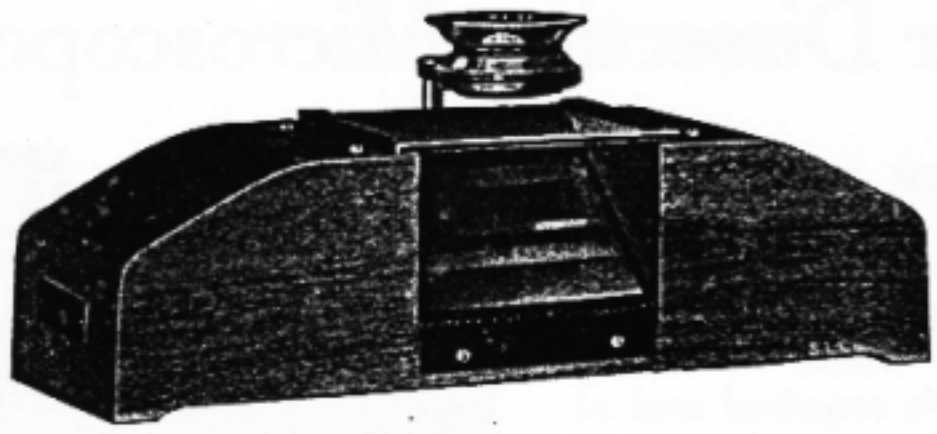
Spencer Monocular Erecting Body No. 87



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.

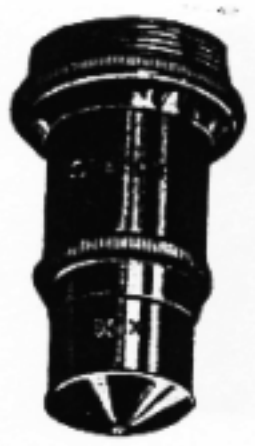
Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateseva	87A	Erecting body without objective or ocular.....	
Atesevb	87B	Erecting body with 10x ocular	
Atesevc	87C	Erecting body with 16 mm. objective, 10x ocular.	

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	
Atenina	89A	With 9x Doublet Magnifier	
Ateninb	89B	With 6x and 9x Doublet Magnifiers	






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	
Onoto	102	40	2.6	dry		35.2	5.3	.0453	
Onofor	104	32	4.0	dry	0.10	21.0	4.0	.0338	
Onosev	107	25	5.8	dry	0.20	10.0	2.65	.0227	
Onoate*	108*	16	10.0	dry	0.25	4.5	1.47	.0126	
Ononto	112	8	20.	dry	0.50	1.44	0.69	.0058	
Ononfiv	115	4	44.	dry	0.66	.72	.34	.0029	
Ononate	118	4	45.	dry	0.85	0.3	.34	.0029	
Ontoto	122	3	60.	dry	0.85	0.2	.26	.0019	
Ontofor	124	3	60.	Water imm.	1.00	0.24	.26	.0019	
Ontofiv	125	3	60.	Oil imm.	1.25	0.25	.26	.0019	
Ontosev	127	1.8	95.	Oil imm.	1.25	0.13	.15	.0013	
Ontoate	128	1.5	115.	Oil imm.	1.25	0.10	.12	.0011	

SPENCER FLUORITE OBJECTIVES

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

SPENCER APOCHROMATIC OBJECTIVES

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

*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.	
Onthresix	136	5x	50. mm.	
Onthreate	138	6x	40. mm.	
Onforo	140	8x	30. mm.	
Onforto	142	10x	25. mm.	
Onforfor	144	12x	20. mm.	

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.	
Onsevsix	176	8x	30 mm.	
Onsevsev	177	10x	25 mm.	
Onsevate	178	12x	20 mm.	
Onsevnin	179	15x	16 mm.	
Onateo	180	20x	12 mm.	

Compensating Oculars

Telegraph Code	Catalog No.	Power	Equivalent Focus	Price
Onsixfor	164	1.5x	170 mm.	
Onsixsix	166	5x	50 mm.	
Onsixsev*	167	10x	25 mm.	
Onsixate	168	10x	25 mm.	
Onsevo	170	15x	16 mm.	
Onsevto	172	20x	12.5 mm.	

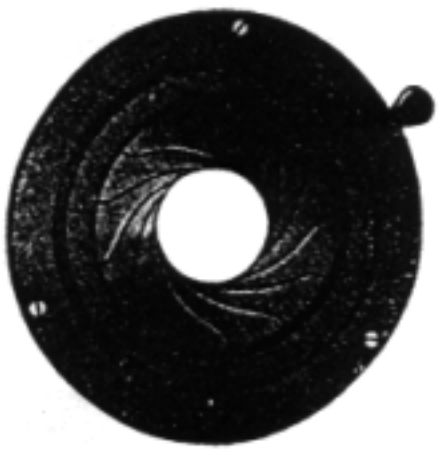
*Note: This eyepiece is constructed having an unusually high eyepoint. It is regularly supplied with an eyepiece cap above the eye lens. The entire field may easily be observed by a microscopist using glasses.



No. 300



No. 305



No. 325



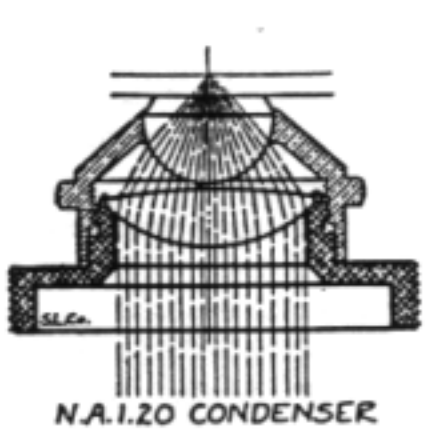
No. 315



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).

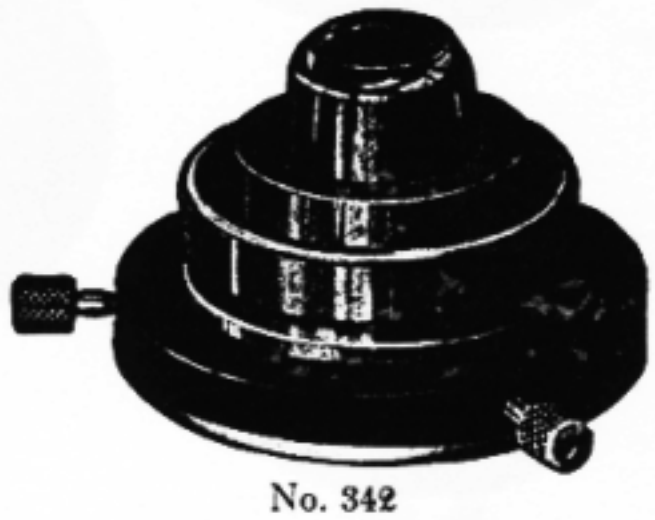
Telegraph Code	Catalog No.	DESCRIPTION	Price
Threoo	300	Abbe Condenser, large type, N. A. 1.20 without iris diaphragm .	
Threoon	301	Abbe Condenser, short focus type, N. A. 1.20 without iris diaphragm	
Threofiv	305	Wide Angle Abbe Condenser N. A. 1.40 without iris diaphragm	
Threoos	300S	Abbe Condenser,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

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	
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	
Thretonin	329	Ditto to fit research fork-type substages	
Threthreo	330	Ditto to fit quick screw substages	
Threthreon	331	6-volt, 12-candle power bulb for above,	Net
Threthresix	336	Resistance to adapt No. 331 bulb to 220-volt current	
Threthresevn	337	Resistance to adapt No. 331 bulb to 110-volt current	
Threnino	390	Transformer to step down 220-volt alternating current to 6-volts	
Threninon	391	Transformer to step down 110-volt alternating current to 6-volts	
Threthrenin	339	Substage type dark-field illuminator with objective stop to fit research type substages	
Threforto	342	Ditto to fit quick screw substages	
Threforfor	344	Ditto to fit simplified rack and pinion fork-type substages	
Threforo	340	Dark-field illuminator to be used above the stage. with objective stop	

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.

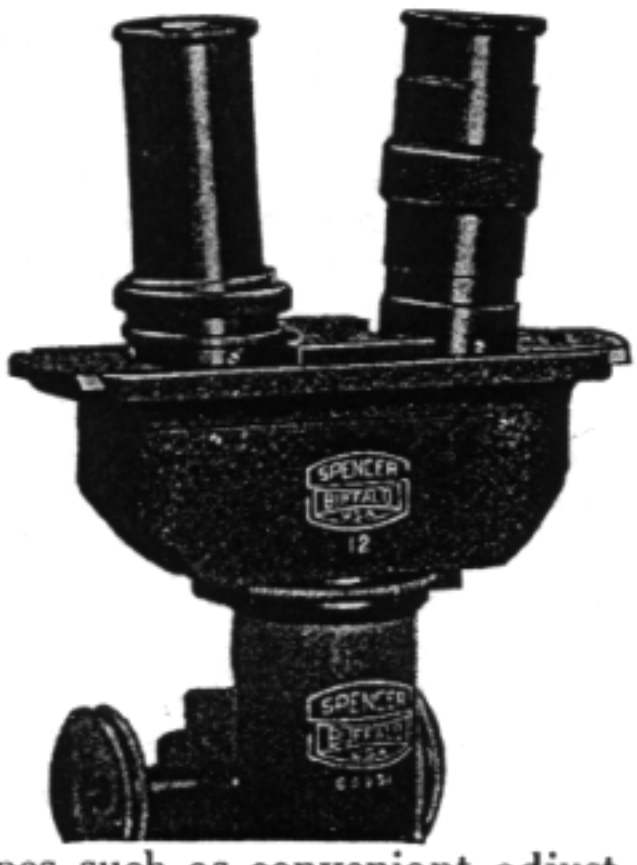


No. 357

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.

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

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	

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	
Threfivnin	359	11.5-volt Miniature Bulb ..... Net	
Threthreate	338	Resistance for 11.5-volt bulb in series on 110-volt current	

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	
Thresixob	360B	Lamp with Daylite glass	
Thresixto	362	Fixed rheostat for 110 volts—5 amperes	
Thresixfor	364	Fixed rheostat for 220 volts—5 amperes	
Thresixsix	366	Carbons .....each	

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.

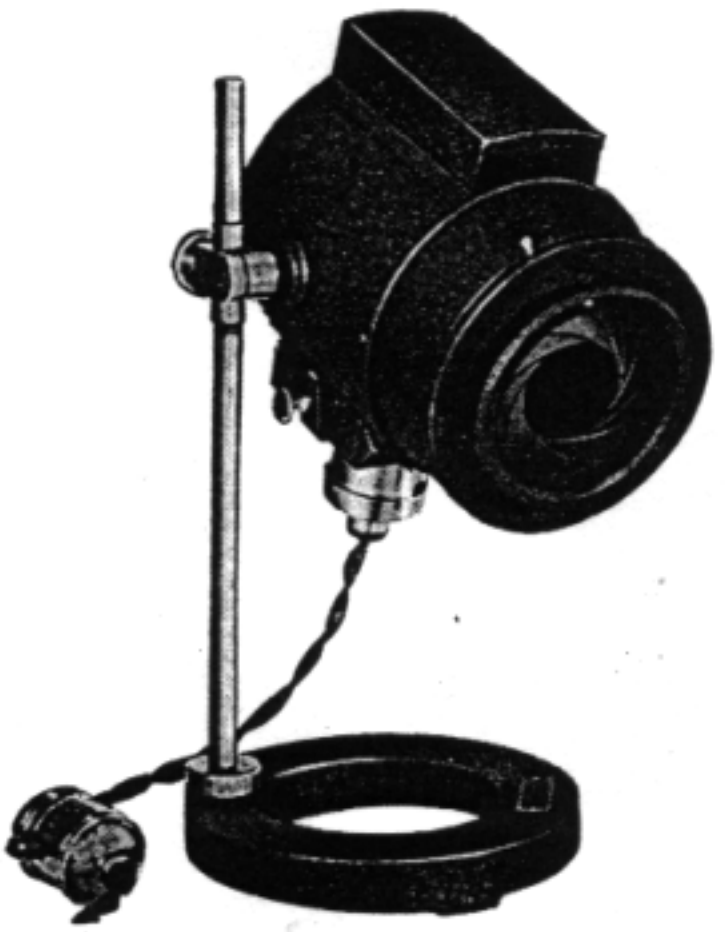
The blue and ground glasses or the daylite glass may be removed. The lamp is then serviceable for illuminating opaque objects for examination with a binocular microscope as well as the more ordinary microscope requirements.

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	
Thresixateb	368B	Lamp with bulb, and daylite glass	
Thresixnin	369	40-watt, 115-volt concentrated filament projection bulb ..... net	

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 equaled 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	
Thresevob	370B	Lamp with bulb, and daylite glass	
Thresevon	371	100-watt, 115-volt projection Bulb, ... Net	

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	
Thresevthre	373	150-watt, 115-volt P. S. daylite Bulb..... net	

Spencer Microscope Lamp No. 374



THIS is an exceedingly practical lamp for general laboratory work. It consists of a standard commercial 150-watt, 110-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 bullseye 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.

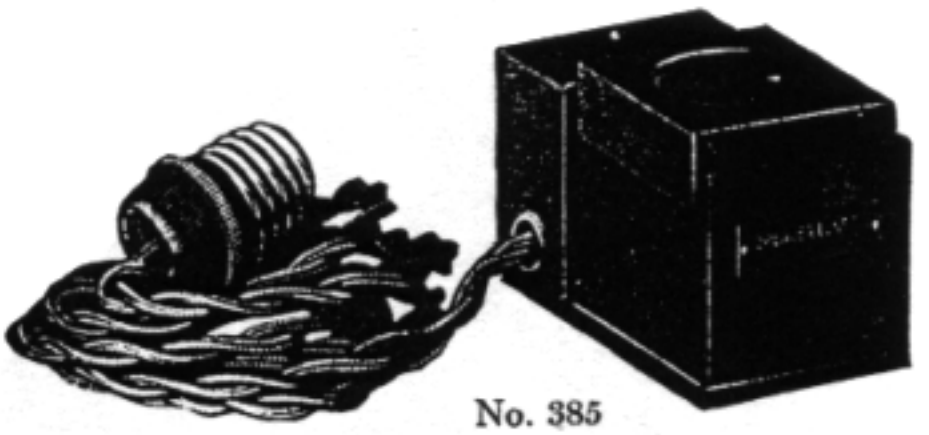
Five feet of cord, with plug and key socket, are included with the outfit.

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

Spencer Miniature Microscope Lamp

No. 385

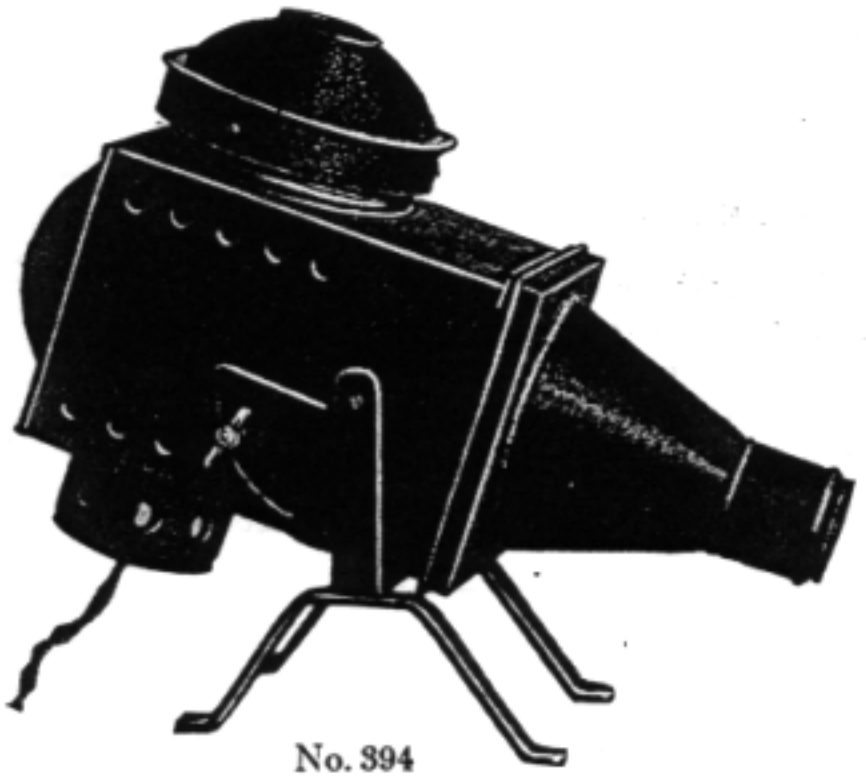
THIS is an exceedingly convenient lamp for use with the microscope. It is very compact, attaches to any standard 110-volt socket and, placed directly beneath the stage of the microscope, gives illumination sufficient for the most exacting work.



No. 385

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threatefiva	385A	Lamp with one bulb, blue and ground glasses	
Threatefivb	385B	Lamp with one bulb and daylite glass	
Threatesix	386	15-watt, 110-volt concentrated filament bulb	
Threatesev	387	Resistance for a 15-watt bulb in series on 220-volt current	

Spencer High Power Mazda Microscope Lamp No. 394

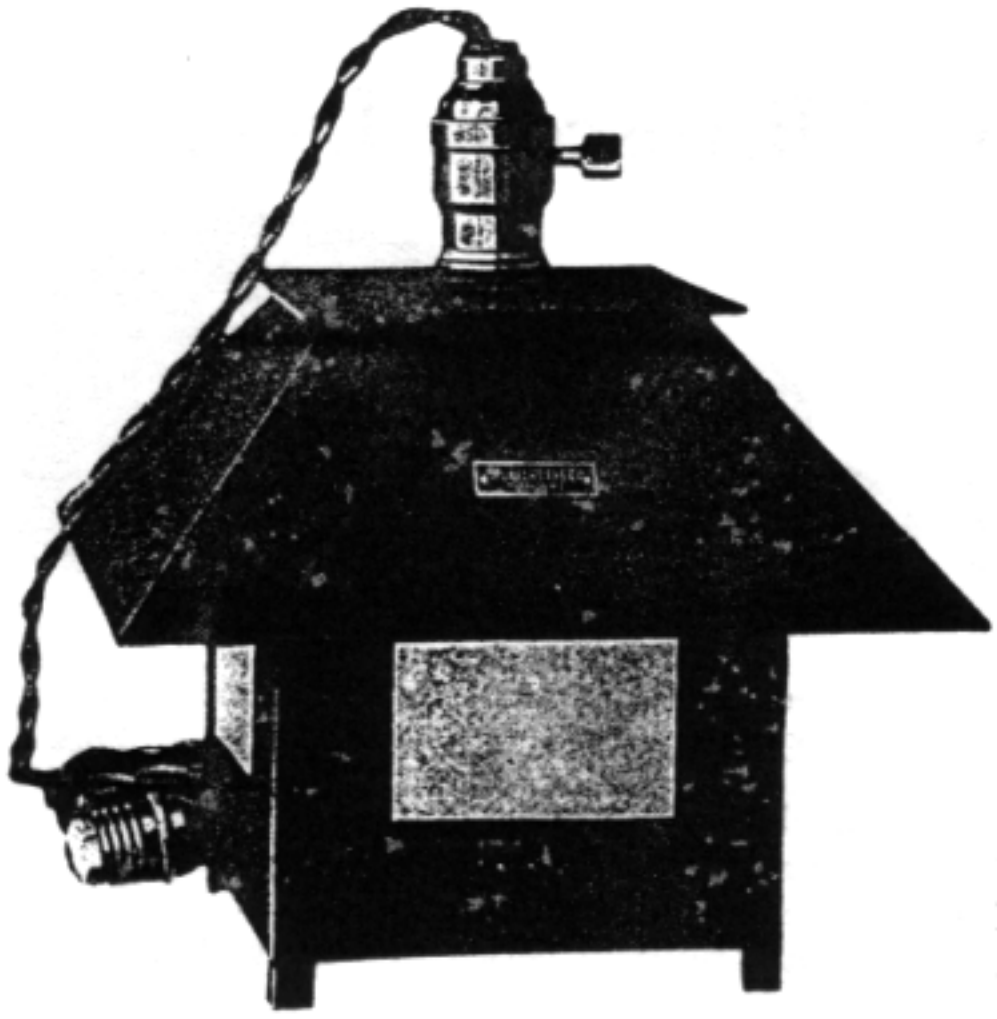


No. 394

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	
Threninforb	394B	Lamp with one bulb and daylite glass	
Ateotoate	8028	Set of accessories to convert 394 lamp into a stereopticon for lantern slide projection, including lens	
Threatefivthre	3853	Resistance for 400-watt bulb, in series on 220-volt current	
Threateono	4010	400-watt, 115-volt Mazda bulb	
Threateonoa	4010a	400-watt, 230-volt Mazda bulb	



The Chalet Lamp No. 395

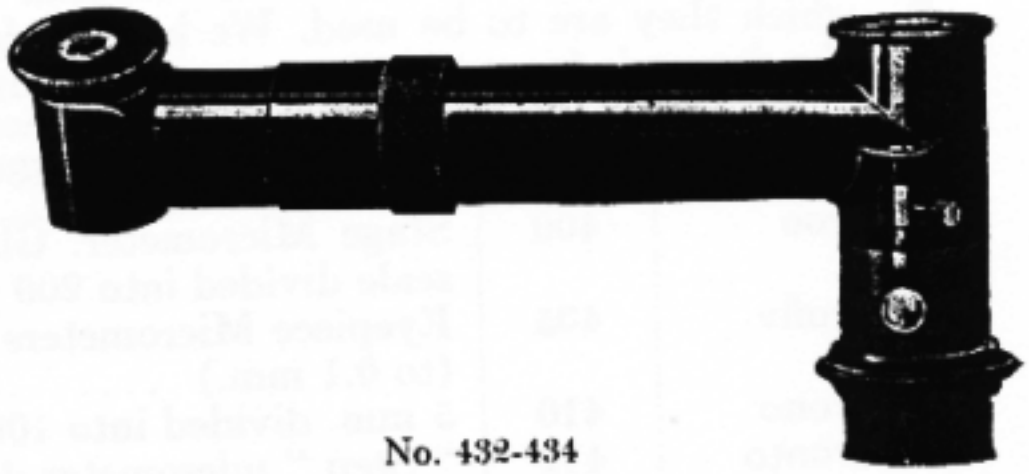
THIS Lamp was designed by Prof. S. H. Gage, of Cornell University, for use in his own and his students' laboratories. It has been found to be an eminently practical instrument.

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.

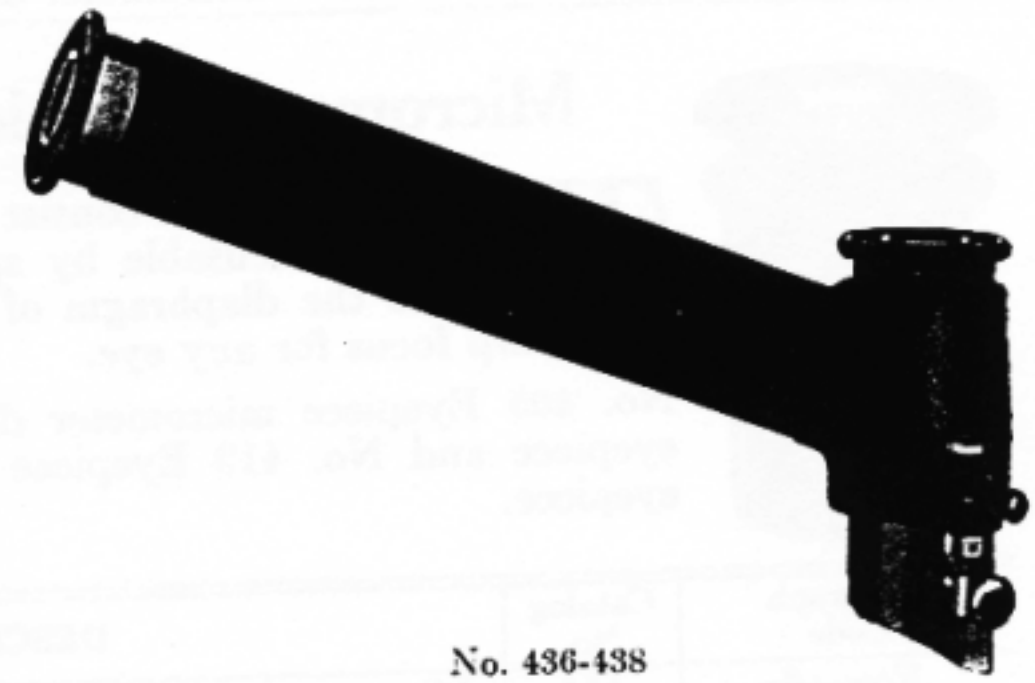
The illuminant is a 100-watt, 110-volt pear-shaped Mazda bulb.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Threninfiva	395A	Lamp with one Daylite glass window	
Threninfivb	395B	Lamp with two Daylite glass windows	
Threninfivc	395C	Lamp with four Daylite glass windows	
Thresevate	378	100-watt, 110-volt P. S. 25 Mazda bulb ... Net	
Thresevatea	378A	100-watt, 220-volt P. S. 25 Mazda bulb ... Net	
Threateo	380	Resistance for 100-watt bulb in series on 220-volt circuit	

Spencer Demonstration Oculars



No. 432-434



No. 436-438

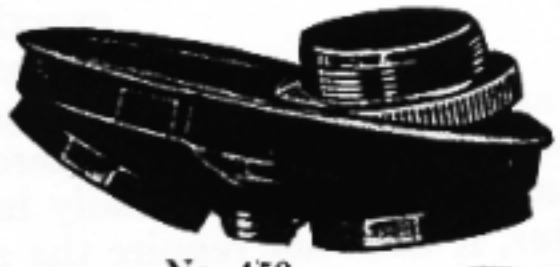
THIS is a well known device of extreme utility. It fits any standard microscope and enables the instructor to look in on the field that his pupil is studying. It is used by simply removing the ordinary eyepiece from the microscope and inserting the demonstration ocular in its place. The pupil then looks 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.

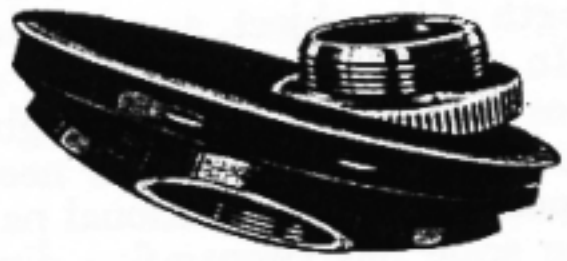
Numbers 436 and 438 have the extension tube fixed at an angle of about 120° to the microscope tube. The auxiliary eyepiece is placed in the end of this extension and is focusable independently of the other ocular by slightly varying its position in this tube.

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

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	
Forfivfiv	455	Triple nosepiece	
Forsixo	460	Quadruple nosepiece	

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 2 mm. scale divided into 200 parts	
Forofiv	405	Eyepiece Micrometers 5 mm. divided into 50 parts (to 0.1 mm.)	
Forono	410	5 mm. divided into 100 parts (to 0.05 mm.)	
Foronto	412	"Step" micrometer disc	

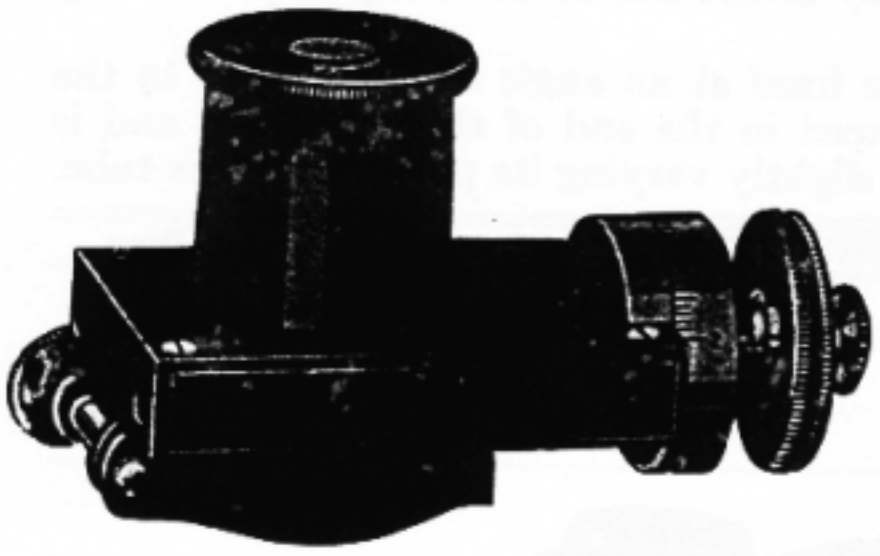


Micrometer Eyepieces With Fixed Scale

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	
Fortoo	420	Micrometer eyepiece, 10x	



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 the filar micrometer, 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.

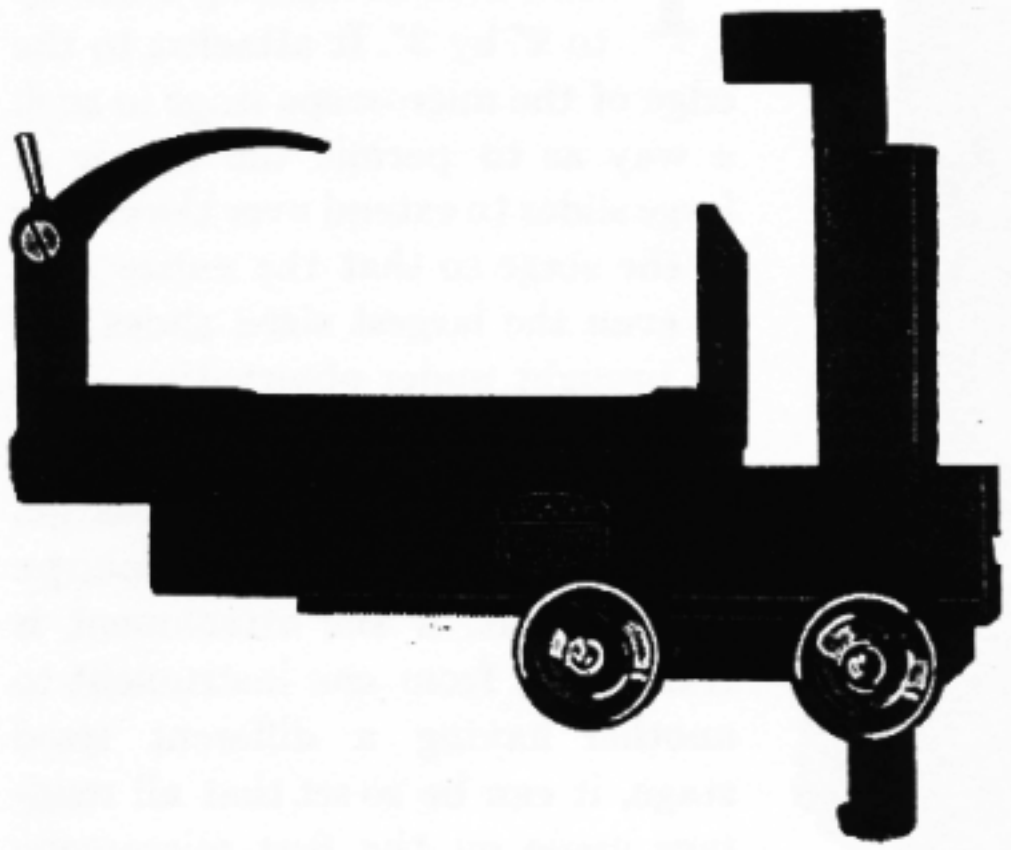
¶ In measuring the length of an object, the scale is moved until one of the millimeter lines coincides with the margin of the object under examination; and then, by noting the amount of revolution necessary to bring another line into coincidence with the opposite side, the fractional part of the last division can be read to hundredths.

The scale has twenty-five divisions, with every fifth division indicated by a line of double length and numbered. The center of the scale is marked by a cross.

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	

Spencer Mechanical Stages

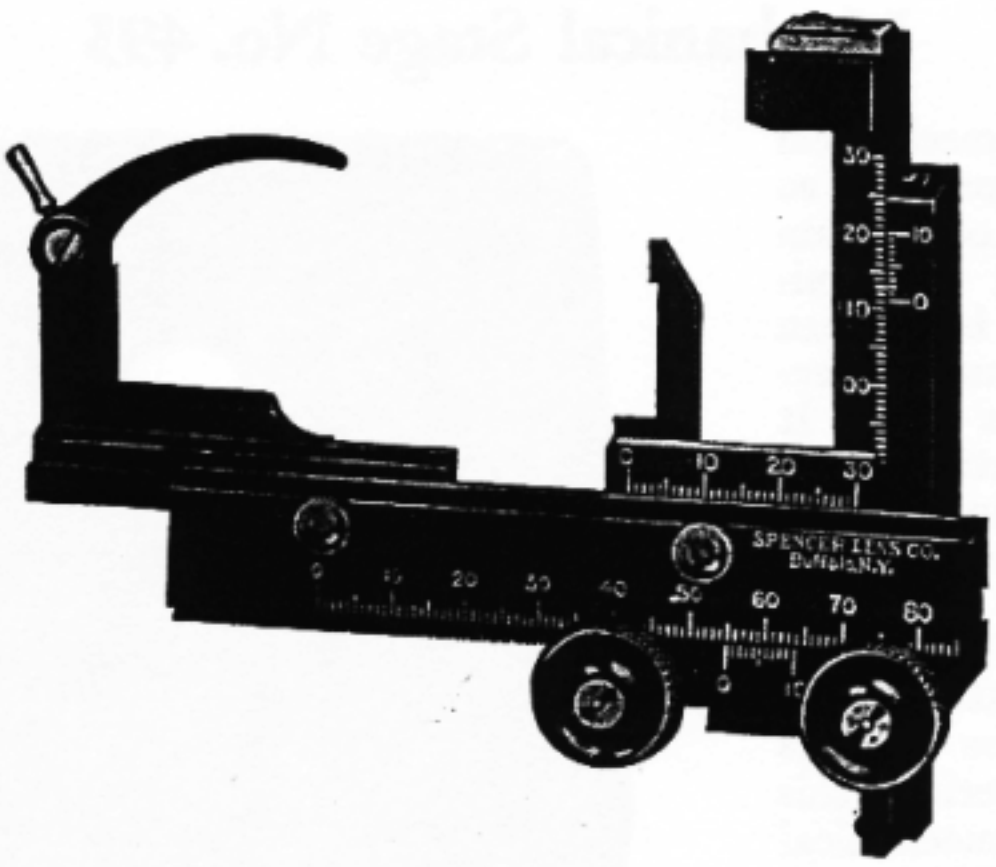


Mechanical Stage No. 484

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	

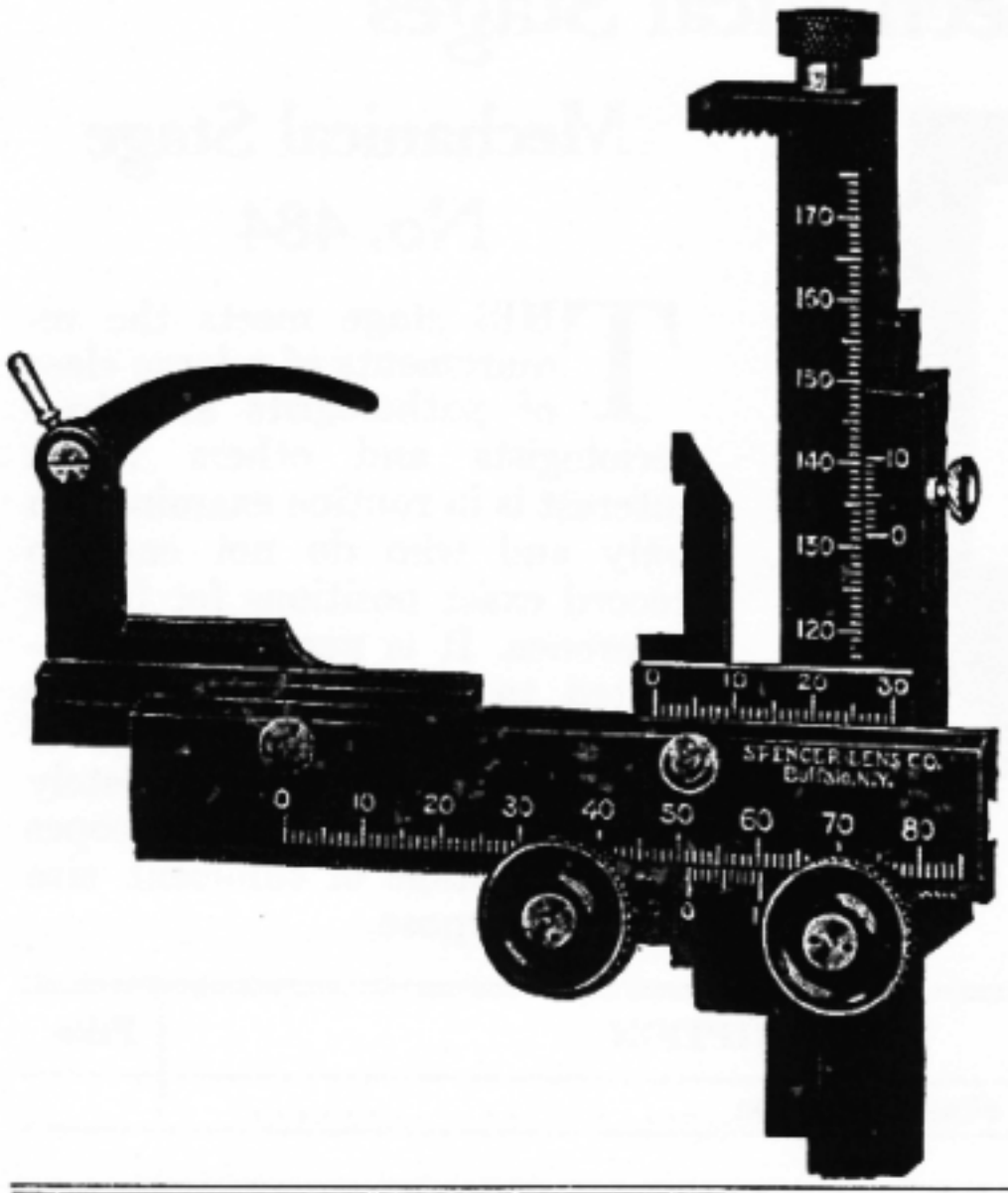
Mechanical Stage No. 485



THIS is our most popular model. The arms are graduated for reading positions 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	

Mechanical Stage No. 490



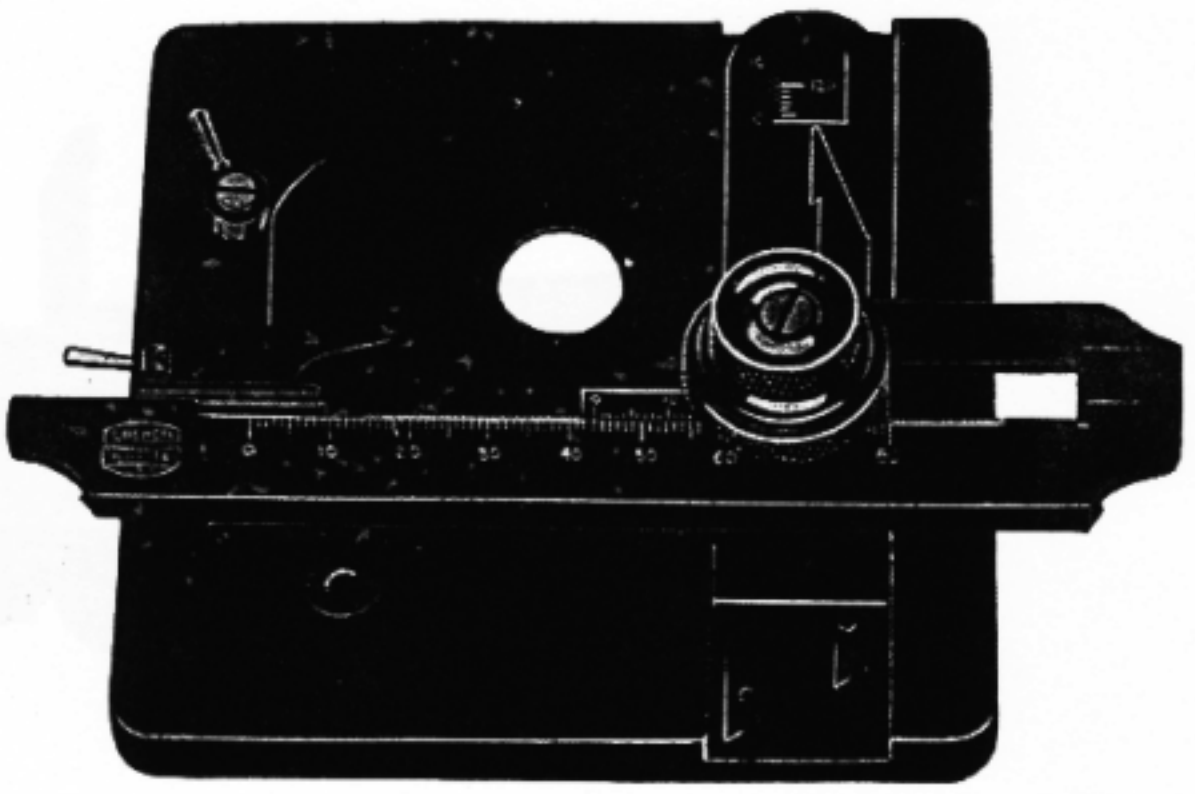
THIS is a stage of exceptional size, accommodating slides up to 2″ by 3″. It attaches to the edge of the microscope stage in such a way as to permit the corner of large slides to extend over the corner of the stage so that the entire area of even the largest sized slides can be brought under observation.

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	

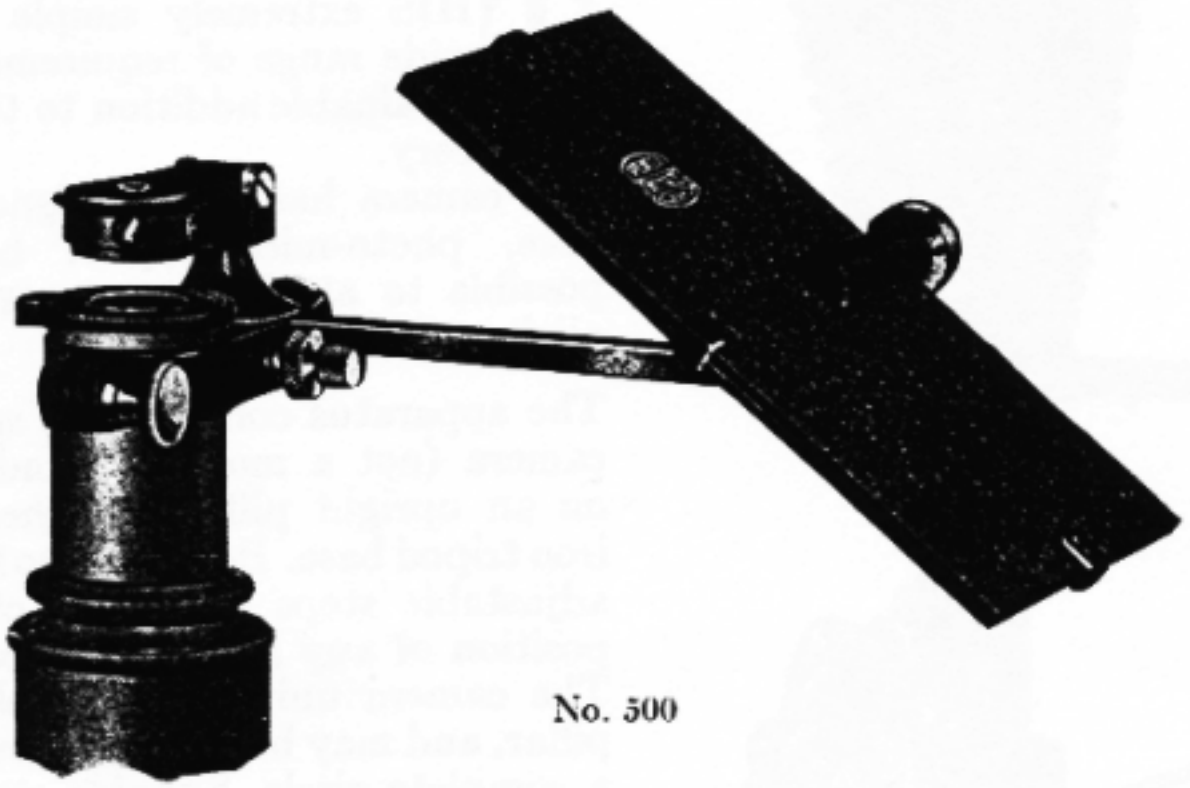
Mechanical Stage No. 493



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	

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	
Fivofiv	505	Camera Lucida, in case	



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.

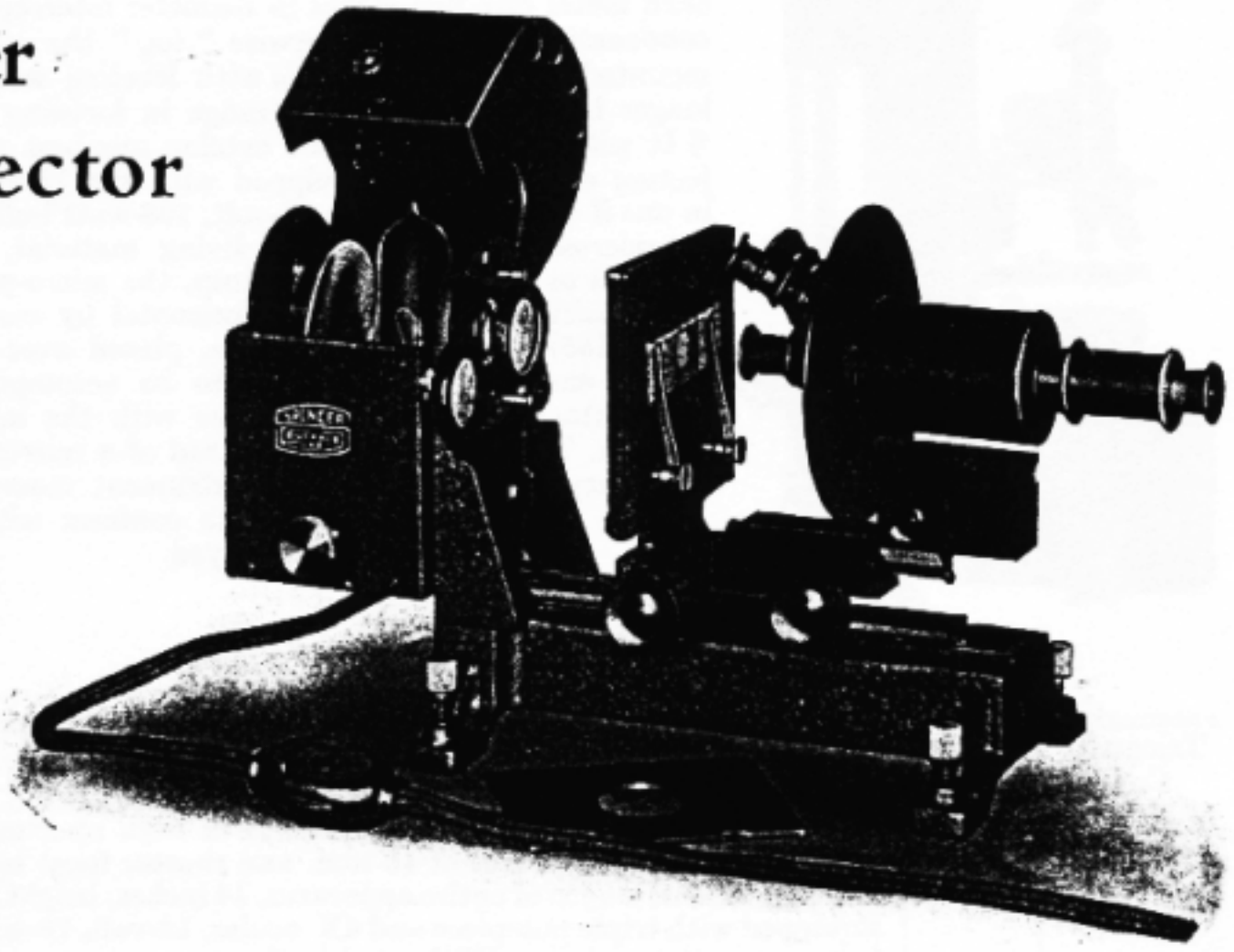
630—Camera complete with upright support, photographic shutter, two 4″ x 5″ or two 3¼″ x 4¼″ plate holders .....

638—Adapter plate to fit 3¼″ x 4½″ plate holders, each .....

637—3⅝″ x 4⅝″ plate holders, each .....

642—4″ x 5″ plate holders, each .....

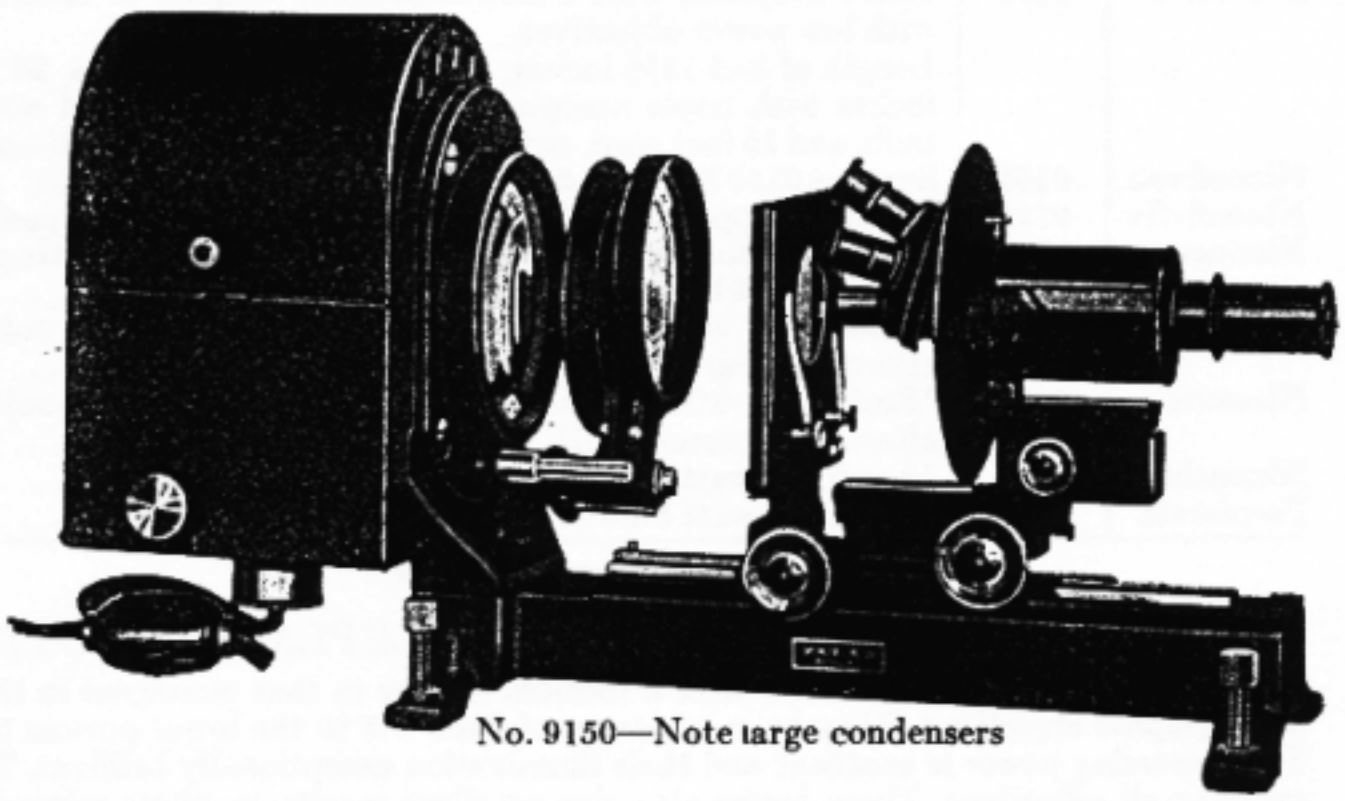
Spencer Microprojector



No. 9100

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.

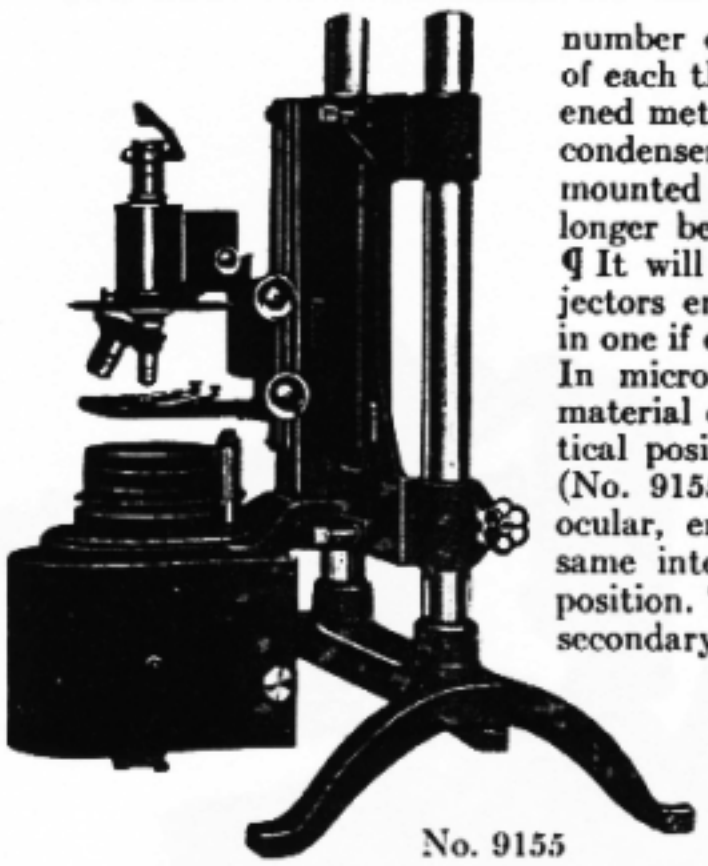


No. 9150—Note large condensers

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 if equipped with the 12-volt, 72-watt bulb, and end in one 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 the 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	
Ninonoon	9101	Same as 9100 but with 6-volt, 108-watt bulb	
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	
Ninonfivon	9151	Same as 9150 but with 6-volt, 108-watt coil filament bulb	
Ninonfivfiv	9155	Stand for supporting either Micro-Projector in a vertical position, includes prism	
Ninonono	9110	Variable Transformer to step down 110 volts alternating current to 6 volts for use with 9101 or 9151	
Ninontoo	9120	*Resistance with ammeter attached for use on 110-volt circuit, direct or alternating current with 12-volt bulb	
Ninontofiv	9125	*Resistance with ammeter attached for use on 220-volt circuit, direct or alternating current with 12-volt bulb	
Ninonthreo	9130	12-volt, 72-watt bulb	Net
Foroforate	4048	6-volt, 108-watt bulb	Net

*If required without ammeter deduct

SPENCER MICRO-TELEPLAT OBJECTIVES

THESE objectives are constructed after a formula similar to that employed in the manufacture of high grade photographic objectives. They have apertures of from F.5 in the lower powers to F.3 in those of high power. Their covering power is excellent and their illumination exceptionally brilliant. The mountings are dull black, avoiding all reflections. These lenses also give excellent results in photo-micrography. When desired for the latter purpose it should be so stated in the order.

SPENCER MICRO-PROJECTION OBJECTIVES

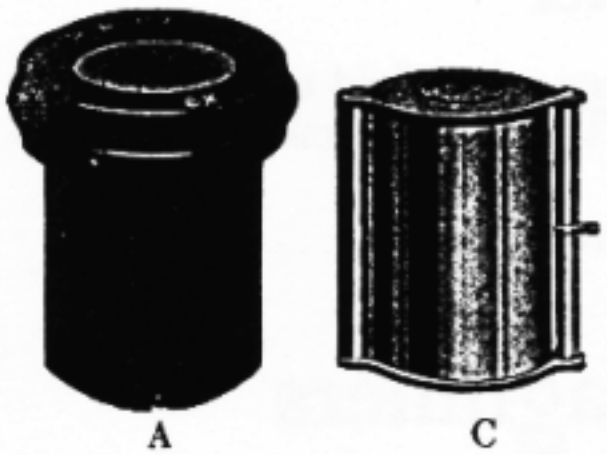
THESE objectives are constructed more nearly after the formulæ of the regular microscope objectives. They are achromatic and give excellent results.The fields are unusually flat and the definition sharp and distinct. Finished in dull black to prevent reflections.

MICRO-TELEPLATS			STANDARD MICRO-PROJECTION		
No.	Focus	Price	No.	Focus	Price
8760	60 mm.		8780	60 mm.	
8762	48 mm.		8781	48 mm.	
8764	32 mm.		8782	40 mm.	
8766	24 mm.		8784	32 mm.	
			8786	16 mm.	
			8788	8 mm.	
			8790	4 mm.	

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.
No. 8794—Projection Ocular 3x, Price ... No. 8796—Projection Ocular 6x, Price ...

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	
Toofor	204	9x	27.8	1.1	15	16		
Toosix	206	12x	20.8	0.8	12	11		
Tooate	208	18x	13.9	0.5	8	8		
Toten	210	24x	10.4	0.4	6	5.5		
Tototo	222	6x	41.6	1.6	22	22	C Folding Case	
Totofor	224	9x	27.8	1.1	15	16		
Totosix	226	12x	20.8	0.8	12	11		
Totoate	228	18x	13.9	0.5	8	8		
Tothreo	230	24x	10.4	0.4	6	5.5		

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	
Tofivate	258	9x	27.8	1.1	24.5	20		
Tosixo	260	12x	20.8	0.8	18.4	15		
Tosixon	261	15x	16.7	0.7	14.9	12		
Tosixto	262	18x	13.9	0.5	12.1	10		
Tosixfor	264	24x	10.4	0.4	9.2	7.5		
Tosevsix	276	6x	41.6	1.6	36.8	30	C Folding Case	
Tosevate	278	9x	27.8	1.1	24.5	20		
Toateo	280	12x	20.8	0.8	18.4	15		
Toateon	281	15x	16.7	0.7	14.9	12		
Toateto	282	18x	13.9	0.5	12.1	10		
Toatefor	284	24x	10 4	0.4	9.2	7.5		



No. 240 Spencer Tripod Dissecting Magnifier

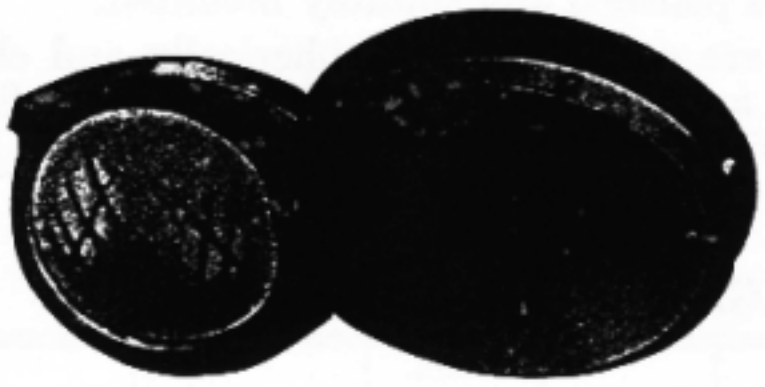
THIS dissecting magnifier gives a large, clear field and magnification sufficient for elementary work. The lens is focused by screwing it up or down in its frame.

Toforo Tripod Dissecting Magnifier, each .....

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	
Tothresev	237	Double folding Vulcanite Magnifier, oval shape, 30 mm. diameter	
Tothreate	238	Double folding Vulcanite Magnifier, bellows shape, 25 mm. diameter	
Tothrenin	239	Double folding Vulcanite Magnifier, bellows shape, 30 mm. diameter	
Toforto	242	Single folding Vulcanite Magnifier, oval shape, 25 mm. diameter	
Toforfor	244	Single folding Vulcanite Magnifier, oval shape, 30 mm. diameter	
Tofivto	252	Single folding Vulcanite Magnifier, bellows shape, 25 mm. diameter	
Tofivfor	254	Single folding Vulcanite Magnifier, bellows shape, 30 mm. diameter	

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	
1002	Slides, 75 x 25 mm. (3 x 1 inch) medium thickness, slightly green. Per gross	
1005	Slides, 75 x 25 mm. (3 x 1 inch) thin, white. Per gross	
1020	Slides, 75 x 38 mm. (3 x 1½ inch) medium thickness, white. Per gross	
1025	Slides, 75 x 50 mm. (3 x 2 inch) medium thickness, white. Per gross	
1030	Slides, 75 x 25 mm. (3 x 1 inch) one concave center. Per dozen	
1032	Slides, 75 x 25 mm. (3 x 1 inch) two concave centers. Per dozen	
1034	Slides, 75 x 25 mm. (3 x 1 inch) three concave centers. Per dozen	
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	
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	

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.	
1060	Squares	No. 2—0.17 to 0.25 mm.	15, 18, 22 or 25 mm.	
1065	Squares	No. 3—0.25 to 0.50 mm.	15, 18, 22 or 25 mm.	
1075	Circles	No. 1—0.13 to 0.17 mm.	15, 18, 22 or 25 mm.	
1080	Circles	No. 2—0.17 to 0.25 mm.	15, 18, 22 or 25 mm.	
1085	Circles	No. 3—0.25 to 0.50 mm.	15, 18, 22 or 25 mm.	

*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		1130	22 x 30 mm.	90	
1095	22 x 40 mm.	106		1135	22 x 40 mm.	65	
1100	22 x 50 mm.	75		1140	22 x 50 mm.	62	
1105	22 x 60 mm.	65		1145	22 x 60 mm.	48	
1107	22 x 70 mm.	54		1147	22 x 70 mm.	46	
1110	24 x 30 mm.	110		1150	24 x 30 mm.	86	
1115	24 x 40 mm.	100		1155	24 x 40 mm.	62	
1120	24 x 50 mm.	70		1160	24 x 50 mm.	60	
1125	24 x 60 mm.	54		1165	24 x 60 mm.	40	
1127	24 x 70 mm.	50		1167	24 x 70 mm.	38	

Slide Boxes

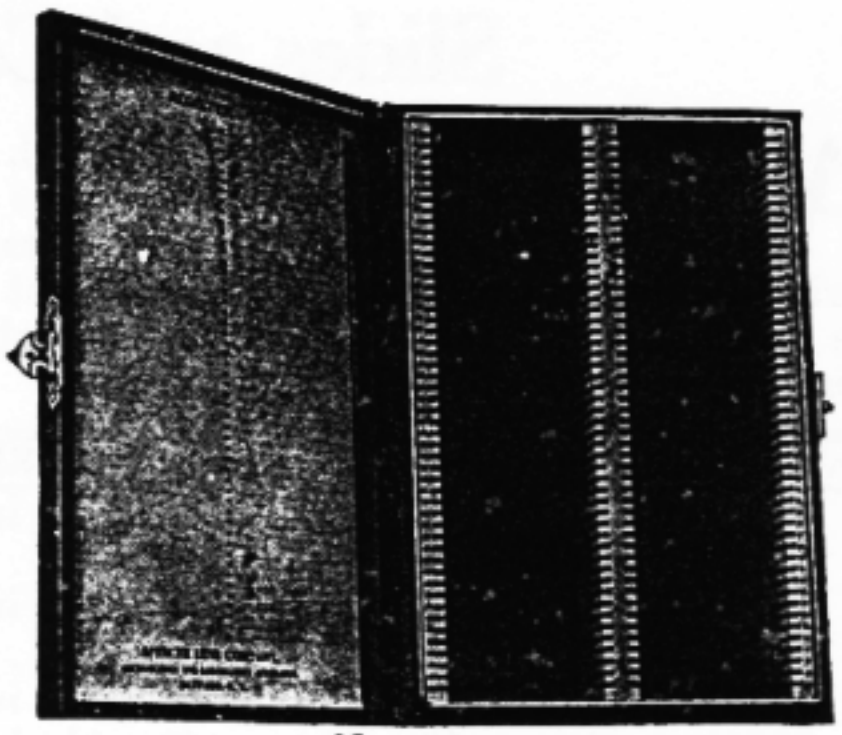
1205 Slide Box, grooved to hold one hundred object slides, 25 x 75 mm., covered with imitation leather, hinged cover and catch. Price, each .....

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) .....

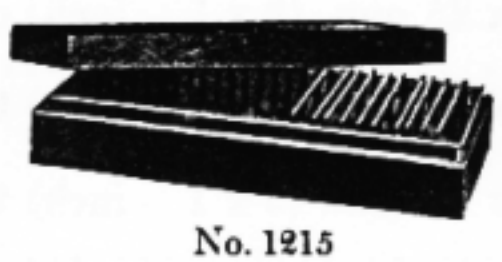
1215—Slide Boxes, made of white wood, with cover so arranged that, when removed, the ends of the slides are exposed so that they can be easily removed. Grooved to hold twenty-five objects, size 25 x 75 mm., numbered and indexed. Price, each ....

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

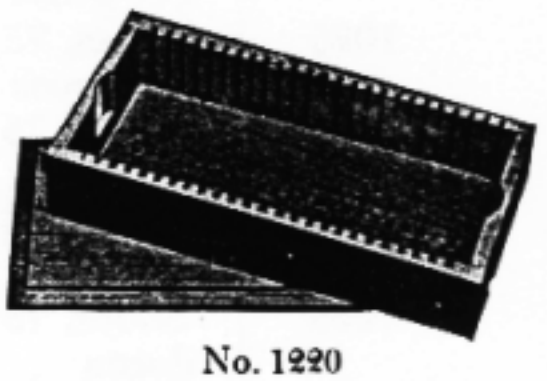
1225—Slide Boxes, same as No. 1220, but grooved to hold twelve objects, size of slide, 25 x 75 mm., numbered and indexed. Price, each .....



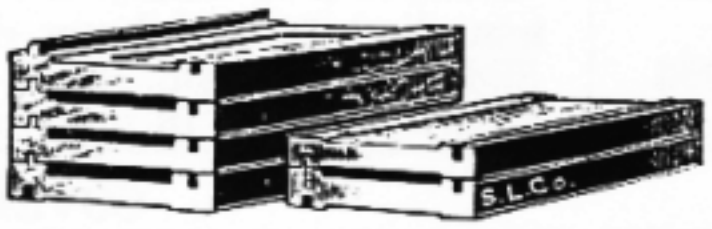
No. 1205



No. 1215



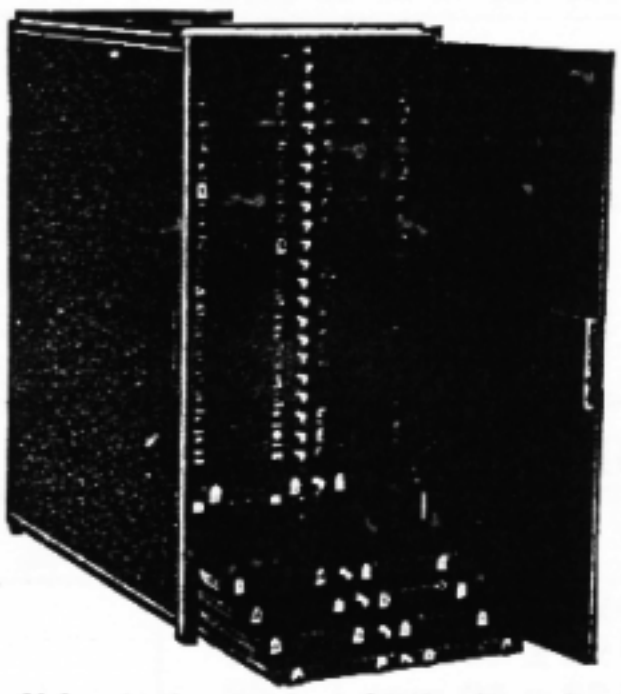
No. 1220



No. 1240

1228—Slide Boxes, same as No. 1220, grooved to hold twenty-five objects, size of slide, 50 x 75 mm. Price, each

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



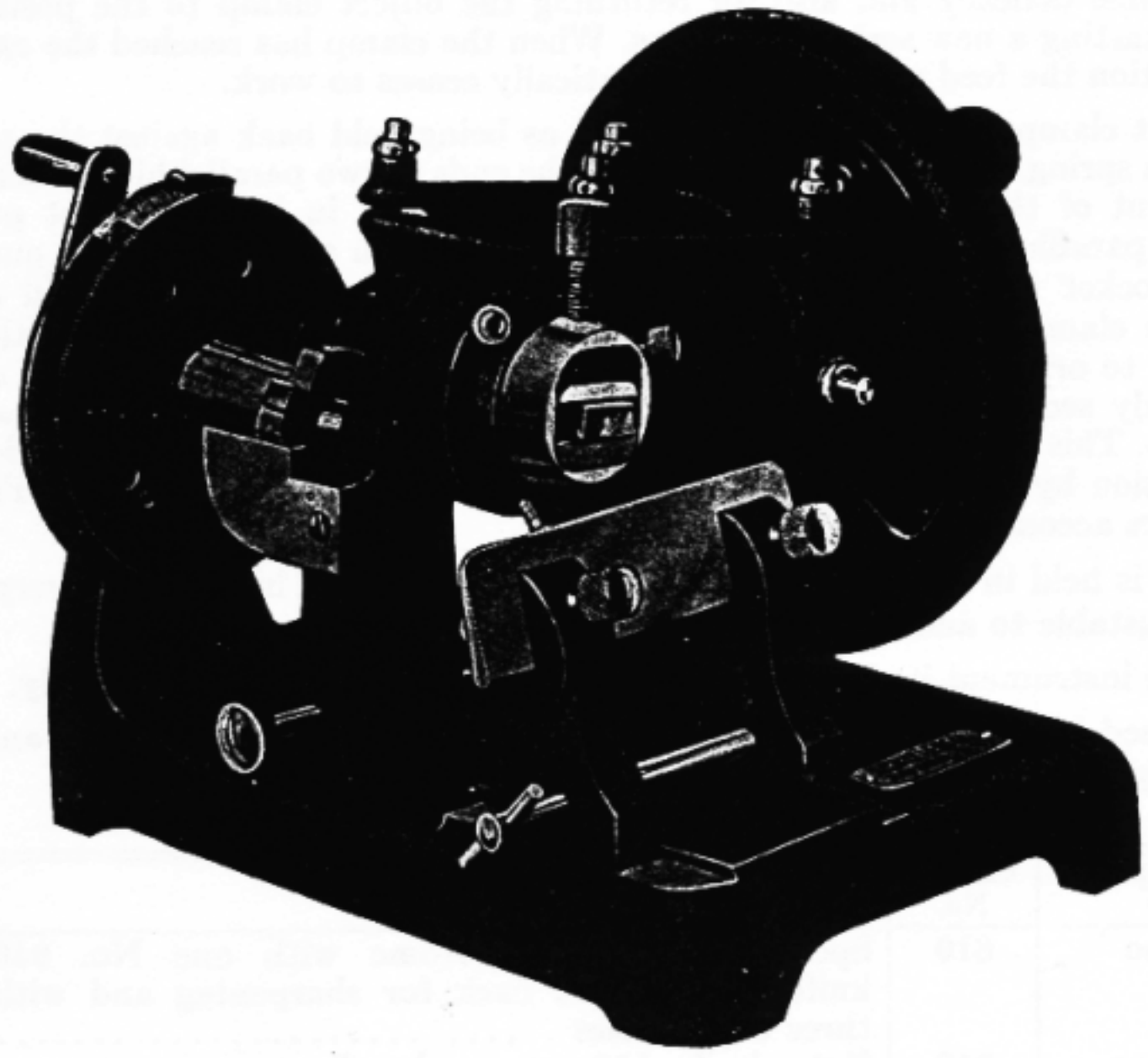
Slide Receptacles

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....	

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.

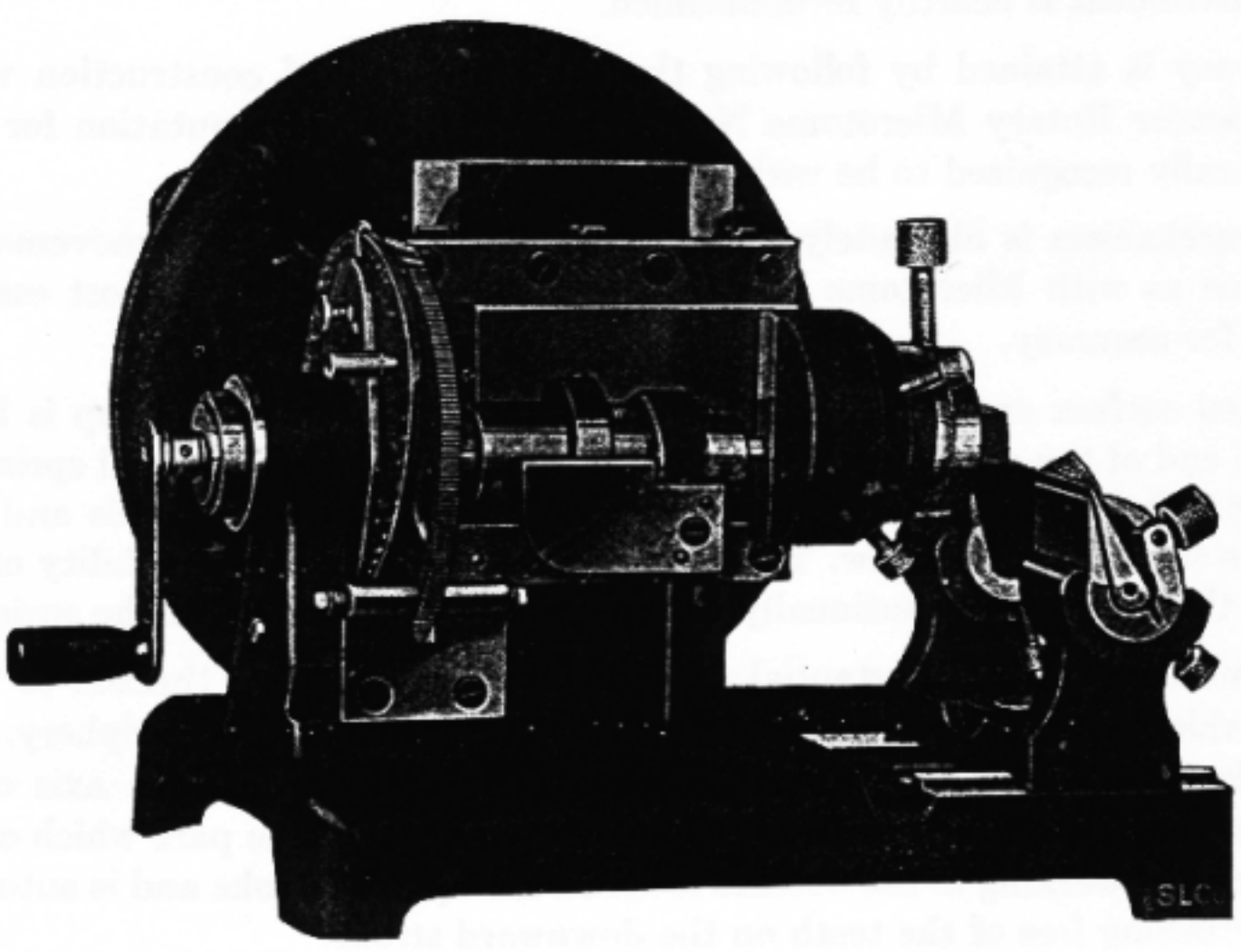
The knife is held in the knife clamp in the ordinary way. This clamp is very rigid and easily adjustable to and from the object.

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	
Ninforo	940	Extra knife, 110 mm., no handle	

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.

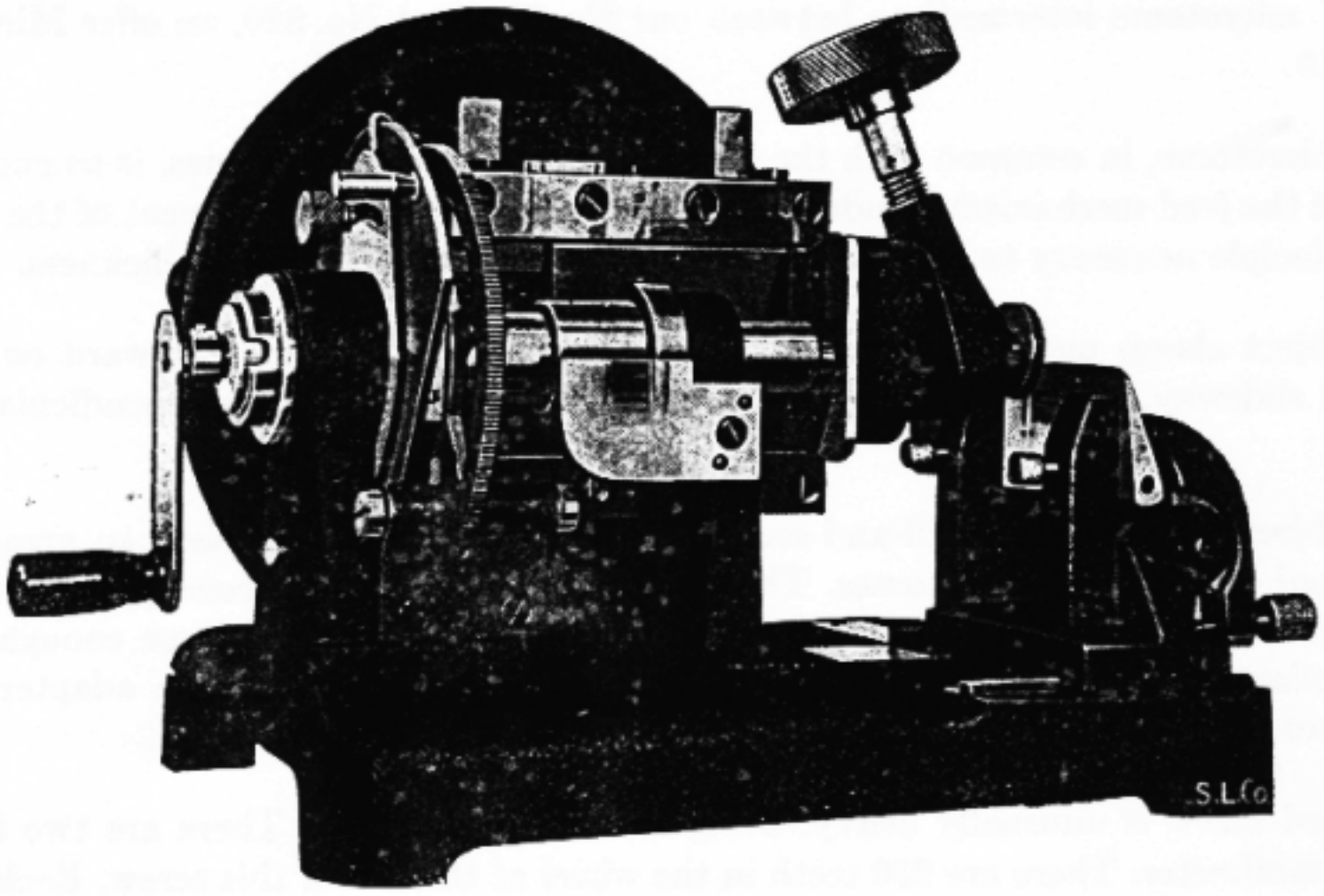
The feed screw is unusually heavy, being 12 mm. in diameter. There are two threads to the millimeter. There are 250 teeth in the wheel at the end of this screw. Each tooth, therefore, represents a section 2 microns in thickness. Any thickness may be cut in multiples of two microns up to forty microns. 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 and 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	

Spencer New Rotary Microtome No. 817



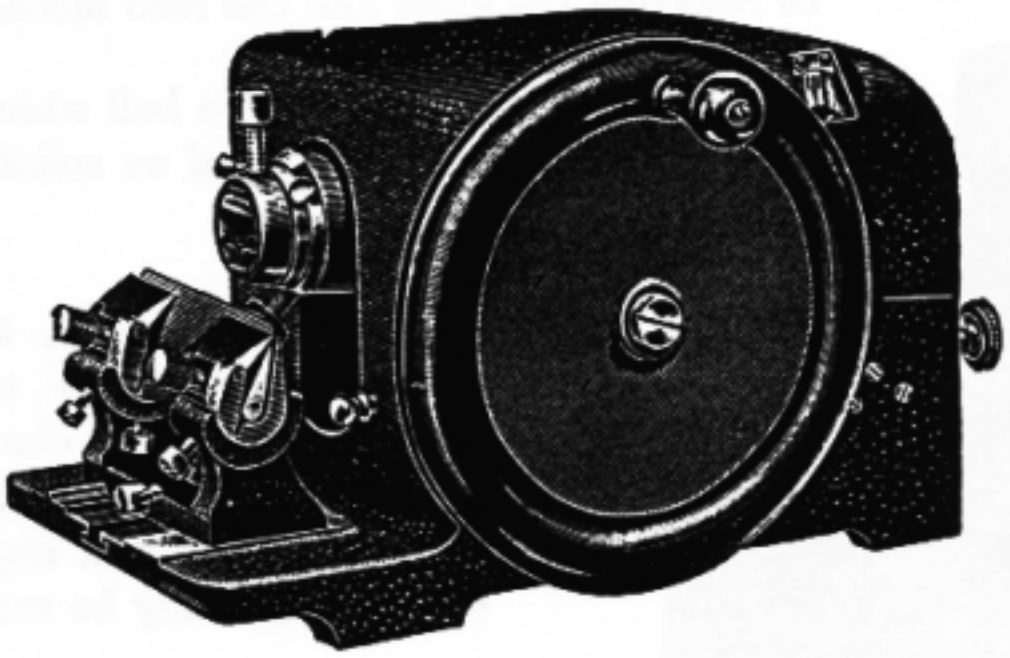
THIS new Microtome is a modification of our Rotary Microtome No. 815. The object clamp and method of holding the knife have been changed to conform with the type formerly made by the International Instrument Co. and approved by Dr. F. B. Mallory, Harvard Medical School.

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	

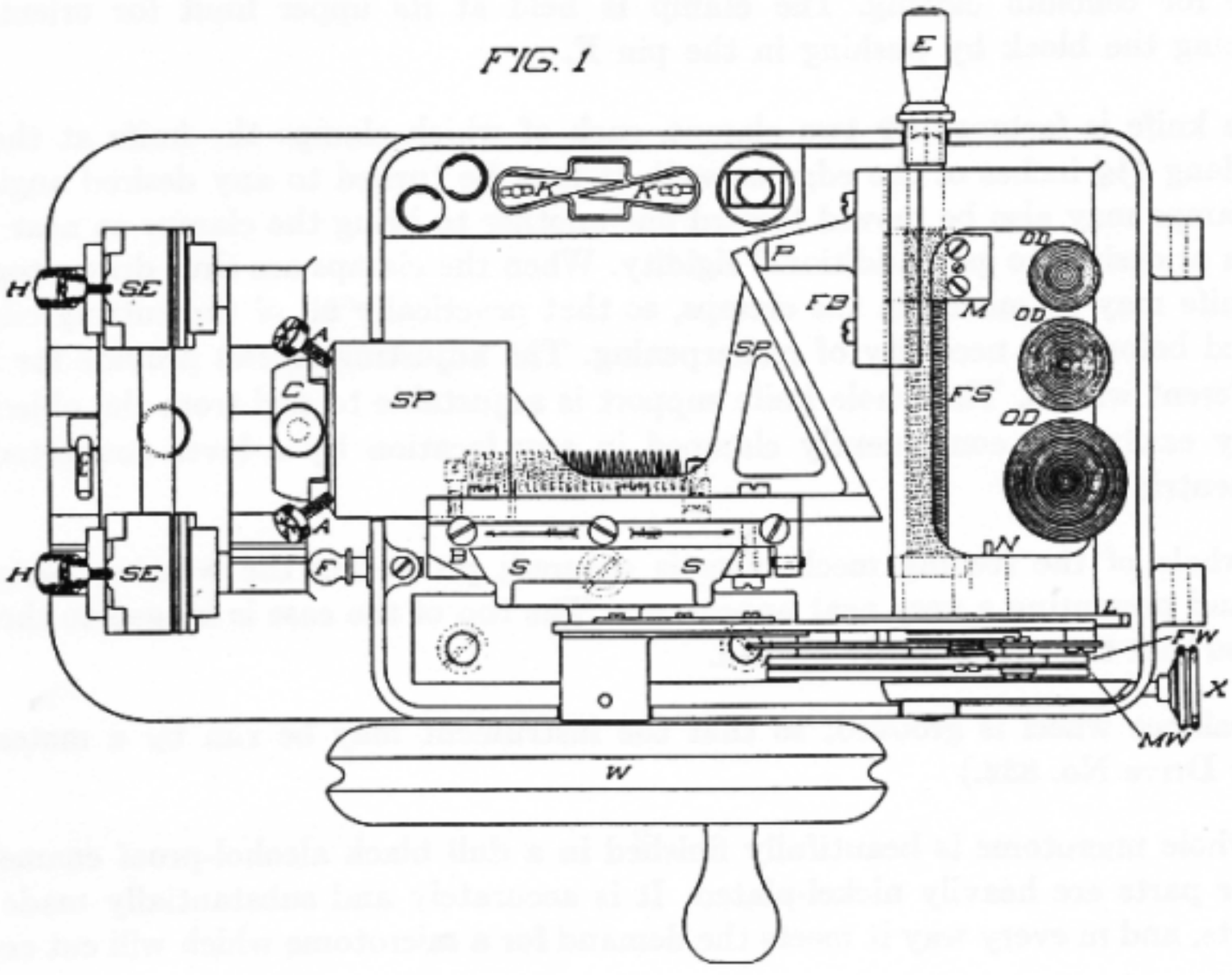
Spencer Precision Rotary Microtome
No. 820



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.

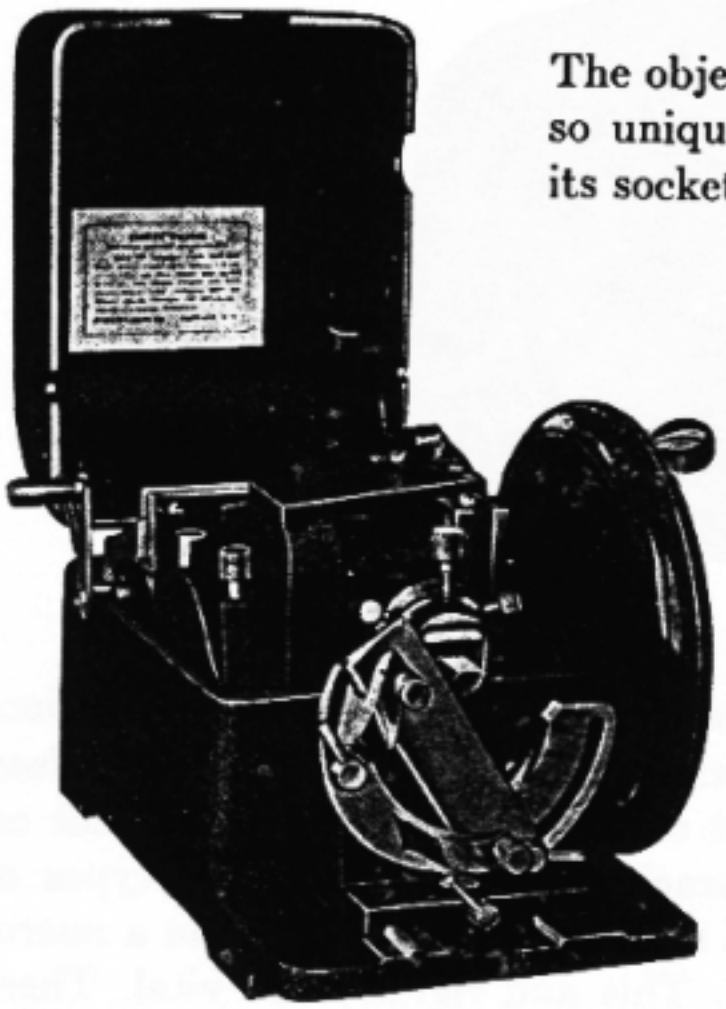
The feed is so arranged that it can be set for sections of any thickness, from 1 micron to 50 microns, by turning the knurled button at the back of the case until the number

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.

¶ 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.)

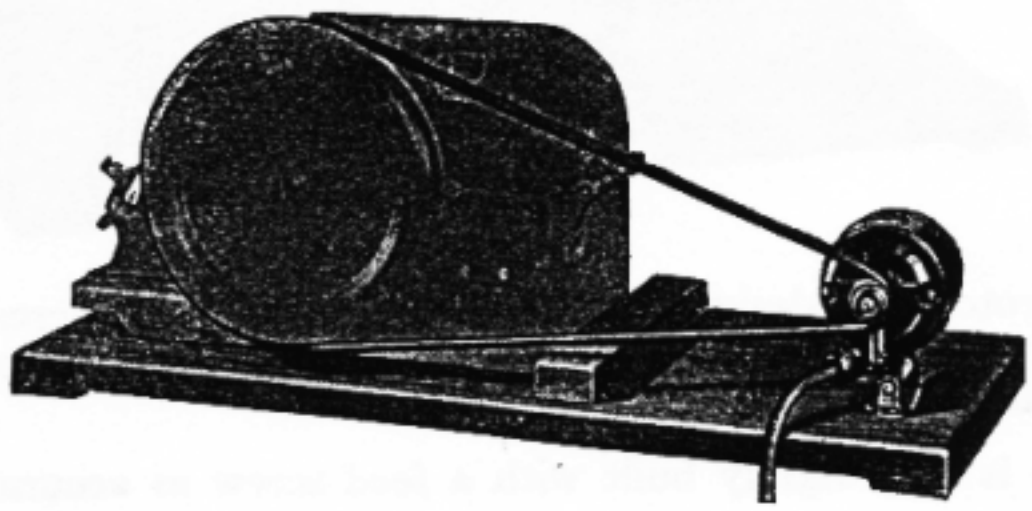
The whole microtome is beautifully finished in a dull black alcohol-proof enamel. The smaller parts are heavily nickel-plated. It is accurately and substantially made in all its parts, and in every way it meets the demand for a microtome which will cut accurate

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	
Atufiv	825	Knife holder for celloidin sections, extra	
Atetusev	827	Adjustable knife holder	
Ninforto	942	Knife for paraffin sections, extra	
Ninforthre	943	Knife for celloidin sections, extra	

A New Motor Drive for Microtomes

Nos. 815, 817, and 820

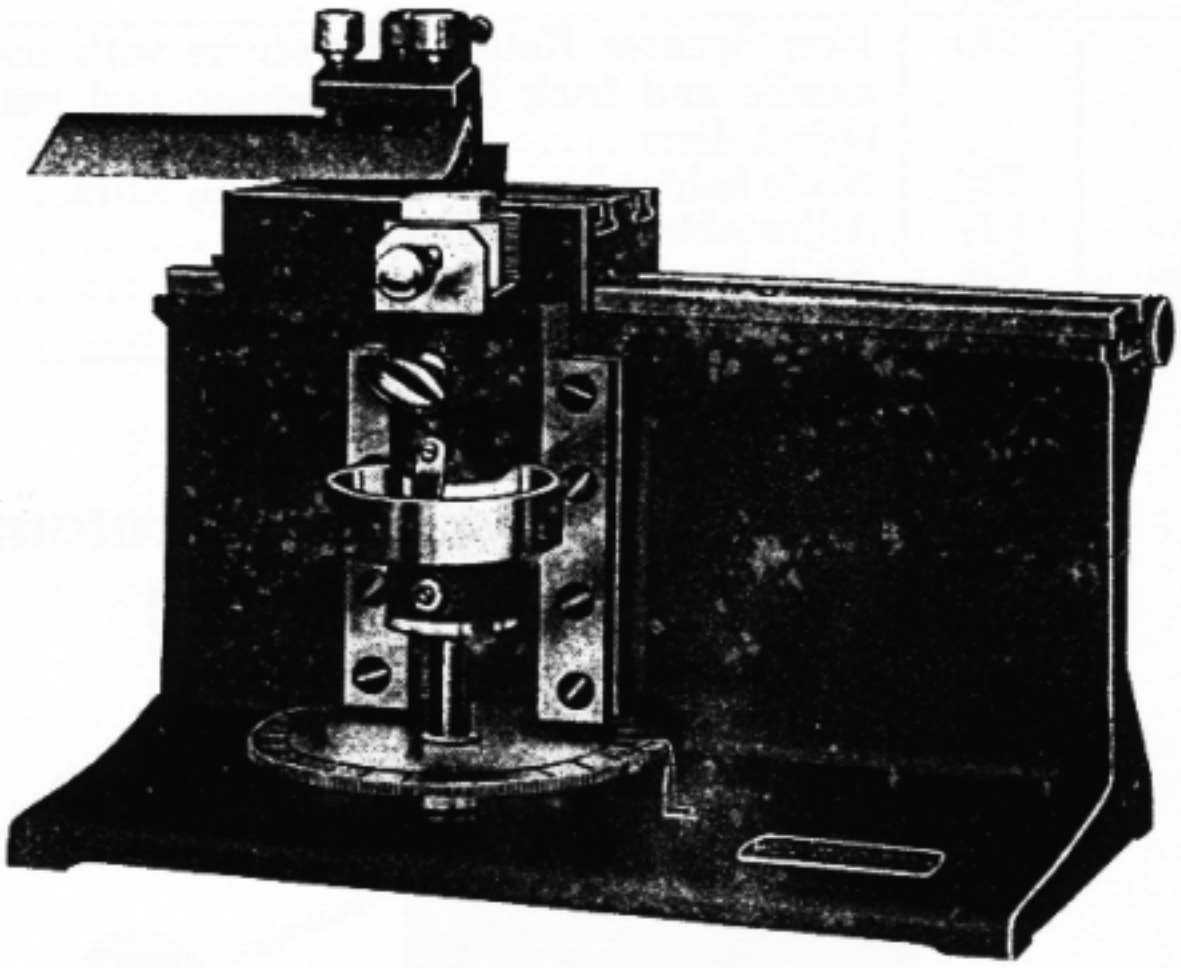


This equipment consists of a motor mounted at one end of a hardwood base.

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	
Atethrefor	834	Special resistance for 220-volt current	

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.

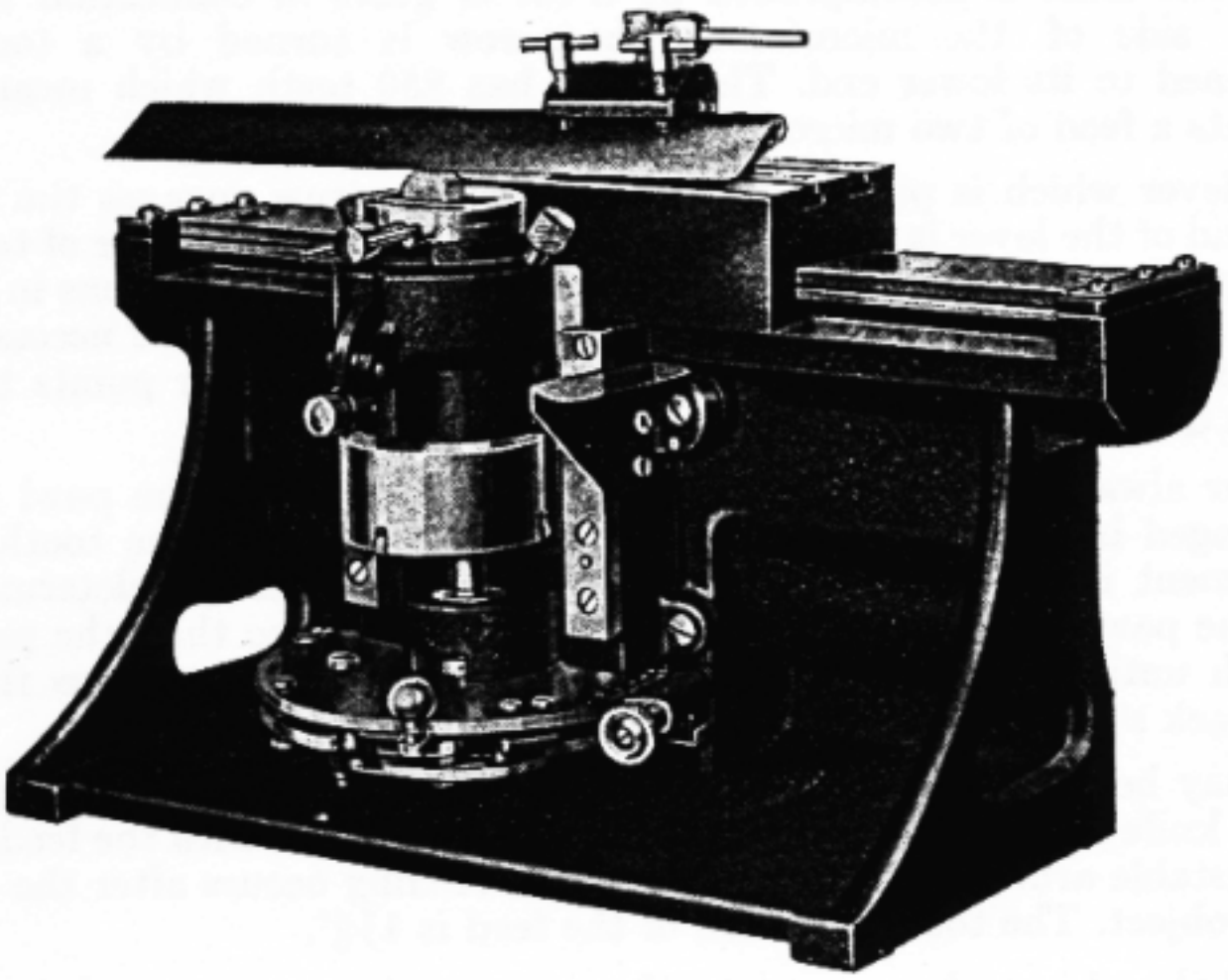
The bearings carrying the object are heavy, long and accurately fitted. The object clamp itself is a simple, rigid clamp. A small cup is placed below the clamp to catch the overflow of alcohol.

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	

Spencer New 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 is 6″ long, 3½″ wide and 2″ thick. One bearing (B, cut 3) for this block is brought as close as possible to the object, and the other B′, as far from it as possible, so that there may be no tipping, or springing of the block, or the knife clamp thereon. This broad, heavy block is held down by a reverse bearing along its middle line which insures it against jumping, tipping or allowing the knife to ride over the object. (A, cut 3). This construction is not so sensitive to any movement or strain by the hand as is the usual design.

The knife clamp is fastened at any desired angle to the broad upper surface of the block by substantial bolts working in one or both of two T slots. It is made of heavy bronze casting with a hinged lower lip on which the knife rests.This lip is controlled by a screw (S, cut 3) 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 (I, cut 3 and cut 2) 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.

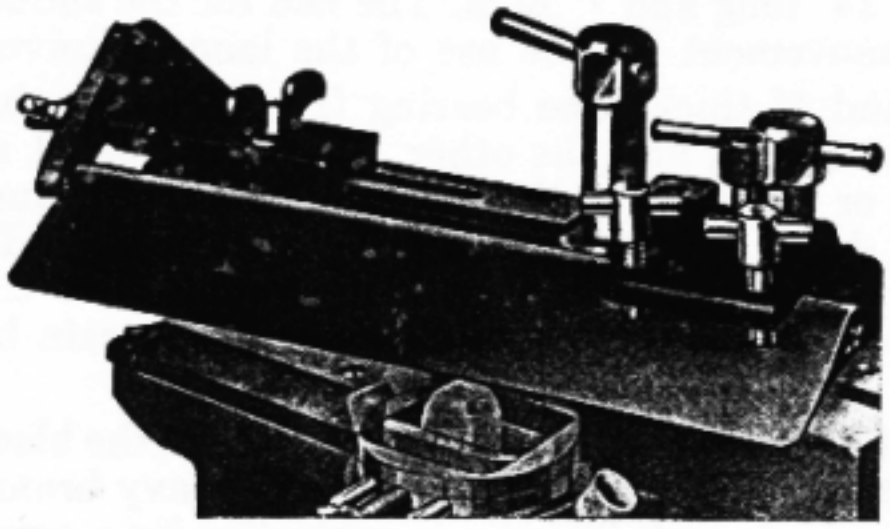
The feed screw is steel ½″ in diameter with threads ½ mm. lead. It works in a very heavy bronze nut—no splice nut. The return movement—or a quick adjustment of the object to the knife is accomplished by a set of gears in connection with a crank on the back side of the microtome. The screw is turned by 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.

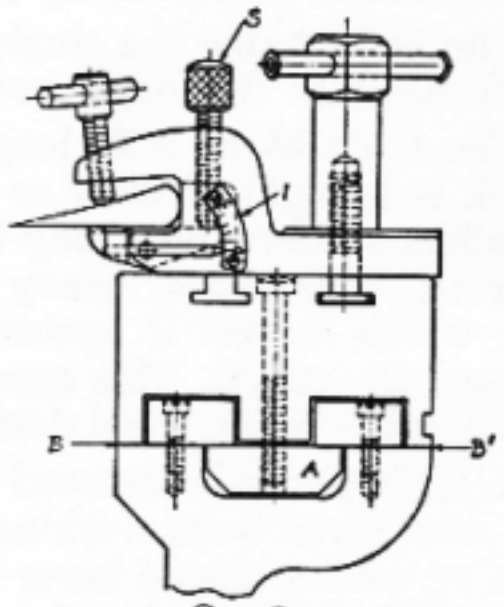
The pawl lever always goes to the full length of its stroke and the pawl *recedes* from the tooth engaged instead of being *lifted out* of and away from the tooth. This is an important element in an accurate feed. Different thicknesses are determined by the point where the pawl engages the tooth. If 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).



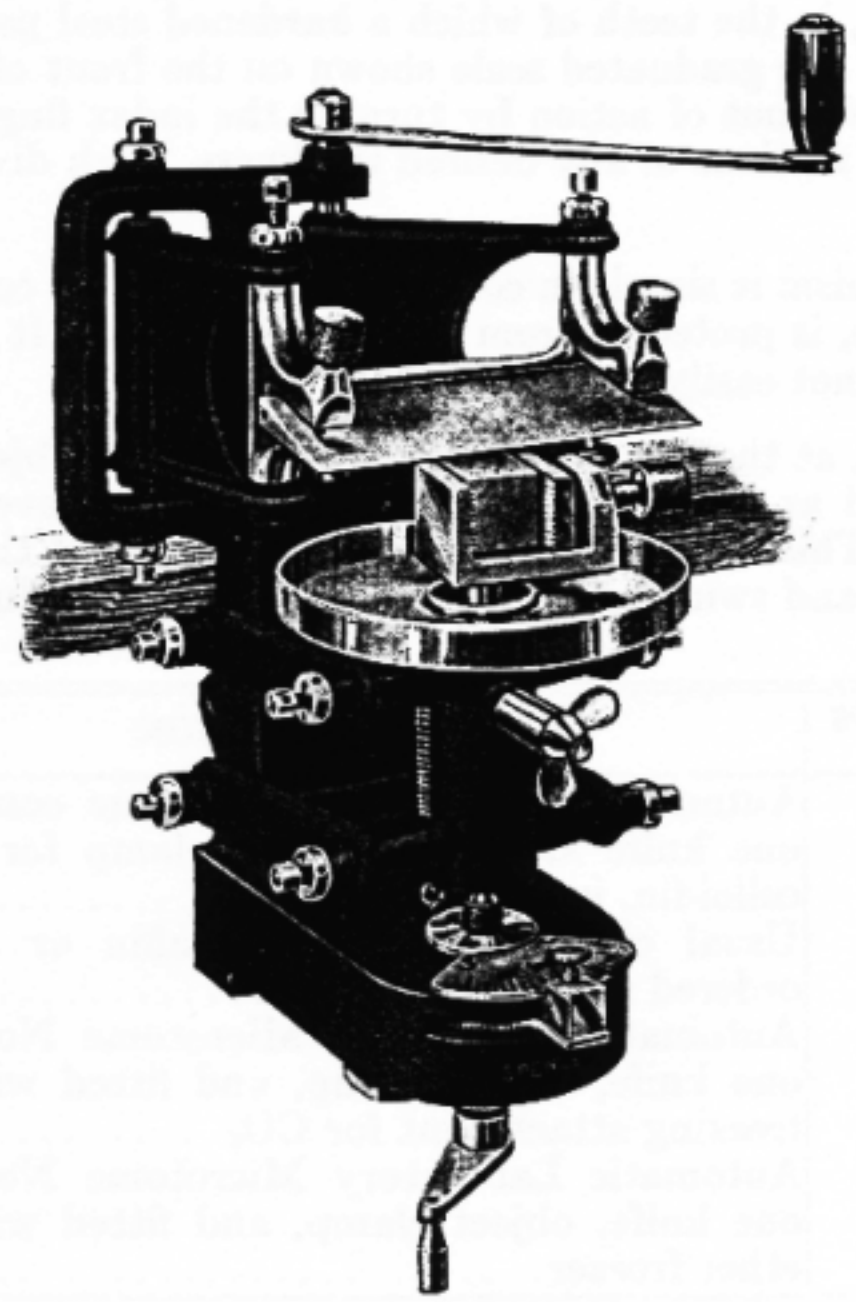
No. 862. Special Knife Clamp. Cut 4.



Cut 3

Telegraph Code	Catalog No.	DESCRIPTION	Price
Atesixo	860	Spencer New Precision Sliding Microtome with ordinary knife clamp No. 861, No. 950 knife with 250 mm. cutting edge, handle No. 957 and back for sharpening No. 963	
Atesixon	861	Spencer ordinary knife clamp, supplied regularly	
Atesixto	862	Spencer special knife clamp for supporting knife at both ends	

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.

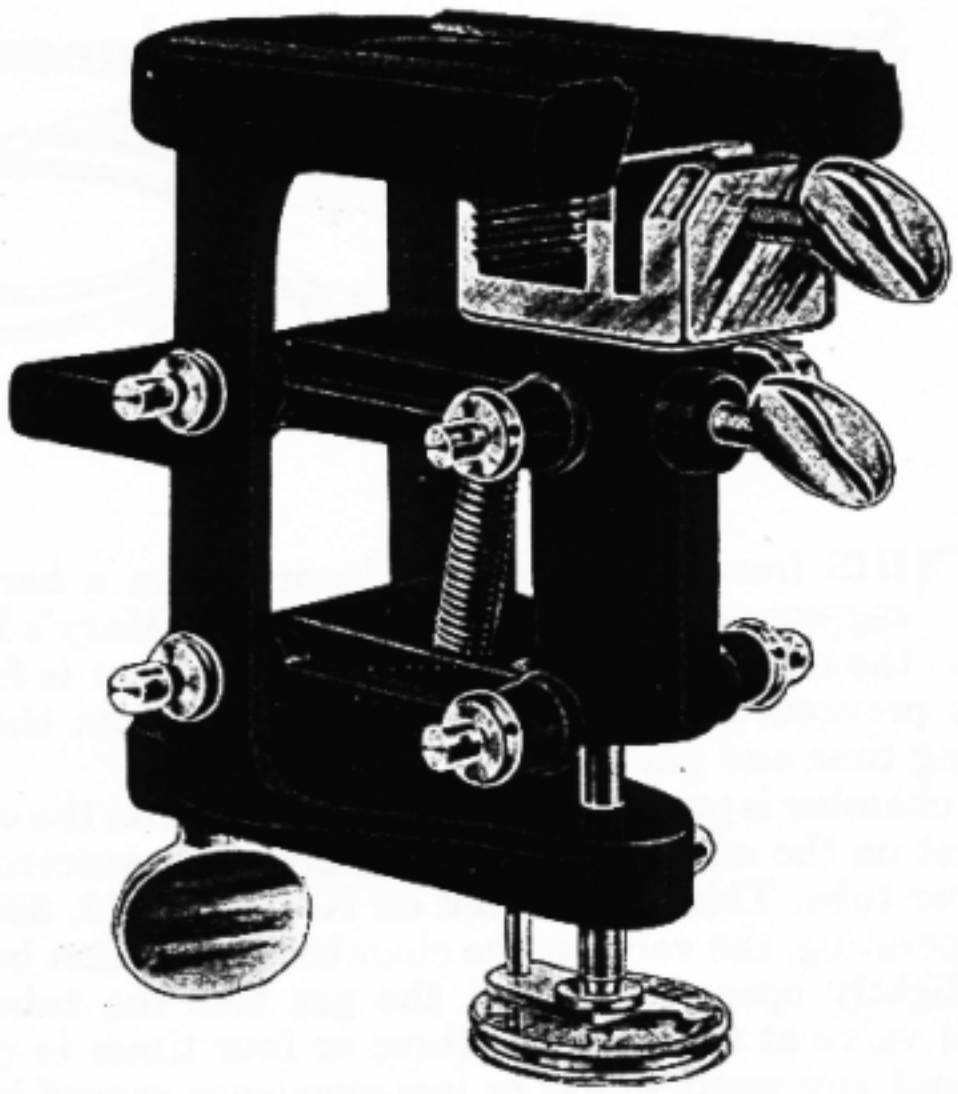
The whole feed mechanism is simple in construction and, being covered by the extended base of the main frame, is protected from dust and drippings. It may easily be reached from below and it can not easily get out of order.

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	
Ateatefiv	885	Usual object clamp for paraffin or celloidin, if ordered separately	
Ateateate	888	Automatic Laboratory Microtome No. 880, with one knife, object clamp, and fitted with No. 930 freezing attachment for CO_2	
Ateatenin	889	Automatic Laboratory Microtome No. 880, with one knife, object clamp, and fitted with No. 915 ether freezer.....	



No. 905



No. 900

Spencer Hand and Table Microtomes

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.

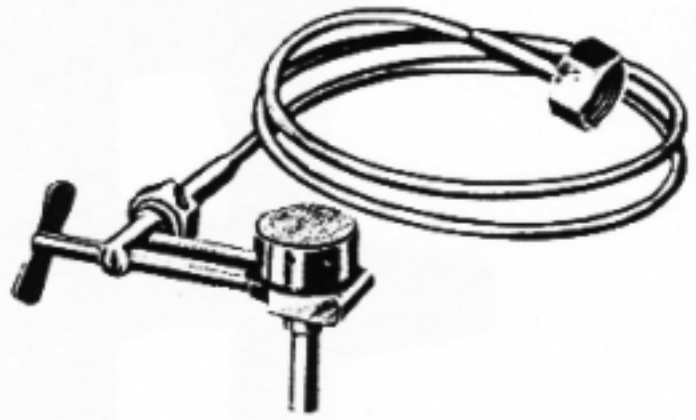
Telegraph Code	Catalog No.	DESCRIPTION	Price
Ninofiv	905	Hand Microtome	

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	
Ninotu	902	Table Microtome No. 900 fitted with No. 930 freezing attachment for CO_2	
Ninofor	904	Table Microtome No. 900 fitted with No. 915 ether freezer	

Spencer Freezing Attachment for CO_2 No. 930



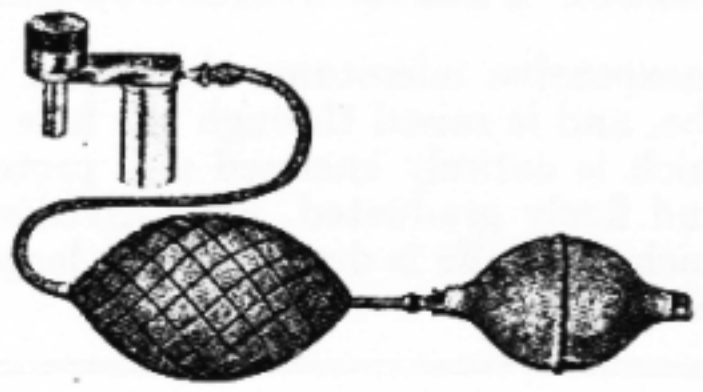
THIS freezing attachment incorporates a hard rubber non-conducting ring (the suggestion of Dr. L. D. Wilson of St. Mary's Hospital, Rochester, Minn.) between the corrugated plate to which the object is frozen and the rest of the apparatus. This prevents the conduction of the cold from the specimen to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

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	

Spencer Hones

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

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	
Ninforo	940	110 mm., no handle	
Ninfortu	942	120 mm., no handle	
Ninforthre	943	120 mm., no handle	*
Ninforfiv	945	185 mm., no handle	
Ninforsix	946	185 mm., hollow ground, no handle	
Ninfivo	950	250 mm., no handle	
Ninfivfiv	955	Handle for sharpening knives up to 185 mm. in length	
Ninfivsev	957	Handle for sharpening 250 mm. knives	
Ninsixo	960	Back for sharpening No. 940 knife	
Ninsixone	961	Back for sharpening No. 942-943 knife	
Ninsixto	962	Back for sharpening No. 945-946 knife	
Ninsixthre	963	Back for sharpening No. 950 knife	

All makes of microtome knives carefully reground and sharpened. Price, depending on size of knife and condition .....

*Ground for celloidin.

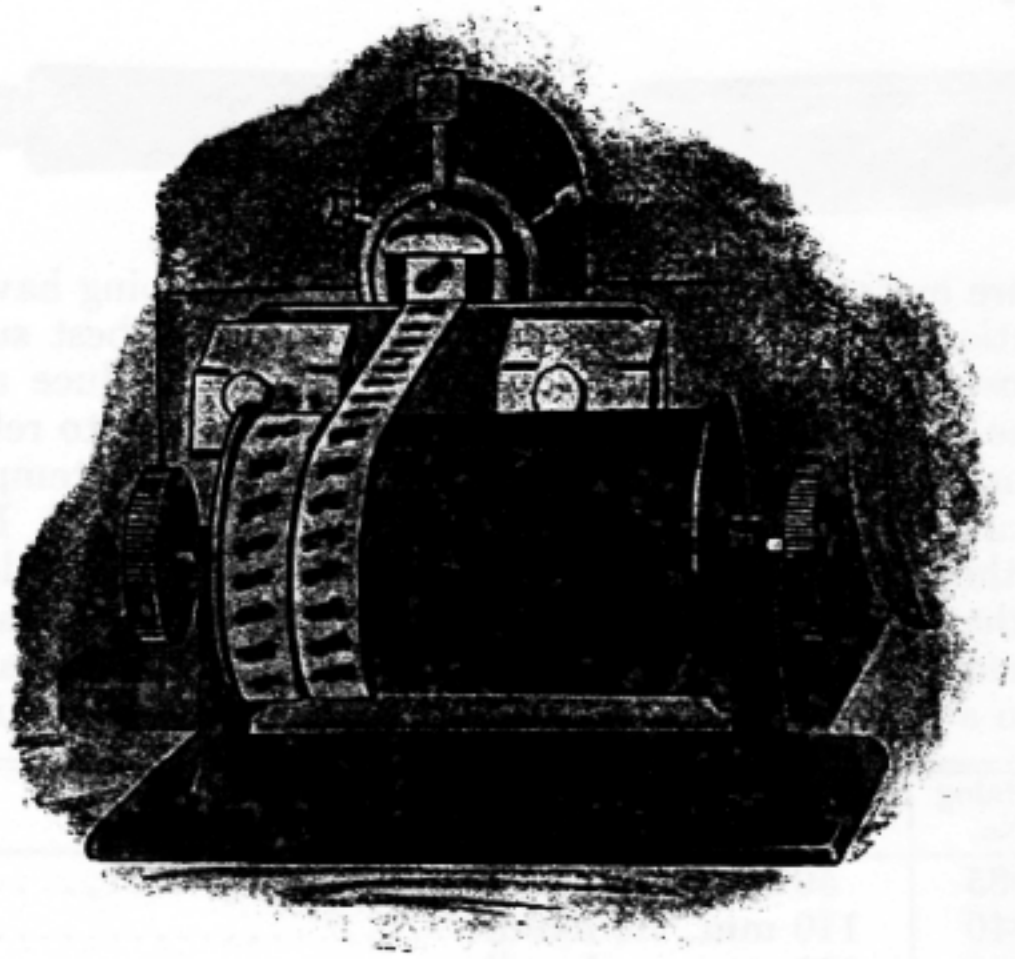
Spencer Handle for Knife Backs No. 964



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	
Ninsixfiv	965	Microtome knife, chisel blade form, cutting edge, 88 mm., for use on table microtome, especially where a freezing chamber is used	

Spencer Cylindrical Ribbon Carrier No. 840

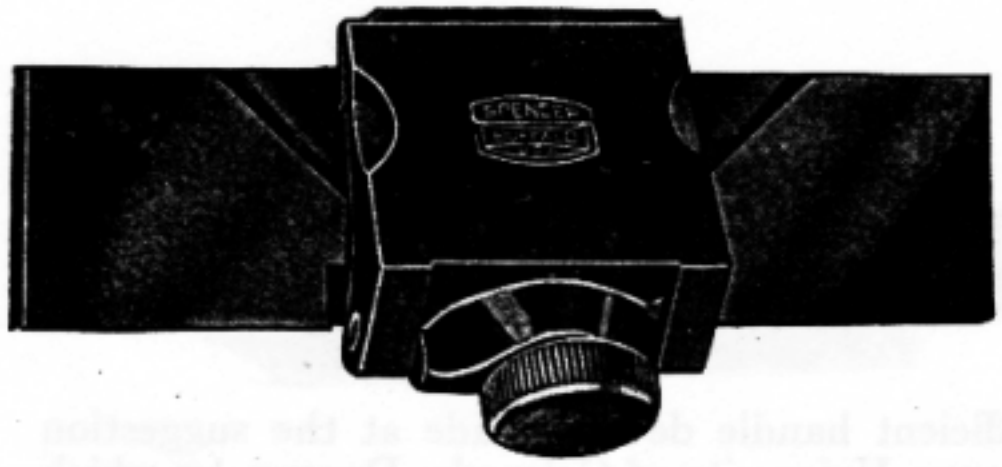


THIS ribbon carrier, compact and easily operated, has been made after the suggestion of Dr. C. E. McClung of the University of Pennsylvania. It consists of an aluminum cylinder 4½ inches long and 2⅝ inches in diameter, mounted in an aluminum framework, under the base of which are little rollers, rolling in the direction of the long dimension of the frame.

The end of the ribbon adheres to the cylinder which is slowly turned by the little buttons at the end as the ribbon lengthens. At the same time the cylinder and frame are gently pushed forward on the rollers, to place the ribbon on the cylinder in a long spiral.

The flanges at the ends of the cylinder are greater in diameter than the cylinder itself, so that when the cylinder is removed from its bearings and placed on a sheet of paper on the table, the sections in the ribbon are not injured. In this position each " turn " of the spiral may be cut and spread out in order on the paper.

Telegraph Code	Catalog No.	DESCRIPTION	Price
Ateforo	840	Cylindrical ribbon carrier	



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	
Ninsixate	968	Spencer holder for safety razor blades for use on Sliding Microtomes Nos. 845 and 860	