

# SPENCER LENS COMPANY



BUFFALO, N.Y.

# **Spencer Microscopes and Accessories**

**Microtomes  
Bacteriological Apparatus  
and  
Laboratory Supplies**

**1914**

**Spencer Lens Company**

**Buffalo, N. Y.**

**U.S.A.**

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## Laboratory Apparatus for Laboratory People

**E**VERY person who is interested in the contents of this catalogue is interested in a laboratory. It may be a small private laboratory, or one connected with a college or university. His demand for apparatus which exactly meets his conditions and helps solve his problems is the same.

In perfecting the new designs described herein we have had no ideals of our own other than those which years of actual laboratory experience and contact with laboratories and laboratory workers in America and Europe have taught us will best fulfill the needs. Every small detail which might add to the efficiency and durability of the instrument, and to the comfort and convenience of the operator, has been carefully worked out. We realize that our apparatus goes to people who are trained to see little things, and that the little things in the apparatus itself will not escape their attention:—neither have they escaped ours. We believe that the extra expense and effort involved have been wisely incurred, for we are convinced that any instrument well and honestly made to exactly meet the demands is more than half sold and, wholly sold, sells others.

To accomplish these ends we use only such materials as long experience has taught us are best suited to their purpose. We employ the best workmanship and machinery within our reach. We have combined these facilities and materials with a practical knowledge of the minute details of the laboratory needs, to bring out a series of instruments each so adapted to its particular purpose as to meet all modern requirements.

The Spencer objectives have long enjoyed the reputation of being equal, if not superior, to the very best made. With our modern methods we have been able to improve the old formulae, and compute new ones, so that our optical parts, as well as our mechanical parts, are unsurpassed.

We guarantee every instrument.

We thank our patrons for their past favors and kindly interest. We solicit not only their trade but their ideas and suggestions. We want their help, and we want to help them. It is only by our working together and coming into close contact that we can unitedly build up the very best laboratories equipped with apparatus of equal grade.

## TERMS

WHEN ordering, please be explicit, not only in giving name, address and shipping directions, but in specifying the articles wanted, by giving name and catalogue number. When two or more sizes are listed under one number, please be careful to state the sizes desired.

Unless otherwise ordered, all goods will be sent by Express except in cases where small articles go cheaper by Parcel Post, when the postage will be charged on the bill. Whenever requested to do so, we shall be glad to accommodate by prepaying transportation charges and entering the same upon the bill.

When cash accompanies the order, with request that goods be sent by mail, the amount of the postage should be sent also, otherwise goods will go by express and transportation charges follow.

Orders from parties unknown to us should be accompanied by the cash or satisfactory references.

Goods will be sent C.O.D. with privilege of examination when the order amounts to \$3.00 or more, and when order is accompanied by an amount sufficient to pay express charges both ways.

All remittances should be made by New York draft, money order, or express order. When money is sent in any other way, the amount of the exchange should be added.

All prices listed are F. O. B. Buffalo and are net cash prices, except where special discounts are given to educational institutions, hospitals, etc., which discounts figure to net cash prices; no further discounts being allowed for cash.

Our goods are thoroughly examined and carefully packed before leaving our factory. They should reach their destination in perfect condition. Our responsibility ceases when goods are delivered to the carrier.

Search all packing carefully before claiming shortages.

We make no charge for boxing or packing.

We use every endeavor within our power to please our patrons. We are not infallible. Sometimes we make mistakes. If anything occurs which is not thoroughly satisfactory, please tell us *promptly*. We cannot make corrections until we know of the error. It is an injustice both to yourself and to us to harbor an unsatisfactory incident and say nothing to us. We are always ready to meet any just claim.

We shall be pleased at all times to loan electrotypes of any of our cuts to authors or publishers.

## Microscope Stands

### Features of Construction

**A**BOVE everything else we have aimed at such qualities and conveniences in our instruments as a wide experience has taught us are most desired by those who are putting them to the severe every-day test. As a result, we have not only brought about a line of substantial, durable and thoroughly efficient microscopes, but also a line which is peculiar to itself in its many little conveniences, its grace of outline and beauty of finish.

As the details of construction are thoroughly gone over in the description of each microscope, it is our purpose here to dwell upon only those features which are generally applicable, and upon those salient points of superiority peculiar to the Spencer Microscopes.

The best of material is used, and is worked by the best modern machinery in the hands of skillful men, carefully trained, each to his particular work.

All Spencer Microscopes are beautifully finished, for the most part in a neat black finish which is baked on at a high temperature, and which is resistant to wear, alcohol, acid alcohol and all common reagents. This beautiful effect is heightened by the yellow finish on the smaller parts. *This yellow finish is also alcohol and reagent proof.* When especially requested, the microscopes will be finished entirely in black.

**Stages.** The hard rubber covering of the exceptionally large stages is vulcanized directly to the stage casting in especially prepared moulds. By this method, soft rubber gum is so fastened while it is hardened that it will not warp or come off. All microscopes are equipped with these stages, with the exception of Nos. 54, 55, 57 and 74.

**Substages.** With the new, simple substage ring, there are three styles of substages; the other two being the quick screw and the rack and pinion.

In the new, *simple ring*, spiral slots are cut in such a way that the condenser may be focused up and down by simply turning it in the ring. The range is limited, but is sufficient for most purposes. This substage is regularly supplied on Nos. 65 and 66 *when a condenser is ordered with the instrument. There is also a provision for automatically locking the smaller stage iris open when the top of the condenser is flush with the upper surface of the stage.*

**The Quick Screw Substage** consists of a sextuple screw which is protected from dust and which carries the substage arm up and down on a perpendicular axis, around which the arm is free to revolve when at the lower limit of the screw. When at this lower limit, the arm may be swung out of the optical axis, carrying with it the small iris diaphragm fastened to its upper surface, and also the condenser, with its larger iris, which is held in the friction sleeve attached to the arm. As is the case with the simple ring, *the small upper iris is automatically locked open when the condenser is in place; thereby precluding any injury to the leaves or the face of the condenser.* This is accomplished by placing the condenser in its sleeve in the ordinary way. It is *not necessary* to get it to any *exact position* before pushing it into the sleeve into which it fits.

Our own special drop-swing condenser mounting can be attached to the quick screw and the rack and pinion substages. In this mounting, the condenser is screwed into an arm which swings on a horizontal axis formed by an arm which in turn revolves around the perpendicular axis coincident with that of the sextuple screw. (See Fig. 1.) By this means, the condenser not only drops from its position in the optical axis but also swings to a position next to the pillar of the microscope, entirely out of the way of the hand, and the light falling on the mirror. (See cut

of No. 20 Microscope.) In this mounting, the upper iris is also automatically locked open when the condenser is in position for work.

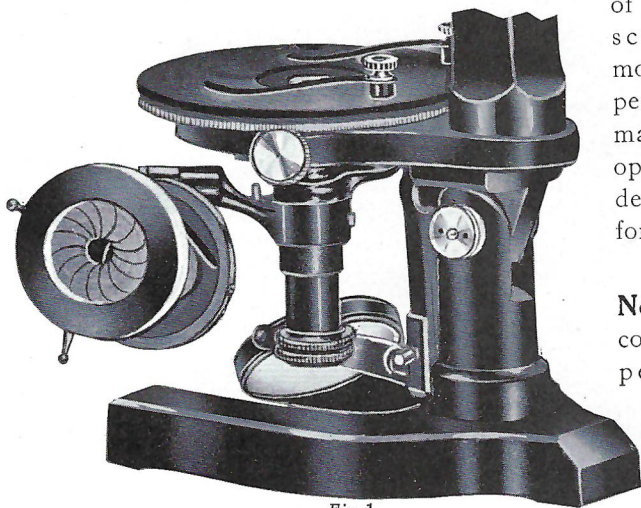


Fig. 1

quick-screw substage. (See Fig. 1.) The iris diaphragm is fastened to the ring, R (Figs. 2 and 3), by two screws, A and B. These

**Oblique Light No. 1** is a simple, compact and inexpensive arrangement for obtaining oblique light, which can be attached to the

screws work in slots in such a manner that the center of the diaphragm opening moves along the straight line, X-Y. Any degree of obliquity may be obtained, and it may be obtained from any azimuth by rotating the ring, R, in its bearing, R<sup>1</sup>. This simple oblique light arrangement may be applied to the ordinary condenser mounting, or to the drop-swing condenser mounting, as shown in Fig. 1. The price is \$10.00.

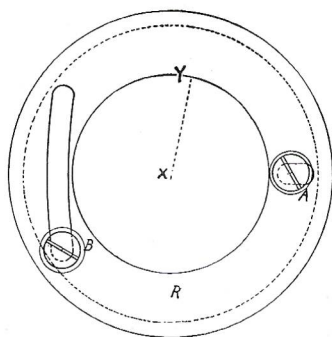


Fig. 2

**The Complete Rack-and-Pinion Substage** is shown in Fig. 4. The whole mechanism is moved up and down on its bearing by means of a rack and pinion.

The iris diaphragm beneath the condenser is located on an arm which swings to the right, and on which provision is made for *Oblique Light No. 2*. In this oblique

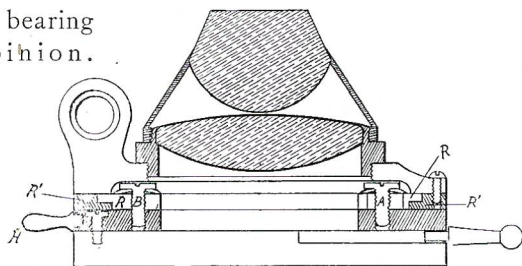


Fig. 3

light arrangement, the iris is de-centered by means of a rack and pinion, and the obliquity is obtained from the desired angle of azimuth by rotating the diaphragm in the supporting arm. The

condenser is mounted on the drop-swing mounting which has been described. The upper iris diaphragm is located on an arm which swings to the left when the substage is racked down sufficiently. The mirror is mounted on an independent swinging arm.

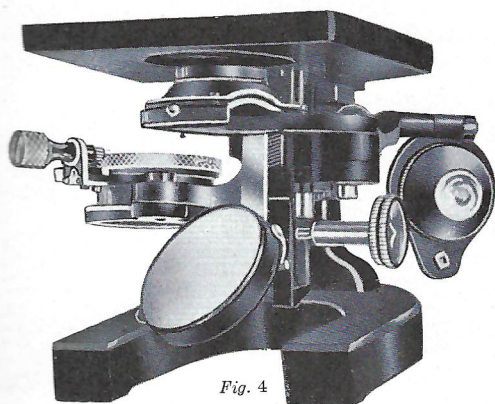


Fig. 4

**The Mirror Bars** on all the higher priced instruments are adjustable as to length, and are also provided with stops indicating

the center line on all instruments with the exception of the more elementary. *The Mirrors* are all 50 mm. in diameter, plane on

one side and concave on the other.

**Bearings.** All the bearings are carefully milled to shape, and smoothly fitted by experts. The metals involved are selected to give the best results, as is also the form of the bearing. The racks and pinions are accurately cut and carefully fitted to give a smooth positive movement and at the same time provide for durability. In addition, the bearing surfaces of the fine adjustments are provided with oil grooves which hold a reserve supply of lubricant to

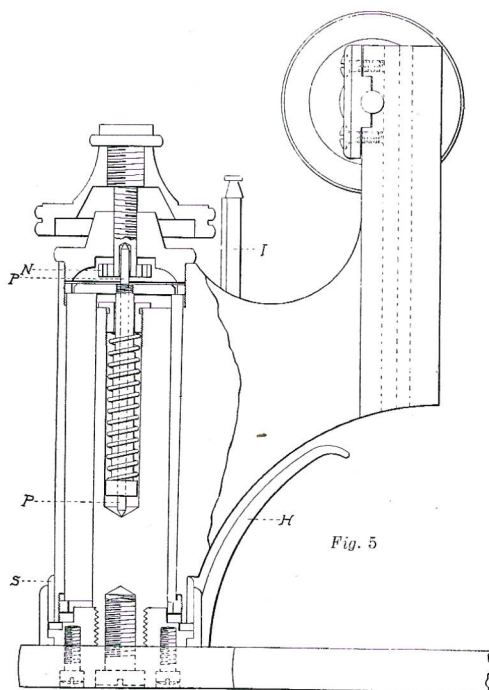


Fig. 5

insure a perfect movement for a period of time longer than could otherwise be hoped for. All fine adjustments are so arranged that they *cease to work* when the objective rests on the cover glass. The threads of the screws are cut two threads to the millimeter on a special machine designed for the purpose, which provides a smooth, accurate and durable movement.

We make three types of fine adjustments.

**Fine Adjustment A** is represented in Nos. 30 and 40. The bearing surfaces inside of the arm are fitted extremely accurately by a special method of our own. The whole mechanism is self-contained and protected entirely from exposure to dust and dirt. Each division of the graduated fine adjustment head represents a movement of 5 microns. The indicator, I (Fig. 5), telescopes into the arm so that it is out of the way when not in use.

The protecting handle, H, following the curve of the lower edge of the arm, is placed on all microscopes of this type to take off all the strain from the delicate threads of the fine adjustment when the instrument is carried by the arm.

**Fine Adjustment B** is represented in Nos. 5, 10, 15, 20, 22, 25 and 60. This adjustment is growing in favor, because of the convenience of having the adjustment buttons on a horizontal axis at the side of the arm. (See Fig. 6.) The nut, N, passing from side to side on the horizontal thread, produces a like movement of the lower end of the lever, L, which in turn produces a *direct up-and-down movement* at Y, the lever being pivoted at X. There is no lateral thrust.

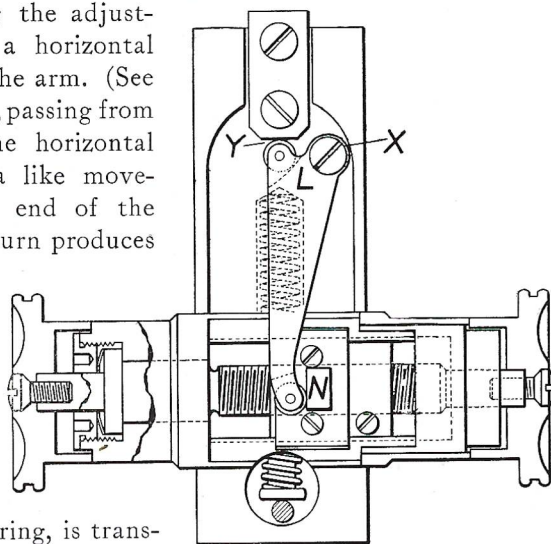


Fig. 6

The downward thrust, caused by gravity and the spring, is transmitted directly through the lever to the nut on the thread, and from the thread to the hands. This continuous strain in one direction only, does away with any possibility of lost motion and automatically provides for any possible wear. There are no worm gears, cams, inclined planes, balls or other complicated arrangements, the wearing of which is sure to result in lost motion, a lateral displacement, or both.

One complete revolution of the micrometer thread moves the tube .1 mm. Each of the one hundred divisions of the micrometer head therefore represents an adjustment of 1 micron—fine enough for the most delicate adjustment and not so fine as to be tardy in response.

There is also a cheaper modification in which the whole threaded shaft passes back and forth through the arm; carrying with it the lower end of a similar lever pivoted in the proportion of 2:5 instead of 1:5 as is the case with the other. In all other regards it has the same superior qualities. It is used in Nos. 44 and 64.

**Fine Adjustment C** is represented in Nos. 16, 36, 45, 62, 65 and 66. In this type, the movement of the screw is transmitted to the intermediate slide by means of the straight lever, L (Fig. 7),

instead of a bell crank lever as in type B. The fulcrum is regularly equidistant from the ends in all instruments with the exception

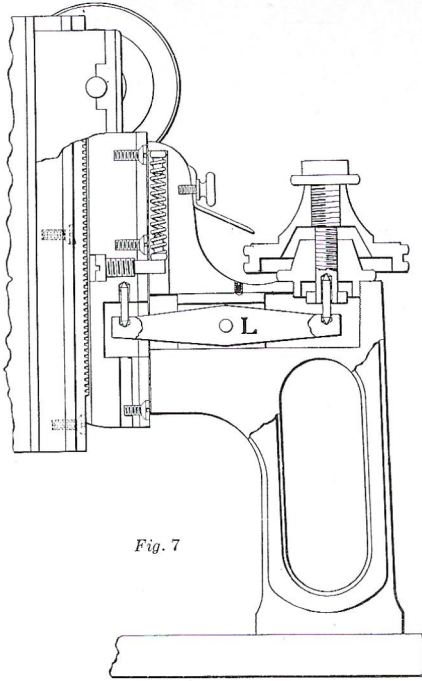


Fig. 7

of No. 16 where the proportion is as 2:1; thereby making a finer adjustment. When so requested, we will make the lever 2:1 on any microscopes of this type.

On the newer type microscopes—Nos. 45, 62 and 65, the essential features of the fine adjustment are identical with those of Nos. 36 and 66, even though there is considerable difference in the form of the arm.

**Body Tubes.** The standard body tubes are 37 mm. in diameter, while those of the large stands—Nos. 5, 10 and 16, are 50 mm. in diameter. They are all finished in black

with a little yellow at the top and bottom. If specially ordered, they can be finished either in all black or all yellow. They are provided with graduated draw tubes mounted in a cloth-lined sleeve which insures a smoother and cleaner movement than any other arrangement. However, when so ordered, they are mounted in metal bearings. In all instances, the body tubes are raised and lowered by the rack and pinion which have been described.

**Nosepieces.** The nosepiece has come to be an essential part of the microscope. Our nosepieces are entirely dustproof, and of light and rigid construction. The movement is smooth and even, and they come to center with a definite click.

Suitable allowance is made for cabinets when they are not wanted.

For \$ .50, we place beneath the stage a ring for holding an eyepiece, so that the microscope with two eyepieces and the objective on the nosepiece may be one complete integer.

## Microscopes

### Summary of Superior Features

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#### UNEXCELLED OPTICS

Achromatic and apochromatic objectives.

28 styles of compound microscopes.

All stands are large and convenient.

The fine adjustment bearings are automatically lubricated,  
and protected from dust.

All fine adjustments cease to work when the objective rests on  
the cover glass.

All fine adjustments are so protected that no harm can come to  
them from handling the microscope by the arm.

A series of binocular microscopes unequaled for convenience  
and adaptability.

A series of metallurgical microscopes.

Two styles of side fine adjustments neither one of  
which shows lost motion or lateral  
displacement.

The unusually large stages are covered with vulcanite  
vulcanized directly to the metal stage.

Provision is made for automatically locking open the upper  
iris diaphragm when the condenser is in position.

When instruments are furnished without cabinets, a small ring  
may be placed beneath the stage to hold an extra eye-  
piece to keep all the parts of the instrument  
together as one complete microscope.

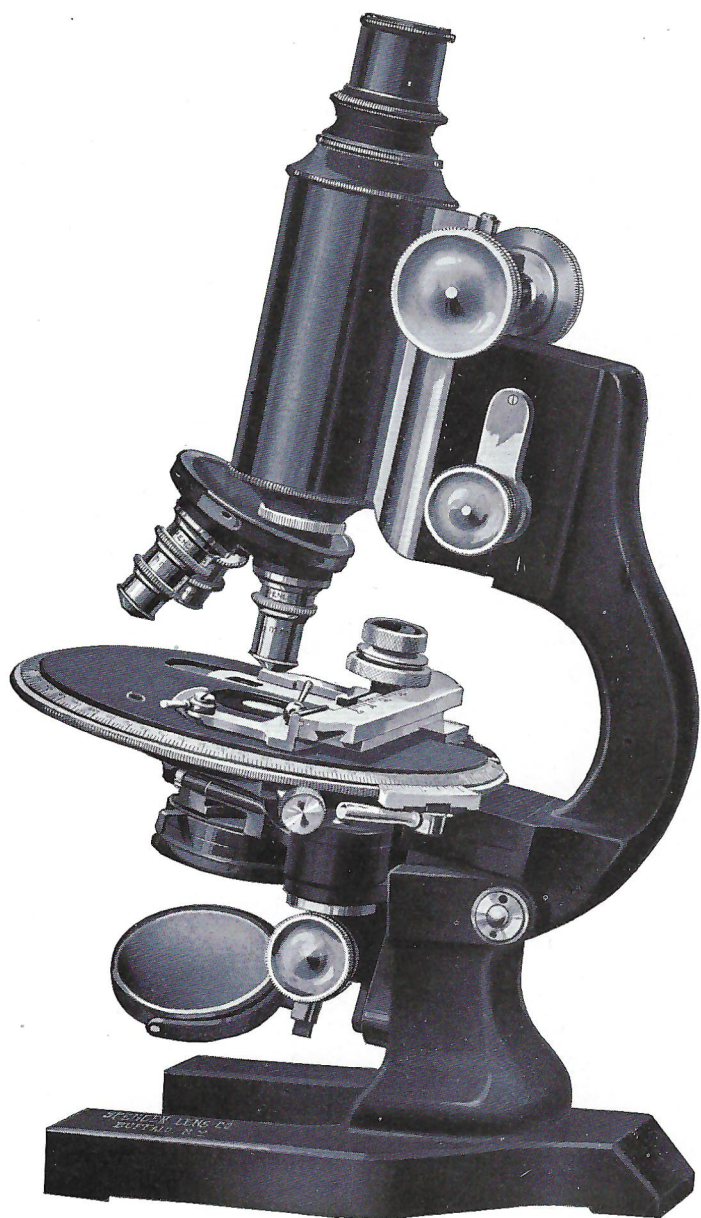
The drop-swing condenser is a simple and most  
convenient condenser mounting.

The substage parts are simple and compact.

A simple oblique light attachment is supplied.

For beauty of outline and finish they are unequaled.

The unexcelled workmanship makes for durability.



New Spencer Microscope No. 5

# SPENCER LENS COMPANY

## New Spencer Microscope No. 5

This instrument embodies the latest in design and is the result of the best material and workmanship.

**The Aluminum Body Tube** is 50 mm. in diameter and is arranged to accommodate the large, low power photo-micro objectives as well as those with the Society screw, also the compensating oculars with the large field lenses.

**The Arm** is large; forming a most convenient handle by which to grasp the instrument with the whole hand. It is provided with our well known side fine adjustment. One complete revolution of the thread represents an up-and-down movement of .1 mm. The graduations on the button to 100 parts make the value of each division one micron.

**The Revolving Stage** is 150 mm. in diameter—130 mm. of its surface being covered with vulcanite. The nickeled periphery is graduated to degrees, and the vernier reads to three minutes.

**The Mechanical Stage** is easily removable by simply slipping it off from its bearings which are embedded in the stage. When removed, these bearings may be covered by a slide provided, which makes a clear, even, plain stage without the necessity and expense of buying an extra plain stage. The buttons operating the mechanical stage are on *concentric axes*, one above the other. There is a range of 80 mm. in lateral movement and 50 mm. in to-and-fro movement. When the large stage is centered by means of the centering screws, the two vernier readings of the mechanical stage are all that are necessary to locate an object.

**The Complete Rack-and-Pinion Substage**, as described on page 7, is regularly equipped with achromatic condenser No. 315 mounted on the drop-swing mounting. The instrument is furnished in a beautiful mahogany cabinet.

### Advantageous Features

A large arm, giving a free distance of 100 mm. from optical axis to arm.

An extremely accurate and sensitive fine adjustment.

A fine adjustment which automatically takes up for wear; no lost motion.

An extra large stage with removable mechanical stage.

Telegraphic Code	Catalogue No.	Achromatic Condenser	Nose Piece	Objectives Equiv. Foc. mm.	Apochromatic Outfits		Achromatic Outfits	
					Compens. Oculars	Price	Huyghenian Oculars	Price
Fivea	5A	N. A. 1.30	.....	16, 4	10x	\$179.50	10x	\$140.00
Fiveb	5B	N. A. 1.30	Double	16, 4	10x	183.50	10x	144.00
Fivec	5C	N. A. 1.30	.....	16, 4	10x, 15x	187.00	6x, 10x	141.50
Fived	5D	N. A. 1.30	Double	16, 4	10x, 15x	191.00	6x, 10x	145.50
Fiveh	5H	N. A. 1.30	Triple	16, 4, 1.8 Oil-imm.	10x, 15x	258.50	6x, 10x	170.00

When ordered with condenser No. 310 instead of No. 315, deduct \$16.00 from above prices.

Prefix "Apo" to code word when wiring for apochromatic outfits.



Spencer Microscope No. 10

## Spencer Microscope No. 10

We offer this microscope for work of the highest and most exacting character—visual and photo-micrographic. In design, workmanship and convenience, its superiority is marked.

**The Aluminum Body Tube** is 50 mm. in diameter and so arranged that the large photo-micrographic objectives and compensating oculars with large field lenses may be used with it.

**The Arm**, with handle opening, is of solid brass and provides a free distance of 80 mm. between it and the optical axis. The side fine adjustment is extremely simple, and sensitive to the touch. One complete revolution of the fine adjustment head represents a movement of the tube of .1 mm. Each division of the graduation represents 1 micron in up-and-down movement.

**The Stage**, like that on No. 5, is very large—150 mm. in diameter—and is vulcanite covered. It can be clamped in any position, and centered by means of centering screws. When centered, the two vernier readings only on the mechanical stage proper are necessary to locate an object. The edge is graduated to degrees, and the vernier reads to three minutes.

**The Mechanical Stage** is so arranged that it may be easily removed from the revolving stage, thus leaving a large plain stage. This does away entirely with the inconvenience and expense of an extra stage. The buttons operating the rack-and-pinion movements are on *concentric axes*. The lateral excursion is 75 mm. and the to-and-fro excursion is 50 mm.

**The Substage** is the complete rack-and-pinion type, like that described on page 7. It is regularly equipped with the *achromatic condenser No. 315*, mounted on the drop-swing mounting, with the decentering iris diaphragm on an independent arm beneath it.

The instrument is finished in our alcohol-proof black and yellow finish. The cabinet is polished mahogany, with lock.

### Advantageous Features

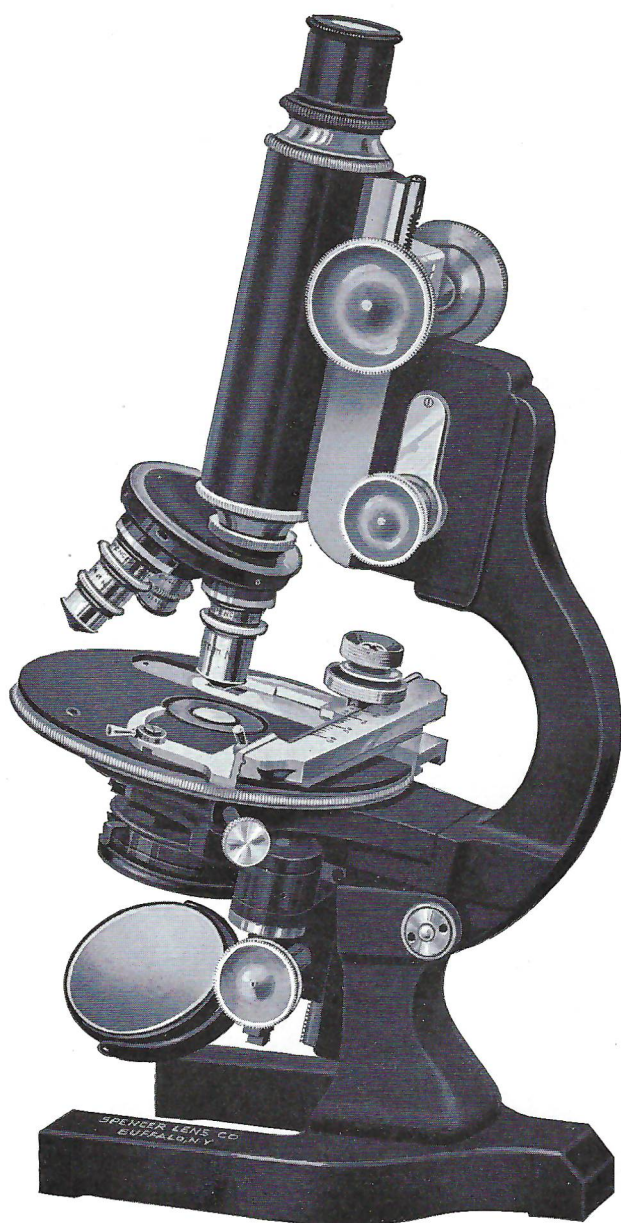
A fine adjustment, with no lost motion and no lateral displacement.

A responsive fine adjustment, with all wear automatically provided for.

A unique combination of very large revolving stage and mechanical stage.

Tele-graphic Code	Catalogue No.	Achromatic Condenser	Nose Piece	Objectives Equiv. Foc. mm.	Apochromatic Outfits		Achromatic Outfits	
					Compens. Oculars	Price	Huyghenian Oculars	Price
Tena	10A	N. A. 1.30	.....	16, 4	10x	\$179.50	10x	\$140.00
Tenb	10B	N. A. 1.30	Double	16, 4	10x	183.50	10x	144.00
Tenc	10C	N. A. 1.30	.....	16, 4	10x, 15x	187.00	6x, 10x	141.50
Tend	10D	N. A. 1.30	Double	16, 4	10x, 15x	191.00	6x, 10x	145.50
Tenh	10H	N. A. 1.30	Triple	16, 4, 1.8 Oil-imm.	10x, 15x	258.50	6x, 10x	170.00

To substitute the wide angle Abbe condenser No. 310 for the achromatic, deduct \$16.00 from above prices.



Spencer Microscope No. 15

## Spencer Microscope No. 15

This microscope is offered to meet the demand for a large and very efficient instrument where critical photo-micrographic work is not a necessity. It is very similar to No. 5, but not so large.

**The Body Tube** is of the standard size, finished in alcohol-proof black and yellow, taking standard objectives and oculars.

**The Arm** is large enough to admit of grasping the same with the whole hand. It is provided with our extremely simple and sensitive side fine adjustment, like that on Nos. 5 and 10. It is very durable; automatically taking up for any wear as it may occur. There is no lost motion and no side thrust. The lever involved is fulcrummed in the proportion of 5:1. One complete revolution of the screw therefore moves the body tube .1 mm—each of the 100 divisions of the graduated button representing a movement of 1 micron.

**The Revolving Stage**, 120 mm. in diameter, is covered with vulcanite. When centered by the centering screws, the axis of revolution is 90 mm. from the arm. It is provided with a removable *mechanical stage* which, when removed, leaves a large plain stage when the exposed bearings are covered with a metal strip provided for the purpose; no necessity for buying a separate plain stage. The buttons operating the mechanical stage are on concentric axes. The lateral excursion is 60 mm. and the to-and-fro excursion is 38 mm.

**The Complete Substage**, as described on page 7, is equipped with Abbe condenser No. 310 N. A. 140.

It is furnished with a beautiful mahogany cabinet.

### Advantageous Features

The best of workmanship and design at a moderate cost.

A fine adjustment which is sensitive, delicate, and without lost motion.

Plenty of room for handling large objects on the stage—90 mm. from arm to center of stage.

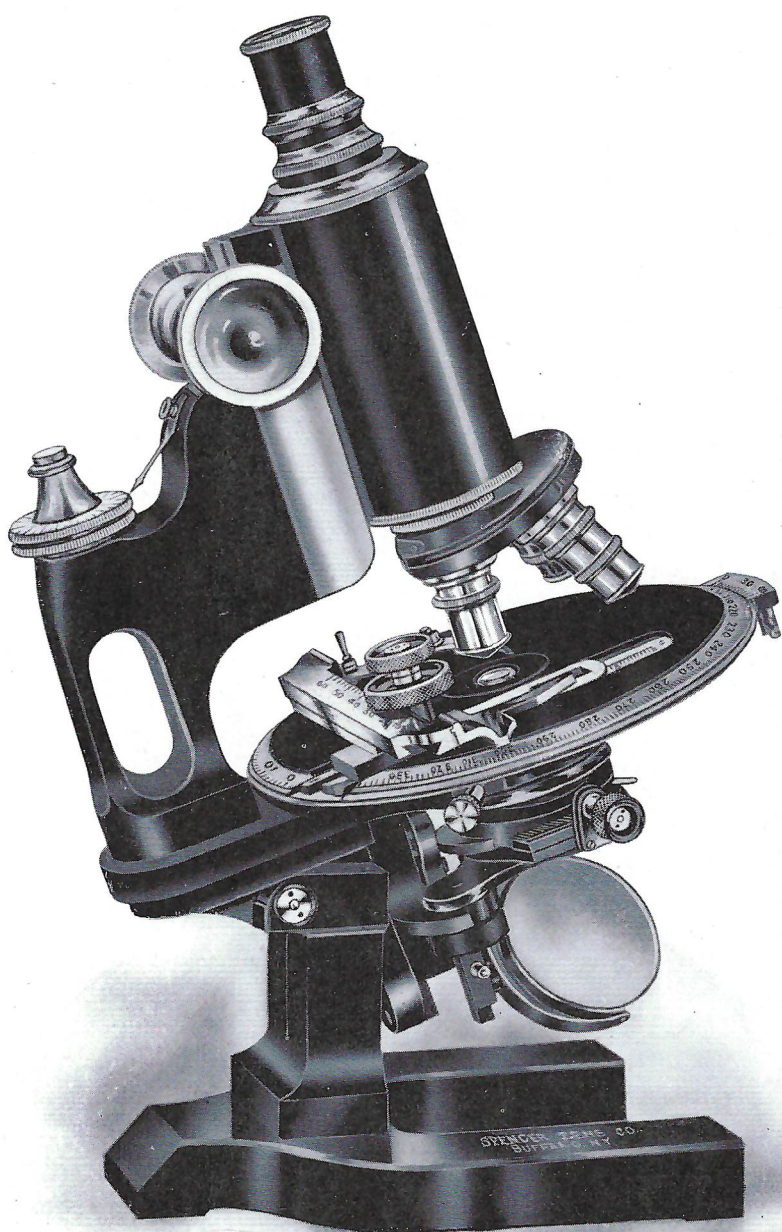
A combination of revolving mechanical and plain stage.

The stage may be substituted for the large stage on Nos. 5, 10 and 16, for \$10.00 additional.

The plain revolving stage, like that of No. 22, may be substituted at a reduction of \$20.00 from prices given below.

Tele-graphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Objectives Equiv. Foc. mm	Apochromatic Outfits		Achromatic Outfits	
					Com-pens. Oculars	Price	Huyghe-nian Oculars	Price
<b>Fiftena</b>	<b>15A</b>	N. A. 1.40	.....	16, 4	10x	<b>\$149.50</b>	10x	<b>\$110.00</b>
<b>Fiftenb</b>	<b>15B</b>	N. A. 1.40	Double	16, 4	10x	<b>153.50</b>	10x	<b>114.00</b>
<b>Fiftenc</b>	<b>15C</b>	N. A. 1.40	.....	16, 4	10x, 15x	<b>157.00</b>	6x, 10x	<b>111.50</b>
<b>Fiftend</b>	<b>15D</b>	N. A. 1.40	Double	16, 4	10x, 15x	<b>161.00</b>	6x, 10x	<b>115.50</b>
<b>Fiftenh</b>	<b>15H</b>	N. A. 1.40	Triple	16, 4, 1. 8 Oil-imm.	10x, 15x	<b>228.50</b>	6x, 10x	<b>140.00</b>

Prefix "Apo" to code word when wiring for apochromatic outfits.



Spencer Microscope No. 16

## Spencer Microscope No. 16

We offer this microscope for research and clinical work of the most exacting character—including photo-micrographic.

**The Body Tube** is extra large—50 mm. outside diameter, arranged to take large photo-micrographic objectives and compensating oculars with the large field lenses.

**The Arm** is large and heavy, of handle type, with a distance from optical axis of 80 mm. The fine adjustment is the standard lever type; each division of the graduated fine adjustment head representing 2.5 microns.

**The Stage** is revolving and is 150 mm. diameter. It can be clamped in any position, and centered by means of centering screws. When centered the two vernier readings only on the mechanical stage proper are necessary to locate an object, which eliminates the necessity of keeping a record of more vernier readings. The edge is graduated to degrees, and the vernier reads to three minutes.

**The Mechanical Stage** is so arranged that it may easily be removed from the revolving stage, thus leaving the plain stage and avoiding the necessity of having an extra stage. The buttons operating the rack-and-pinion movements of the mechanical stage are on *concentric axes*, one above the other; the most convenient position possible. The mechanical stage has a lateral excursion of 75 mm. and a to-and-fro excursion of 50 mm.

**The Substage** is our complete type, substantially and compactly built, raised and lowered by rack and pinion, and regularly equipped with Abbe condenser.

The instrument is *finished* in black alcohol and reagent proof lacquer, with just enough bright lacquer to give it a very handsome and rich appearance. The cabinet is of mahogany in natural polished finish, with handle and lock and key.

### Advantageous Features

Extra large black lacquered body tube.

Very large stage with long arm.

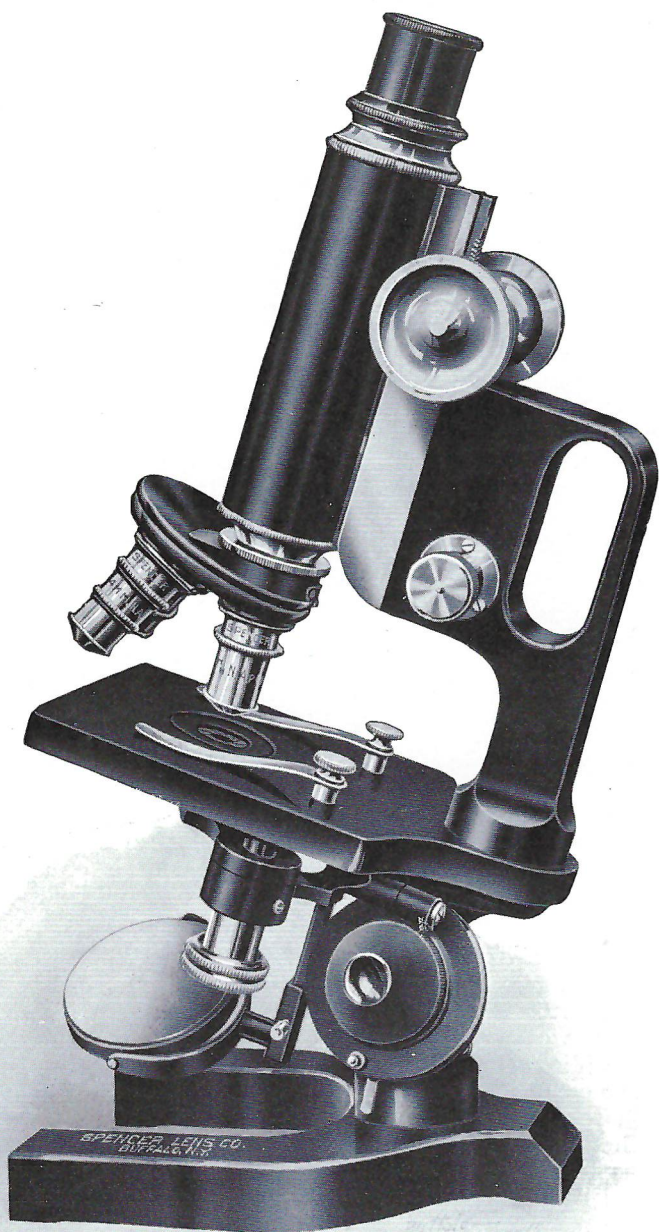
Complete rack-and-pinion substage.

Unique combination; plain and mechanical stage—two in one—avoiding necessity and inconvenience of extra stage.

The operating buttons of mechanical stage are on concentric axes in the most convenient possible position.

The mechanical stage revolves with the stage.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Objectives Equiv. Foc. mm.	Apochromatic Outfits		Achromatic Outfits	
					Compens. Oculars	Price	Huyghenian Oculars	Price
Sixtena	16A	N. A. 1.20	.....	16, 4	10x	<b>\$164.50</b>	10x	<b>\$125.00</b>
Sixtenb	16B	N. A. 1.20	Double	16, 4	10x	<b>168.50</b>	10x	<b>129.00</b>
Sixtenc	16C	N. A. 1.20	.....	16, 4	10x, 15x	<b>172.00</b>	6x, 10x	<b>126.50</b>
Sixtend	16D	N. A. 1.20	Double	16, 4	10x, 15x	<b>176.00</b>	6x, 10x	<b>130.50</b>
Sixtenh	16H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	10x, 15x	<b>243.50</b>	6x, 10x	<b>155.00</b>



Spencer Microscope No. 20

## Spencer Microscope No. 20

We offer this microscope for advanced laboratory research and clinical work of the most exacting character.

**The Body Tube** is our standard size—37 mm. in diameter, with Society thread, the draw tube taking standard size eyepieces. The graduated and numbered draw tube is adjustable in cloth-lined sleeve, or with metal fitting when so specified.

**The Arm** is of solid brass, with opening by which it can be handled without danger to the sensitive fine adjustment. This fine adjustment is our latest improved side adjustment which has proven so popular; one complete revolution of the threaded shaft moving the tube through .1 mm.; making it five times finer than the type A or C. This feature makes it not only advantageous for careful visual work but almost indispensable for photomicrographic work. The fine adjustment button is graduated to 100 parts; making each division represent 1 micron of movement. The distance from the optical axis to the arm is 68 mm.

**The Stage** is of brass, covered, top and edges, with a heavy sheet of genuine vulcanite rubber vulcanized directly to the stage plate. The size of the stage is 110 mm. by 95 mm. (or 112 mm. broad if desired).

**The Substage** is the quick screw form, as described on pages 5 and 6. By this simple movement, the condenser drops from the optical axis and swings on an arm to a position entirely out of the way, as shown in the cut. The mirror (55 mm. in diameter) is mounted on an adjustable mirror bar.

The instrument is finished in black, with the smaller parts in yellow. *Both of these finishes are alcohol and reagent proof.*

The handsome mahogany cabinet accompanies each instrument.

### Advantageous Features

Black lacquered body tube, avoiding reflection of light into the eyes.

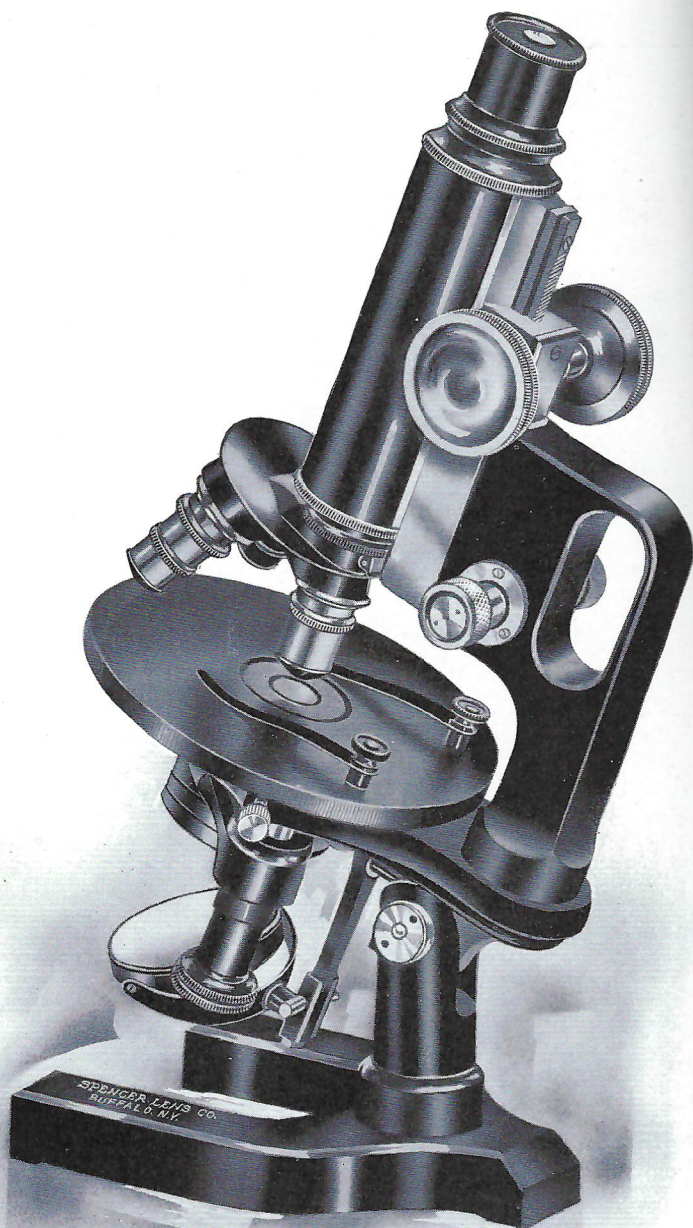
Drop-swing condenser mounting, permitting the condenser to be swung entirely out of the way.

Fine adjustment bearings automatically lubricated.

Fine adjustment ceases to work when objective comes in contact with the cover glass.

Upper iris diaphragm automatically locked when Abbe condenser is in place.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
<b>Twena</b>	<b>20A</b>	N. A. 1.20	.....	16, 4	10x	<b>\$54.00</b>
<b>Twenb</b>	<b>20B</b>	N. A. 1.20	Double	16, 4	10x	<b>58.00</b>
<b>Twenc</b>	<b>20C</b>	N. A. 1.20	.....	16, 4	6x, 10x	<b>55.50</b>
<b>Twend</b>	<b>20D</b>	N. A. 1.20	Double	16, 4	6x, 10x	<b>59.50</b>
<b>Twenh</b>	<b>20H</b>	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	<b>85.00</b>



Spencer Microscope No. 22

## Spencer Microscope No. 22

We offer this microscope for advanced laboratory research and clinical work of the most exacting character.

**The Body Tube** is of our standard size. The draw tube is adjustable in cloth-lined sleeve; or with metal fitting when so specified.

**The Arm** is of solid brass with the new side fine adjustment which is five times as fine as the other types. The distance from the base of arm to the optical axis is 68 mm.

**The Stage**, 120 mm. diameter, is of brass covered with a heavy sheet of genuine vulcanite rubber vulcanized directly to the stage plate. The edge is neatly milled.

**The Substage** is the quick-screw form and is fitted with drop-swing condenser mounting which enables the Abbe condenser to be thrown to one side, leaving in place the upper iris diaphragm which is automatically locked when the condenser is returned to its normal position. By this simple movement, the condenser drops from its position in the optical axis and swings entirely out of the way. The mirror is plane on one side and concave on the other, 50 mm. in diameter, mounted on adjustable bar.

**Finish**:—it is finished in alcohol-proof black lacquer, trimmed with yellow also alcohol-proof.

The cabinet is of handsome mahogany in natural polished finish, with handle, lock and key.

### Advantageous Features

Black lacquered body tube, avoiding reflection of light into the eyes.

Extra large circular revolving stage, with very long distance from optical axis to base of the arm, affording unusual capacity.

Drop-swing condenser mounting, permitting the condenser to be swung entirely out of the way.

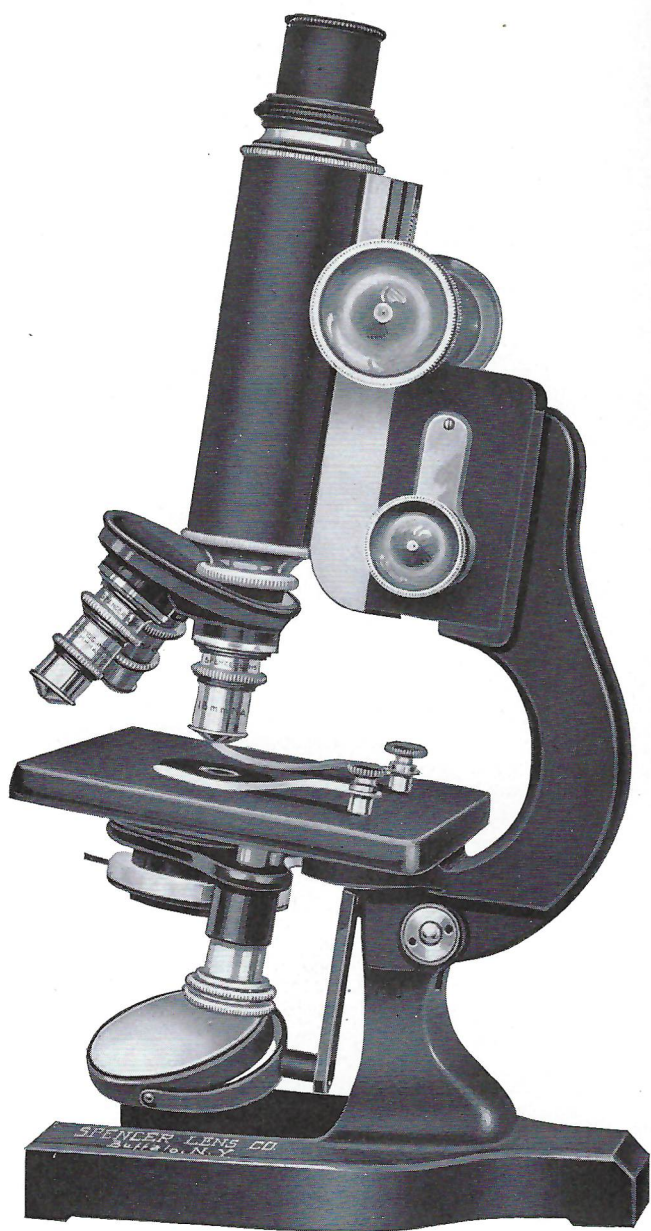
Fine adjustment bearings automatically lubricated.

Fine adjustment ceases to work when objective comes in contact with the cover glass.

Upper iris diaphragm automatically locked when Abbe condenser is in place.

This microscope can be equipped with a mechanical stage like that on Nos. 15 and 35 at an additional cost of \$20.00.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Objectives Equiv. Foc. mm.	Apochromatic Outfits		Achromatic Outfits	
					Compens. Oculars	Price	Huyghenian Oculars	Price
Twentoa	22A	N. A. 1.20	.....	16, 4	10x	\$103.50	10x	\$64.00
Twentob	22B	N. A. 1.20	Double	16, 4	10x	107.50	10x	68.00
Twentoc	22C	N. A. 1.20	.....	16, 4	10x, 15x	111.00	6x, 10x	65.50
Twentod	22D	N. A. 1.20	Double	16, 4	10x, 15x	115.00	6x, 10x	69.50
Twentoh	22H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	10x, 15x	183.00	6x, 10x	95.00



New Spencer Microscope No. 25

## New Spencer Microscope No. 25

The continually growing demand, during the past ten years, for our side fine adjustment has induced us to combine it with the newer type of arm which is also growing greatly in favor.

**The Arm** is strong and graceful; making a convenient means for carrying the instrument and providing plenty of room for work on the stage; the distance from the optical axis to the arm being 80 mm. The arm contains the Spencer side fine adjustment. It is a simple bell crank lever, the long arm of which is actuated by a nut running on the threaded shaft. The shorter arm, which is one fifth as long as the longer one, raises the body tube directly vertically. The pressure downward on the short arm is converted to a lateral pressure at the end of the long arm; which pressure is continuously transmitted in one direction only, through the nut and thread to the operator's hand. Any possible wear is thus automatically taken up. Each division of the 100 on the graduated button represents a movement of 1 micron—fine enough for very critical work and not so slow as to be tardy in response. It is very sensitive in response.

**The Rectangular Stage** is vulcanite covered, and is 112 mm. broad by 108 mm. the other dimension.

**The Substage** is the quick screw type described on pages 5 and 6, with the upper iris locked open, no matter how the condenser may be placed in the substage ring.

The instrument is beautifully finished in alcohol-proof black and yellow, and is furnished in a handsome mahogany case.

### Advantageous Features

Low, compact construction, with large stage—80 mm. from axis to arm.

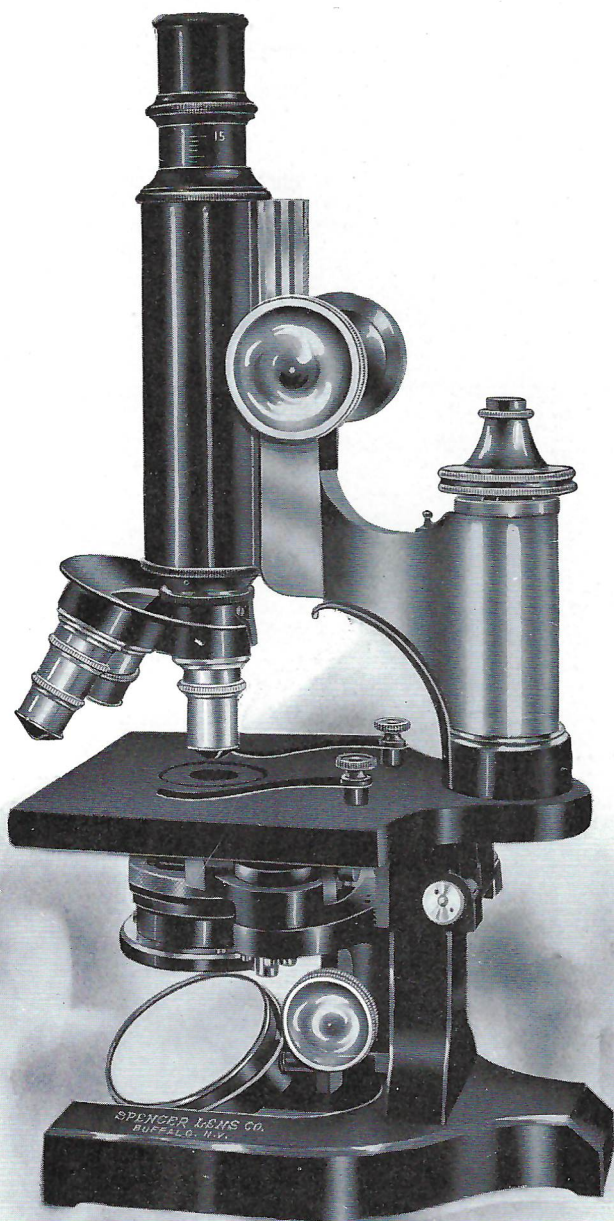
Upper iris automatically locked open when condenser is in place.

Fine adjustment ceases to work when objective rests on the cover glass.

Fine adjustment buttons conveniently located on *both* sides of the instrument.

Simple construction in fine adjustment, which responds promptly with no lost motion or lateral displacement, and which automatically takes up for any possible wear.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Twenfia	25A	.....	.....	16, 4	10x	\$34.00
Twenfib	25B	.....	Double	16, 4	10x	38.00
Twenfic	25C	.....	.....	16, 4	6x, 10x	35.50
Twenfid	25D	.....	Double	16, 4	6x, 10x	39.50
Twenfie	25E	N. A. 1.20	Double	16, 4	10x	44.50
Twenfif	25F	N. A. 1.20	Double	16, 4	6x, 10x	46.00
TwenfiH	25H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	67.50



Spencer Microscope No. 30

## Spencer Microscope No. 30

We offer this microscope for research and clinical work of the most exacting character.

**The Body Tube** is of our standard size, 37 mm. outside, with Society thread; the graduated draw tube taking standard size eyepieces, and adjustable in cloth-lined sleeve; or with metal fitting when so specified.

**The Arm** containing the sensitive prism type of fine adjustment, which is operated by a graduated micrometer screw, provides a free distance of 67 mm. from it to the optical axis. Beneath it, independent of it and following the curve of its lower edge is a neat unobtrusive handle which provides a means for carrying the instrument safely without injury to the fine adjustment. This feature is to be found only on Spencer microscopes.

**The Stage** is of brass, covered, top and edges with a heavy sheet of genuine rubber vulcanized directly to the stage plate. Size of stage, 110 mm. x 95 mm. (or 112 mm. if preferred).

**The Substage** is the complete rack-and-pinion type, as described on page 7. The Abbe condenser automatically locks the upper iris open when it is in place and also swings to a position entirely out of the way when not in use.

The instrument is beautifully finished in black and yellow lacquer, both of which are *alcohol-proof*.

The cabinet is mahogany, natural finish and polished.

### Advantageous Features

Extra large stage, with long distance from optical axis to base of arm, affording unusual capacity.

Complete rack-and-pinion substage with drop-swing condenser mounting.

Handle beneath arm for safety in handling.

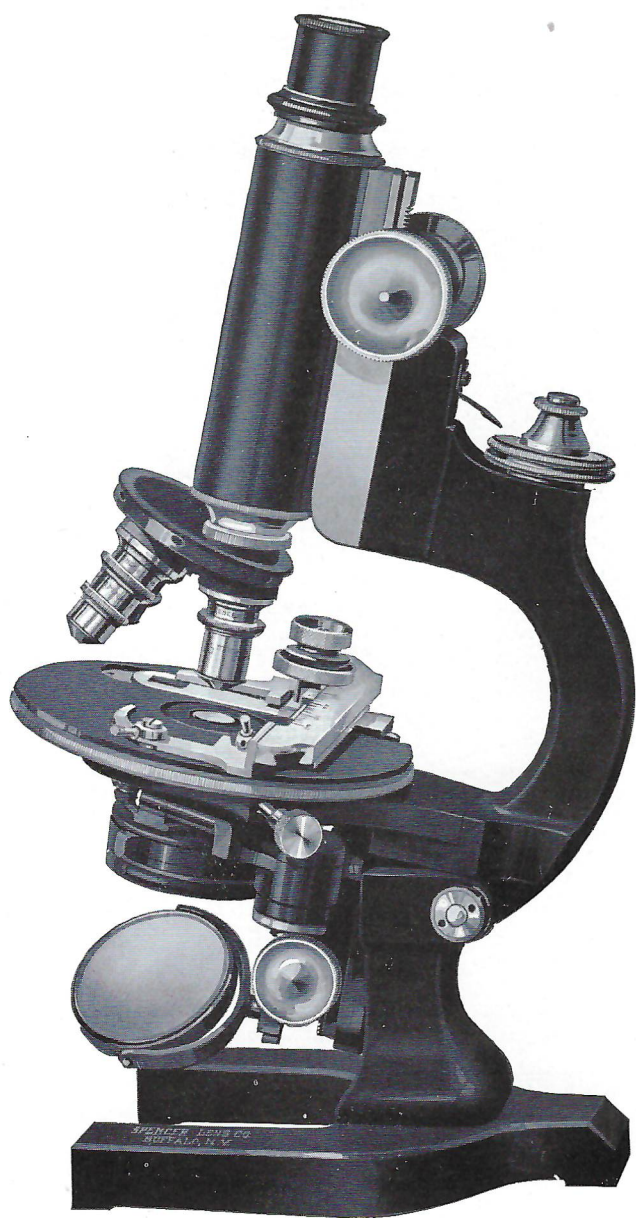
Fine adjustment bearings automatically lubricated.

Fine adjustment ceases to work when objective comes in contact with the cover glass.

Upper iris diaphragm automatically locked when Abbe condenser is in place.

Our standard superior optics, scientifically corrected for the most critical work; objective lenses mounted directly into the metal mount.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huygenian Oculars	Price
<b>Thira</b>	<b>30A</b>	N. A. 1.20	.....	16, 4	10x	<b>\$ 79.00</b>
<b>Thirb</b>	<b>30B</b>	N. A. 1.20	Double	16, 4	10x	<b>83.00</b>
<b>Thirc</b>	<b>30C</b>	N. A. 1.20	.....	16, 4	6x, 10x	<b>80.50</b>
<b>Third</b>	<b>30D</b>	N. A. 1.20	Double	16, 4	6x, 10x	<b>84.50</b>
<b>Thirh</b>	<b>30H</b>	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	<b>110.00</b>



New Spencer Microscope No. 35

## New Spencer Microscope No. 35

This new microscope is like No. 15, with the exception that the side fine adjustment is replaced by a straight lever adjustment of type C; bringing the graduated button to a convenient position at the top of the arm.

**The Body Tube** is the Spencer standard with Society screw, and taking the standard eyepieces in the graduated draw tube.

**The Arm** is large and graceful; making a convenient grasp for the whole hand and providing a free arm-to-axis distance of 90 mm. The threads of the fine adjustment are cut two to the mm. Each of the 100 divisions of the graduated head represents a movement of 5 microns when the lever is fulcrummed in the middle, as it is usually sent out. This may be reduced to  $2\frac{1}{2}$  microns at no extra cost by making a 2:1 lever in place of the regular one. This type of adjustment has proven to be extremely satisfactory.

**The Revolving Stage** is 120 mm. in diameter and is provided with centering screws. The removable mechanical stage with the buttons on *concentric axes* is the most convenient, compact and efficient revolving mechanical stage yet produced. The fact that the whole stage can almost instantly be removed (leaving a large, clear stage), is a point of great value, for it not only saves the expense of an extra stage but the inconvenience as well. The range of this mechanical stage is 60 mm. lateral movement and 38 mm. to-and-fro movement.

**The Complete Rack-and-Pinion Substage**, as described on page 7, is equipped with Abbe condenser No. 310 N. A. 140. This condenser is mounted on the drop-swing mounting.

The instrument is finished in alcohol-proof black and yellow lacquer (making a handsome appearance), and is furnished in a beautiful mahogany cabinet.

### Advantageous Features

The large arm with the 90 mm. arm-to-axis distance.

A sensitive fine adjustment with no lost motion.

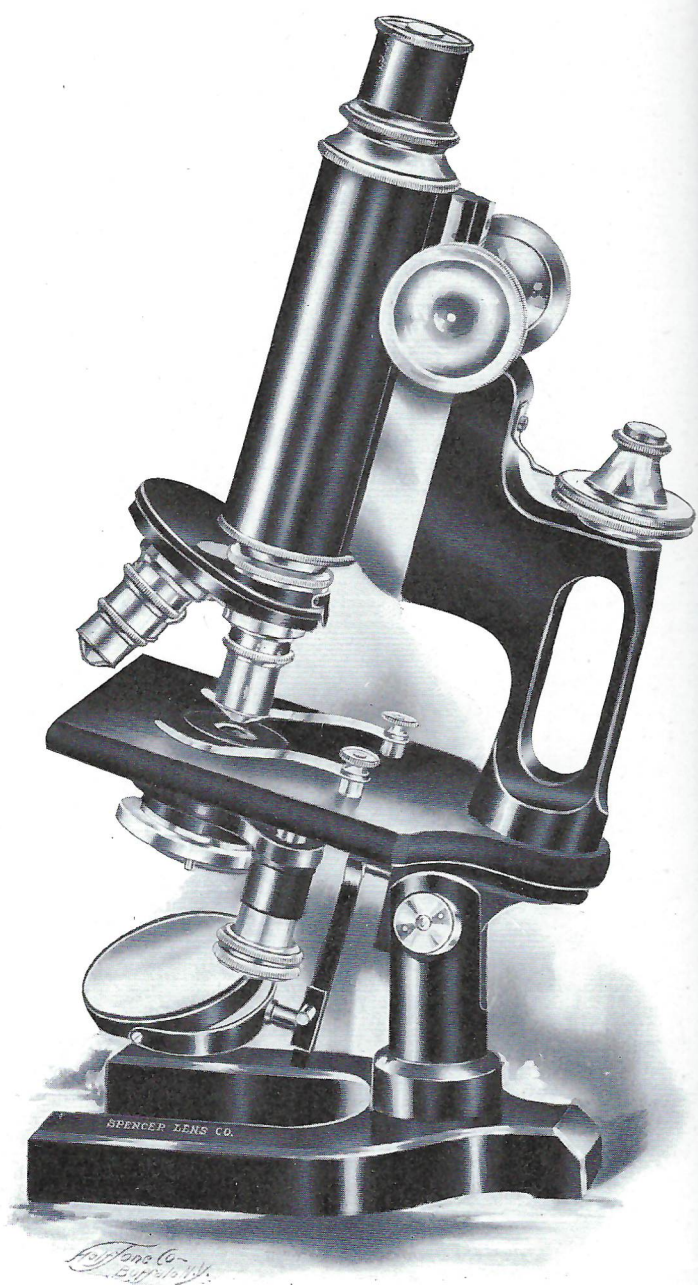
A convenient and compact combination of revolving mechanical stage and plain stage.

A beautifully finished and beautifully designed instrument.

The large stage, like that on Nos. 5, 10 and 16, may be substituted for regular stage at an additional price of \$10.00.

A plain revolving stage, like that on No. 22, may be substituted at a reduction of \$20.00 from prices given below.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Objectives Equiv. Foc. mm.	Apochromatic Outfits		Achromatic Outfits	
					Compens. Oculars	Price	Huyghenian Oculars	Price
Thirfia	35A	N. A. 1.40	.....	16, 4	10x	\$139.50	10x	\$100.00
Thirfib	35B	N. A. 1.40	Double	16, 4	10x	143.50	10x	104.00
Thirfic	35C	N. A. 1.40	.....	16, 4	10x, 15x	147.50	6x, 10x	101.50
Thirfid	35D	N. A. 1.40	Double	16, 4	10x, 15x	151.00	6x, 10x	105.50
Thirfih	35H	N. A. 1.40	Triple	16, 4, 1.8 Oil-imm.	10x, 15x	218.50	6x, 10x	130.00



Spencer Microscope No. 36

## Spencer Microscope No. 36

We offer this microscope for medical and advanced laboratory work.

**The Body Tube** is our standard size—with Society thread; the graduated draw tube taking the standard oculars.

**The Arm** is of handle type, with an arm-to-axis distance of 70 mm. The sensitive fine adjustment is of type C with graduated micrometer head.

**The Stage** is of brass, covered, top and edges, with a heavy sheet of genuine vulcanite rubber vulcanized directly to the stage plate. The stage is 95 mm. wide; or 112 mm. if preferred.

**Substage** is our standard quick-screw form. There is a device for automatically locking upper iris, so arranged that condenser may be placed in ring in any position most suitable to operator.

The instrument is finished throughout in black, alcohol-proof lacquer, with the exception of the smaller parts which are finished in alcohol-proof yellow lacquer; giving it a very rich appearance.

The cabinet is of handsome mahogany in natural polished finish, with handle, lock and key.

### Advantageous Features

Black lacquered body tube; avoiding reflection of light into the eyes.

Extra large stage, with long distance from optical axis to base of arm, affording unusual capacity.

Low, compact construction (considerably lower than those of other makers), affording great ease and comfort in using.

Fine adjustment bearings automatically lubricated.

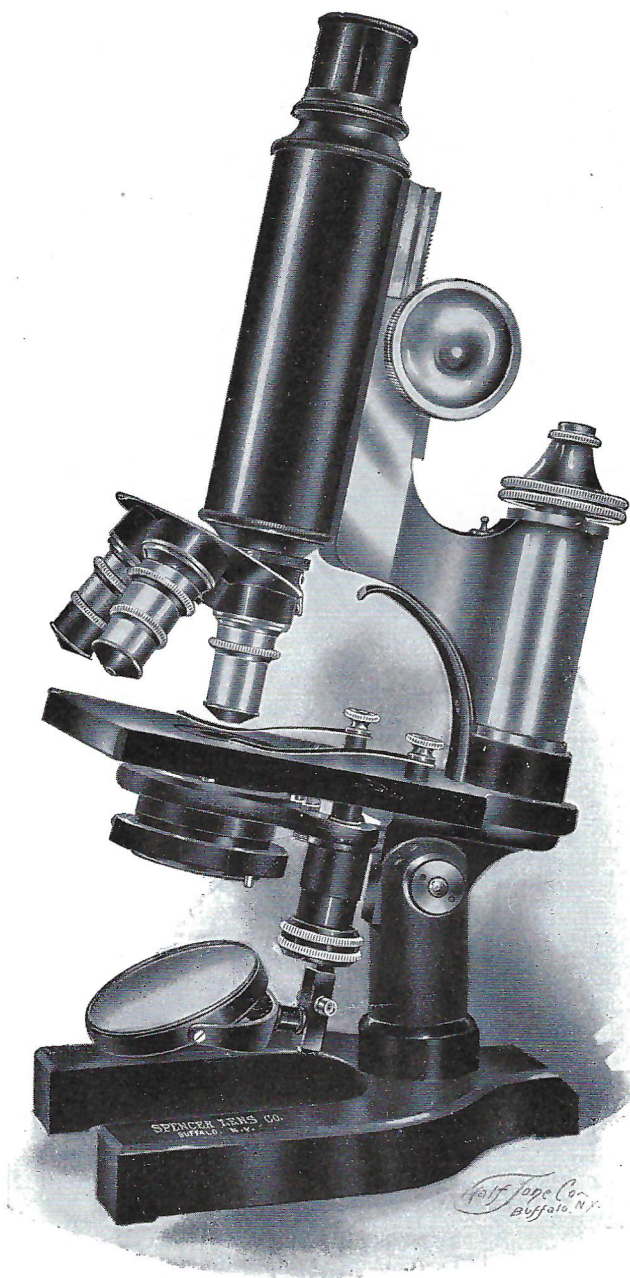
Fine adjustment ceases to work when objective comes in contact with the cover glass.

Upper iris diaphragm automatically locked when Abbe condenser is in place.

Our standard superior optics, scientifically corrected for the most critical work; objective lenses mounted directly into the metal mount.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Thirsia	36A	.....	.....	16, 4	10x	\$41.50
Thirsib	36B	.....	Double	16, 4	10x	45.50
Thirsic	36C	.....	.....	16, 4	6x, 10x	43.00
Thirsid	36D	.....	Double	16, 4	6x, 10x	47.00
Thirsie	36E	N. A. 1.20	Double	16, 4	10x	53.00
Thirsif	36F	N. A. 1.20	Double	16, 4	6x, 10x	54.50
Thirsih	36H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	80.00

For drop-swing condenser mounting, add \$5.00.



Spencer Microscope No. 40

## Spencer Microscope No. 40

We offer this microscope for medical and advanced laboratory work.

**The Body Tube** is of standard size—37 mm. outside, with Society thread; the draw tube taking standard eyepieces.

**The Arm**, made of brass with an arm-to-axis distance of 67 mm., is equipped with the sensitive type A fine adjustment described on page 8. Each division of the micrometer head represents a movement of five microns. This adjustment is protected by the neat handle also described on page 8. This feature is found on Spencer microscopes only.

**The Stage** is of brass, covered with a heavy sheet of genuine rubber vulcanized directly to the stage plate. Size of stage, 110 x 95 mm. (or 112 mm. if preferred).

**The Substage** is our standard quick-screw form, adjustable for focus with friction collar for condenser; the iris diaphragm in plane of the stage is automatically locked and so arranged that condenser may be placed in ring in any position. Whole substage may be lowered and swung out of optical axis when desired.

The instrument is beautifully finished in black and yellow, both of which are *alcohol-proof*, and is sent out in a handsome mahogany cabinet.

### Advantageous Features

Black lacquered body tube, avoiding reflection of light into the eyes.

Low, compact construction (considerably lower than those of other makers), affording great ease and comfort in using.

Handle beneath arm, for safety in handling.

Fine adjustment bearings automatically lubricated.

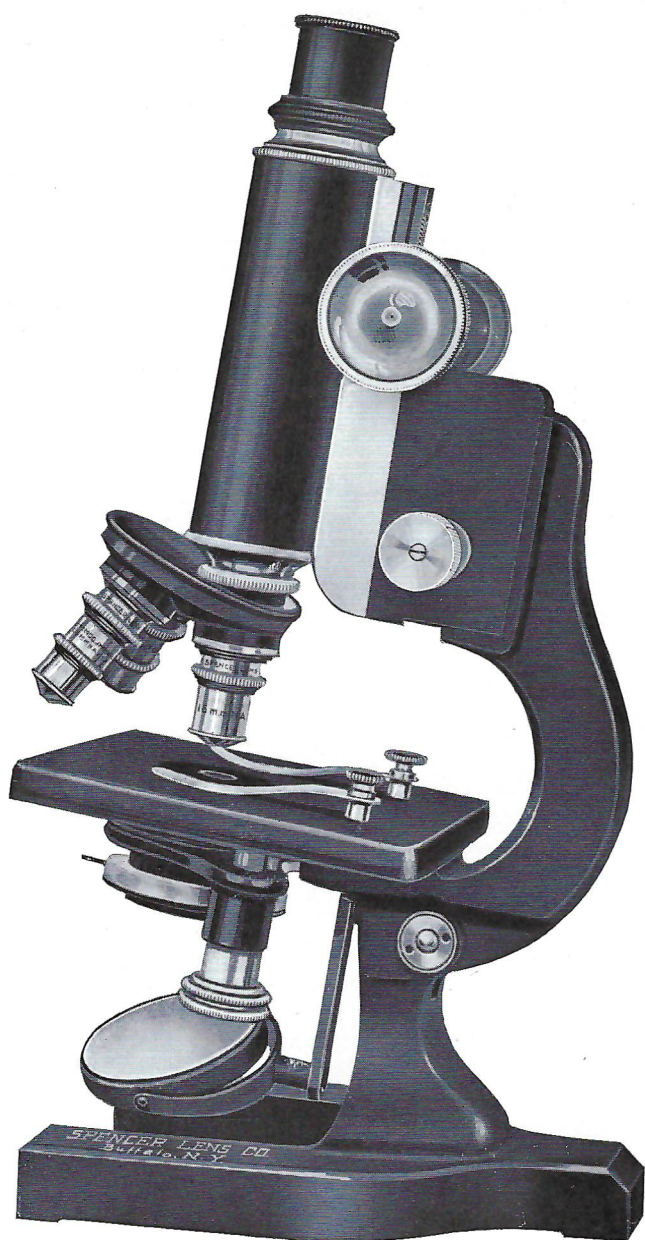
Fine adjustment ceases to work when objective comes in contact with the cover glass.

Upper iris diaphragm automatically locked when Abbe condenser is in place.

Our standard superior optics, scientifically corrected for the most critical work; objective lenses mounted directly into the metal mount.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Fora	40A	.....	.....	16, 4	10x	\$41.50
Forb	40B	.....	Double	16, 4	10x	45.50
Fore	40C	.....	.....	16, 4	6x, 10x	43.00
Ford	40D	.....	Double	16, 4	6x, 10x	47.00
Fore	40E	N. A. 1.20	Double	16, 4	10x	53.00
Forf	40F	N. A. 1.20	Double	16, 4	6x, 10x	54.50
Forh	40H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	80.00

For drop-swing condenser mounting, add \$5.00.



Spencer Microscope No. 44

## New Spencer Microscope No. 44

This microscope represents a new, efficient and comparatively inexpensive type of side fine adjustment.

**The Arm** is large; making a convenient grasp for handling the instrument and providing a distance of 80 mm. from it to the optical axis. The fine adjustment is a modification of type B, as described on page 9, in that the thread bearing shaft with buttons on *both* ends passes back and forth through the arm; carrying with it the free end of the longer arm of a bell crank lever, the shorter horizontal arm of which raises and lowers the body tube .2 mm. for each complete revolution of the shaft. The construction is exceedingly simple; nothing but the screw and lever. There are no inclined planes, balls or cams which introduce lateral thrust causing lateral displacement. Neither are there gears of any kind, the wearing of which is sure to cause lost motion. Any possible wear is automatically provided for, just as is the case with the straight lever. It is the simplest of its kind,—and the best.

**The Stage** is vulcanite covered, is 112 mm. wide and 108 mm. deep. It is provided with the regular *substage* of the quick-screw type, as described on page 6, the upper iris diaphragm is automatically locked open when the condenser is put into place, no matter how the condenser may be placed in the substage ring.

The microscope is finished in alcohol-proof black enamel and alcohol-proof yellow lacquer, the same as the other microscopes. It is furnished in a hardwood cabinet.

### Advantageous Features

A large, commodious stage.

The fine adjustment buttons are on *both* sides of the arm.

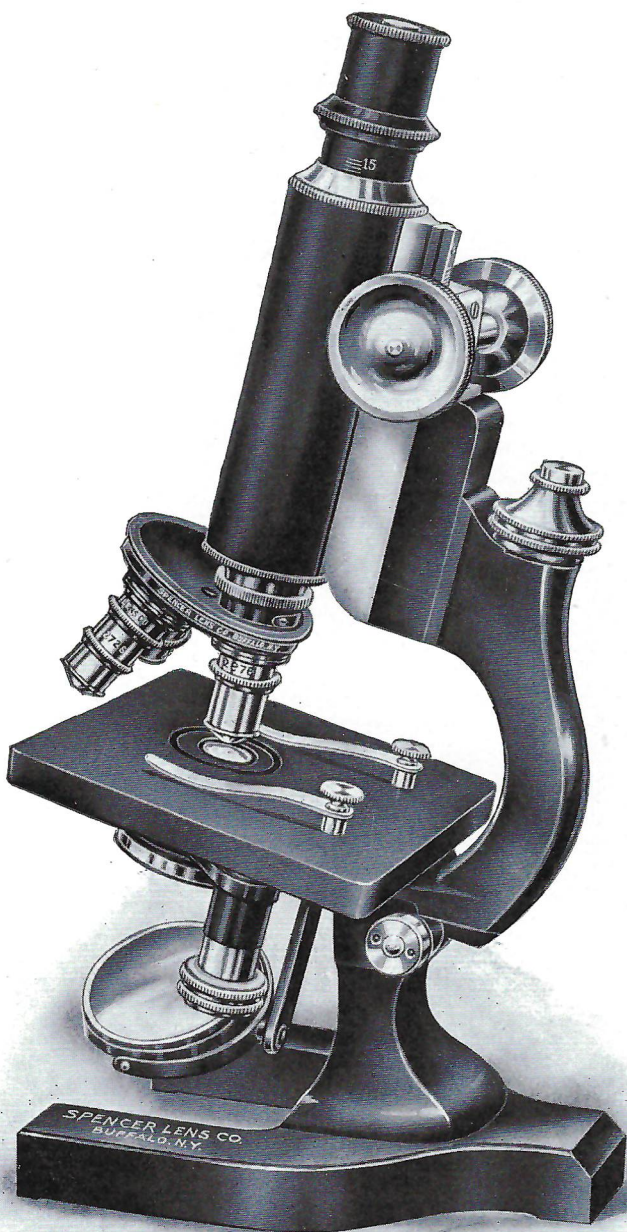
The fine adjustment is simple in construction—no lateral thrust.

The fine adjustment automatically takes up for wear—no lost motion.

The fine adjustment ceases to work when the objective rests on the cover glass.

A compact, graceful instrument, convenient in all its appointments.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Fortifora	44A	.....	.....	16, 4	10x	\$31.50
Fortiforb.	44B	.....	Double	16, 4	10x	35.50
Fortiforc	44C	.....	.....	16, 4	6x, 10x	33.00
Fortiford	44D	.....	Double	16, 4	6x, 10x	37.00
Fortifore	44E	N. A. 1.20	Double	16, 4	10x	41.00
Fortiforf	44F	N. A. 1.20	Double	16, 4	6x, 10x	42.50
Fortiforh	44H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	65.00



Spencer Microscope No. 45

## Spencer Microscope No. 45

We offer this microscope for medical and advanced laboratory work.

**The Body Tube** is our standard size—37 mm. outside diam. with Society thread; the draw tube taking standard eyepieces.

**The Arm** is of the handle type, which may be grasped with the whole hand, with a distance of 80 mm. from the optical axis, and with the accurate and sensitive fine adjustment type C, described on pages 9 and 10.

**The Stage** is of brass, covered with a heavy sheet of genuine vulcanite rubber vulcanized directly to the stage plate. Size of stage, 112 mm. x 108 mm.

**Substage** is our standard quick-screw form, adjustable for focus with friction collar for condenser; iris diaphragm in plane of the stage. There is a device for automatically locking upper iris, so arranged that condenser may be placed in ring in any position most suitable to operator. The whole substage may be lowered and swung out of optical axis when desired.

The microscope is finished in black and yellow, *both* of which are *alcohol* and *reagent proof*. It is sent out in a polished mahogany cabinet.

### Advantageous Features

Black lacquered body tube, avoiding reflection of light into the eyes.

Extra large stage, with very long distance from optical axis to base of arm, affording unusual capacity.

Handle-arm, which may be grasped with the whole hand.

Low, compact construction (considerably lower than those of other makers), affording great ease and comfort in using.

Fine adjustment bearings automatically lubricated.

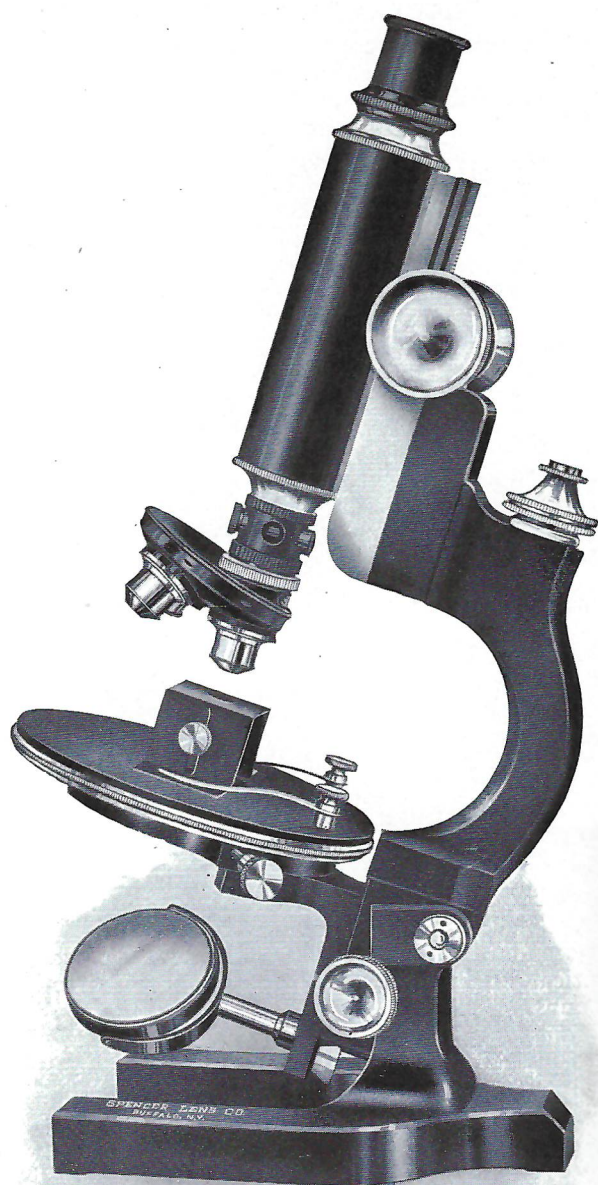
Fine adjustment ceases to work when objective comes in contact with the cover glass.

Upper iris diaphragm automatically locked when Abbe condenser is in place.

Our standard superior optics, scientifically corrected for the most critical work; objective lenses mounted directly into the metal mount.

Telegraphic Code	Catalogue No.	Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Forfivia	45A	.....	.....	16, 4	10x	\$31.50
Forfivib	45B	.....	Double	16, 4	10x	35.50
Forfivic	45C	.....	.....	16, 4	6x, 10x	33.00
Forfivid	45D	.....	Double	16, 4	6x, 10x	37.00
Forfivie	45E	N. A. 1.20	Double	16, 4	10x	41.00
Forfivif	45F	N. A. 1.20	Double	16, 4	6x, 10x	42.50
Forfivih	45H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	65.00

The drop-swing condenser mounting can be added for \$5.00 additional.



**Metallurgical Microscope No. 47**

## New Spencer Metallurgical Microscope No. 47

This microscope is especially constructed for metallurgical work, but can be used for biological purposes also.

**The Arm** is large and is of the new type which has proven so satisfactory. It may be easily grasped by the whole hand and provides an arm-to-axis distance of 85 mm. The lever type fine adjustment is sensitive and accurate; one complete revolution moving the tube .5 mm.

**The Stage** is exceptionally large, being 120 mm. in diameter. It is covered with vulcanite and is centered by centering screws. A disc closes the center opening of the stage when it is desired. When especially ordered, it is provided with a mechanical stage like that on No. 51. This is easily removable by simply slipping it from its bearings; thereby leaving a plain stage. The mechanical stage has a lateral excursion of 60 mm. and a to-and-fro excursion of 38 mm. The buttons operating the mechanical stage are on concentric axes very conveniently located.

The revolving stage may be racked up and down through a range of 45 mm., and if necessary to accommodate a large object may be racked off entirely. Metals are conveniently held, polished side upwards, in the small frame which is held on the stage by the stage clips.

Vertical Illuminator No. 350 or No. 355 may be used. As a source of illumination we recommend Lamps Nos. 360, 370, 375, or 383.

**The Substage** consists of a simple substage ring for holding an Abbe condenser or polarizer when transparent work is desired. The standard mirror is furnished on a swinging mirror bar.

The objectives (of any power) are especially mounted for the purpose. They are the same price as the regular mounts. They are suited, also, to ordinary work.

The instrument is beautifully finished in black and yellow alcohol-proof finish, and is put up in a beautiful mahogany cabinet.

### Advantageous Features

A large instrument for large objects.

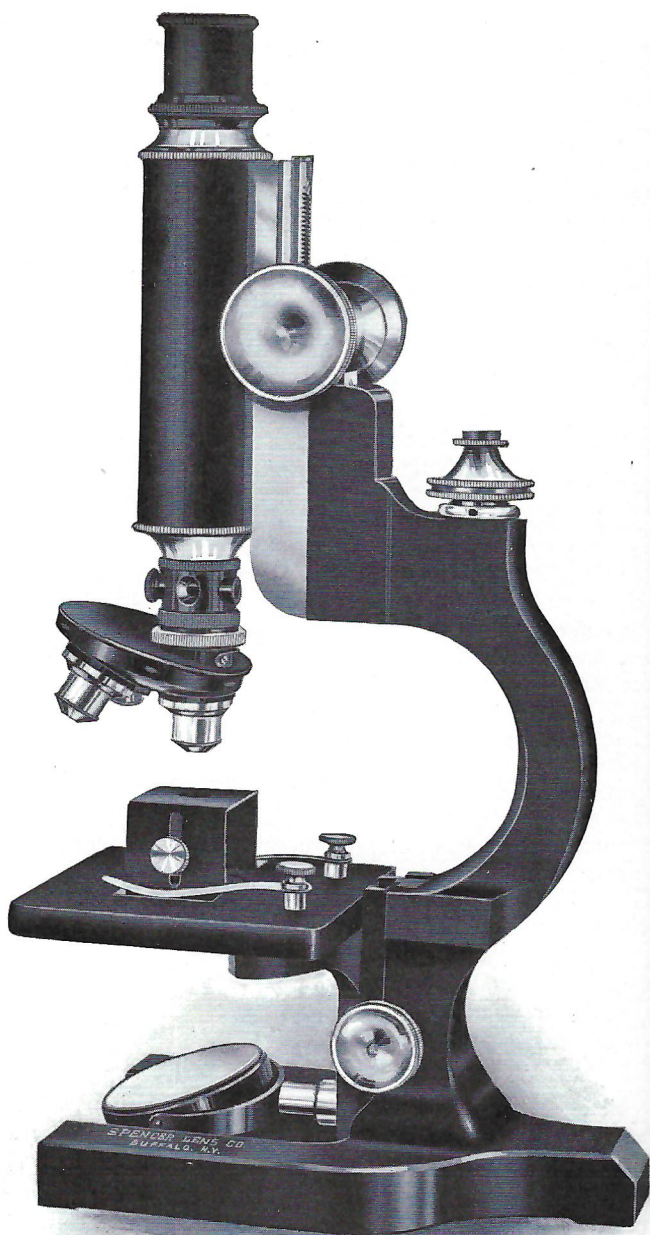
A large, revolving stage with which a detachable mechanical stage may be furnished for \$20.00 extra.

The whole stage may be removed from the microscope.

The instrument may be used for transparent purposes as well.

The vertical illuminator accompanies the instrument at prices given below.

Telegraphic Code	Catalogue No.	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Forsevea	47A	.....	16, 4	10x	\$88.00
Forseveb	47B	Double	16, 4	10x	92.00
Forsevec	47C	.....	16, 4	6x, 10x	89.50
Forseved	47D	Double	16, 4	6x, 10x	93.50
Forsevek	47K	Triple	32, 16, 4	6x, 10x	98.00



Metallurgical Microscope No. 49

## New Spencer Metallurgical Microscope No. 49

This microscope is offered to meet the demand for an inexpensive microscope for metallurgical purposes.

**The Arm** and pillar are one solid casting; the arm being of the new type; making a convenient means for carrying the instrument and also giving a distance of 85 mm. from the arm to the center of the stage. The fine adjustment is the lever type, very sensitive and accurate; one complete revolution moving the tube .5 mm.

**The Stage** is 100 mm. broad by 92 mm. deep. The center opening is covered by a removable disc. It may be racked up and down through a distance of 45 mm., and may be entirely removed to allow placing under the objective an object larger than could be accommodated otherwise. The small frame, by which metals may be held with the polished side upwards, accompany this instrument. The No. 485 mechanical stage may be used on the rectangular stage. A circular revolving stage, 90 mm. in diameter like that of No. 53, may be substituted for \$10.00 extra.

Either No. 350 or No. 355 vertical illuminator may be used. A choice is included in prices given below. Some illuminant, like Nos. 360, 370, 375 or 383, should be used with the vertical illuminator. A mirror accompanies the microscope, as does also a simple substage ring for holding a condenser or polarizer for transparent observations. If neither the mirror nor the ring are desired, deduct \$2.00 from prices given. The instrument is beautifully finished and sent out in a polished hardwood cabinet.

### Advantageous Features

A solid, compact instrument.

The stage may be removed entirely.

The stage may be exchanged for a circular stage.

The instrument may be used for both opaque and transparent work.

The prices include vertical illuminator. Be sure to state which is desired.

Telegraphic Code	Catalogue No.	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Fornina	49A	.....	16, 4	10x	\$70.00
Forninab	49B	Double	16, 4	10x	74.00
Forninac	49C	.....	16, 4	6x, 10x	71.50
Forninad	49D	Double	16, 4	6x, 10x	75.50
Forninak	49K	Triple	32, 16, 4	6x, 10x	80.00



Spencer Metallurgical Microscope No. 51

## New Spencer Metallurgical Microscope No. 51

This instrument is a combination monocular and binocular microscope.

**The Arm** which provides an arm-to-axis distance of 85 mm. is so arranged that either body tube, with its accompanying adjustments, may be used interchangeably. The one tube may be lifted off from the arm and replaced by the other by simply loosening and tightening a small knurled screw at the back of the arm. The monocular tube with its vertical illuminator is the same as is used on metallurgical stand Nos. 47 and 49. The coarse adjustment is the same. The fine adjustment, however, is the side fine adjustment type which is very accurate, durable and responsive; being much finer than the other type. The binocular body is the same as that used on Nos. 54, 55 and 56. Either tube may be used on the small base where the object is so large that the microscope must be brought to it. The illustration shows the monocular tube on this base.

**The Revolving Stage** is 120 mm. in diameter, with a detachable mechanical stage which is easily removable when a plain stage is desired. A plain revolving stage without the mechanical stage or the possibilities of it may be substituted at a price \$20.00 less than those given below. The whole stage may be removed entirely. The metal frame accompanies this instrument the same as Nos. 47 and 49. Lamps Nos. 360, 370, 375 or 383 should be used with this instrument.

**The Substage** consists of a simple ring for condenser or polarizer. A mirror is also furnished on a swinging mirror bar; thereby making it suitable for ordinary biological work and some petrographical work, either as a high power monocular or a low power binocular. It is sent out complete with both body tubes with their adjustments, vertical illuminator and the small base in a beautiful mahogany case.

### Advantageous Features

A complete monocular metallurgical microscope.

A complete binocular metallurgical microscope.

A monocular microscope for ordinary transparent work.

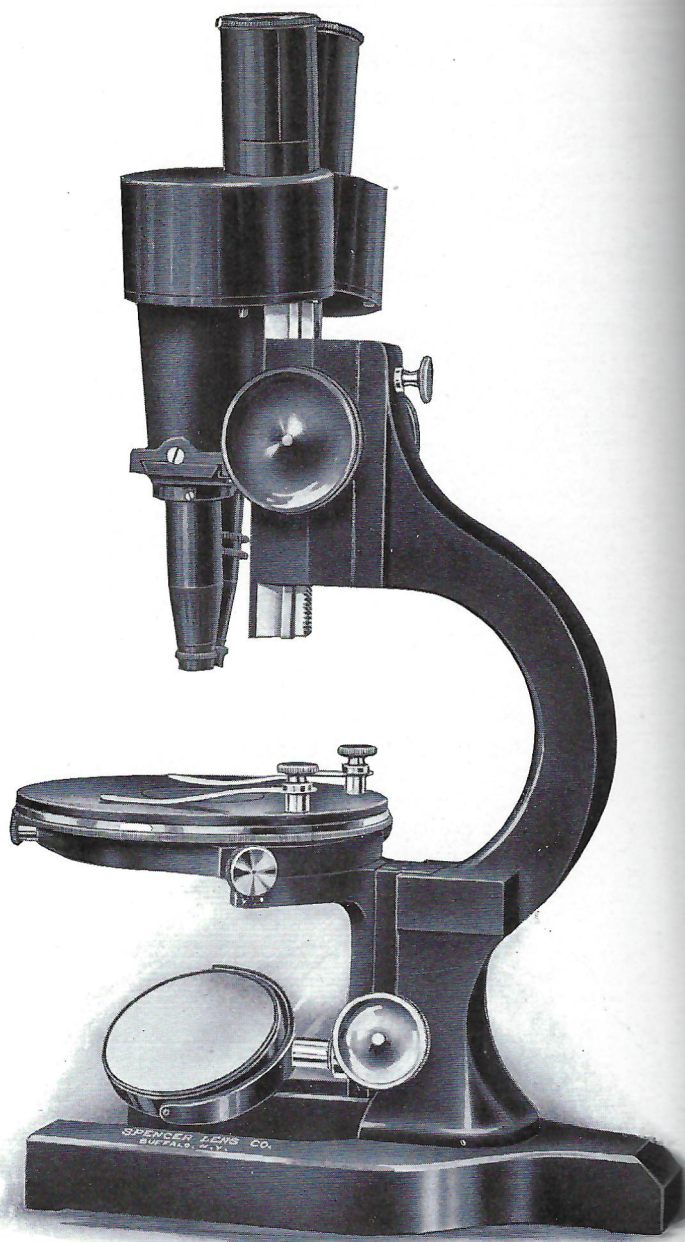
A binocular microscope for any kind of work.

Either tube may be used on a small base for very large objects.

A large detachable revolving mechanical stage.

Telegraphic Code	Catalogue No.	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Paired Achromatic Objectives Equiv. Foc. mm.	Faired Huyghenian Oculars	Price
<b>Fiftiona</b>	<b>51A</b>	.....	16, 4	40	10x	<b>\$161.00</b>
<b>Fiftionab</b>	<b>51B</b>	Double	16, 4	48, 32	6x, 10x	<b>180.00</b>
<b>Fiftionac</b>	<b>51C</b>	.....	16, 4	48, 32, 25	4x, 6x, 10x	<b>191.00</b>
<b>Fiftionad</b>	<b>51D</b>	Double	16, 4	55, 48, 32, 25	4x, 6x, 10x	<b>207.00</b>
<b>Fiftionak</b>	<b>51K</b>	Triple	32, 16, 4	55, 48, 32, 25	4x, 6x, 10x	<b>213.00</b>

The paired objectives are \$12.00 per pair, and the paired eye-pieces are \$3.00 per pair.



Metallurgical Microscope No. 53

## New Spencer Binocular Metallurgical Microscope No. 53

This instrument meets the demands for a simple binocular microscope stand, fitted for metallurgical work.

**The Arm** and pillar are one solid casting, gracefully formed to allow a free arm-to-axis distance of 85 mm. The block carrying the rack-and-pinion adjustment and the binocular tube is fastened to the arm by means of a knurled screw at the back of the arm. This block may be adjusted as to height on the arm to supplement the range of the rack and pinion; or it may be removed entirely to be placed on the smaller base which accompanies the instrument and which is useful in examining very large surfaces where the microscope must be brought to the object.

The prism cases on top of the tube rotate around the axes in a way to accommodate for variation of pupillary distance even down to 48 mm.

**The Stage**—circular and revolving—is 90 mm. in diameter. It may be racked up and down through a distance of 45 mm., or it may be removed entirely where large objects require it, or it may be substituted for a rectangular stage, like that on No. 49, at a reduction of \$10.00 from the prices quoted below. The center opening of the stage is covered with a removable disc. A metal frame for holding small polished pieces of metal, with the polished surface up, accompanies the instrument.

**The Substage** consists of a simple ring for holding a condenser or polarizer when ordered.

The 50 mm. mirror provides a means for doing transparent work also. Any of the electric lamps—Nos. 360, 370, 375 or 383—should accompany the microscope.

The microscope is put up in a polished hardwood cabinet.

### Advantageous Features

A compact, graceful instrument, with sufficient distance from the arm to the center of the stage.

The binocular body may be adjusted as to height to supplement the rack and pinion.

A simple means of changing the binocular body to a small stand.

A sufficient variation in pupillary distances.

A large stage—either rectangular or circular.

Telegraphic Code	Catalogue No.	Paired Objectives Equiv. Foc. mm.	Paired Huyghenian Oculars	Price
Fiftithrea	53A	40	10x	\$ 80.00
Fiftithreb	53B	48, 32	6x, 10x	95.00
Fiftithrec	53C	55, 40, 25	4x, 6x, 10x	110.00
Fiftithred	53D	55, 48, 32, 25	4x, 6x, 10x	122.00
Fiftithree	53E	55, 48, 40, 32, 25	4x, 6x, 10x	134.00

## New Spencer Binocular Microscope No. 54



**The Body Tube** of this new binocular microscope is a combination of two optically distinct tubes, so combined at an angle of 10 degrees each from the other that the objectives focus on the same point; thereby giving a magnified stereoscopic vision. Each tube is supplied with a set of prisms which erect the image so that dissections and other manipulations may be easily carried on.

The prism chambers at the top of the body revolve on axes, each coincident with that of its objective. The eyepieces are so situated, eccentric to these axes, that the centers of the eye lenses may be brought within a distance of 48 mm. of one another and may be separated to a distance of 105 mm. *This range is sufficient to accommodate the greatest possible variation in pupillary distance.*

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**The Arm** which admits of an arm-to-axis distance of 80 mm. is provided with a small knurled screw at the back, by the turning of which the binocular body, with its rack and pinion, may be removed entirely or adjusted as to height on the arm through 30 mm.; thus supplementing the rack and pinion and admitting of examining objects of considerable thickness or height.

**The Stage** is exceptionally large (110 mm. x 105 mm.). The 55 mm. opening is closed by a removable disc. Black and white backgrounds, either one of which can be used independently, are provided beneath the stage. They are out of sight and out of the way when not in use. Hand-rests accompany the instrument;—when removed, a mechanical stage, No. 485 or 490, can be attached.

A light, simple stand is supplied with each instrument. It is illustrated in the smaller cut with the microscope body attached. By it, the microscope may be brought to large objects which could not be examined otherwise.

Each pair of objectives is mounted and carefully centered on a block which slides into grooves at the lower end of the body. The lenses of one objective are adjustable as to focus, and compensate for any difference in the eyes of the operator.

### Advantageous Features

Accommodates the greatest possible variation in pupillary distances.

Easily and quickly changed from one stand to the other.

It will accommodate a mechanical stage.

The black and white backgrounds beneath the stage are always out of the way.

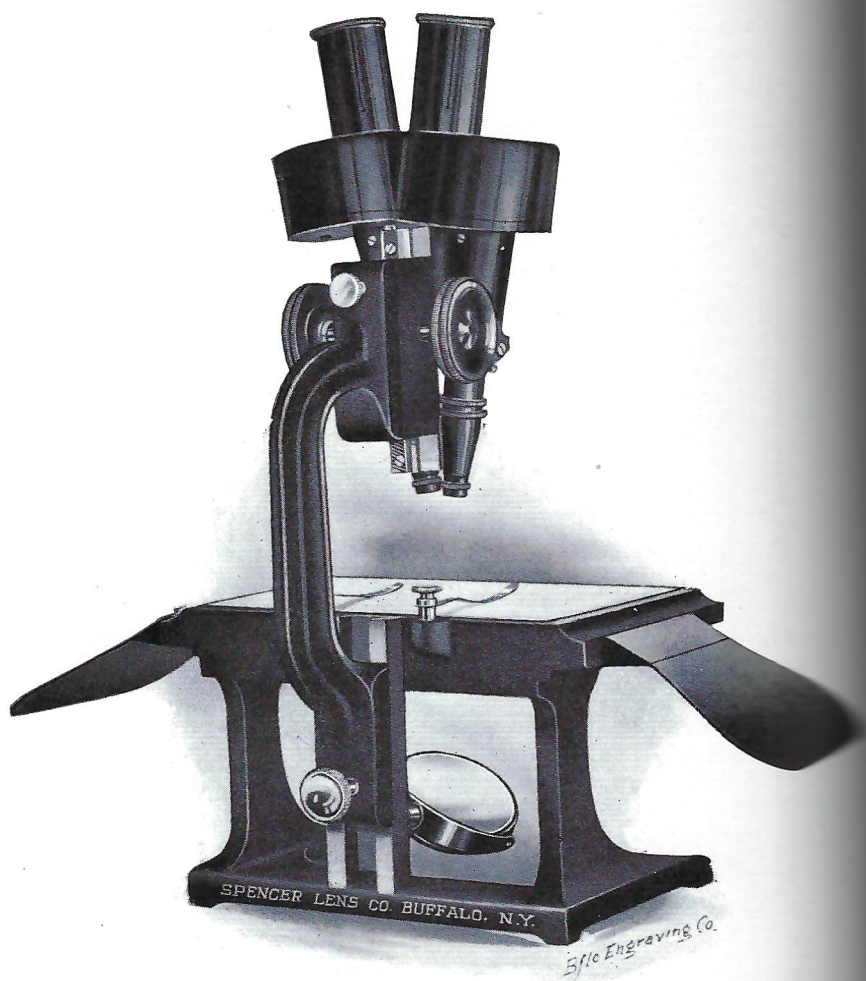
The unique arrangement for supplementing the rack-and-pinion adjustment. This feature will be especially appreciated by the entomologist who desires to examine specimens mounted on cork without removing them, and also by others who desire to examine specimens of considerable thickness or height.

Telegraphic Code	Catalogue No.	Paired Objectives Equiv. Foc. mm.	Paired Huyghenian Oculars	Price
<b>Fivfora</b>	<b>54A</b>	40	10x	<b>\$ 60.00</b>
<b>Fivforb</b>	<b>54B</b>	48, 32	6x, 10x	<b>75.00</b>
<b>Fivforc</b>	<b>54C</b>	55, 40, 25	4x, 6x, 10x	<b>90.00</b>
<b>Fivford</b>	<b>54D</b>	55, 48, 32, 25	4x, 6x, 10x	<b>102.00</b>
<b>Fivfore</b>	<b>54E</b>	55, 48, 40, 32, 25	4x, 6x, 10x	<b>114.00</b>

Large stand only, in case, \$9.00.

Small stand, \$2.00.

Binocular body with rack and pinion, no objectives or eye-pieces, \$34.00.



**New Spencer Binocular Microscope No. 55**

## New Spencer Binocular Microscope No. 55

This new and unique instrument has been produced in answer to a demand for a binocular microscope with a very large stage and also for a great range in the distance from the stage at which the objectives may be used.

**The Body Tube** is the binocular form identical with that of No. 54 and interchangeable with it.

**The Arm** is made of aluminum. The distance from the optical axis to the arm is 90 mm. It is adjustable up and down on the combination base and stage, through a distance of 50 mm., or may be removed entirely. As the binocular body is also adjustable on the top of the arm safely through 30 mm., there is a generous range; to say nothing of the rack-and-pinion movement. Thus, very large objects of some considerable height may be observed very comfortably.

**The Stage**—110 mm. x 150 mm.—and base are one (aluminum) casting. The combination is light, substantial and convenient. A plate glass—105 mm. x 146 mm.—is embedded into the metal framework, to form the stage. A black and white background, which slips under the glass stage, is furnished with each instrument.

Easily removable hand-rests accompany each instrument. A standard mirror swings at the end of a mirror bar beneath the stage. The whole instrument is light, capacious and convenient. It is handsomely finished, and sent out in a polished mahogany case.

### Advantageous Features

Convenient, light.

Its parts may be used on No. 56.

An exceptionally large stage.

Exceptional room between the arm and the optical axis.

An object may be examined in any plane from the level of the stage to 125 mm. above it.

A small base, like that of No. 54, accompanies each instrument.

Telegraphic Code	Catalogue No.	Paired Objectives Equiv. Foc. mm.	Paired Huyghenian Oculars	Price
<b>Fiftifiva</b>	<b>55A</b>	40	10x	<b>\$62.00</b>
<b>Fiftifivab</b>	<b>55B</b>	48, 32	6x, 10x	<b>77.00</b>
<b>Fiftifivac</b>	<b>55C</b>	55, 40, 25	4x, 6x, 10x	<b>92.00</b>
<b>Fiftifivad</b>	<b>55D</b>	55, 48, 32, 25	4x, 6x, 10x	<b>104.00</b>
<b>Fiftifivae</b>	<b>55E</b>	55, 48, 40, 32, 25	4x, 6x, 10x	<b>116.00</b>

Combination base and stage only, in mahogany case, \$10.00.

Arm only, \$2.00

Small base, like that of No. 54, \$2.00.

Binocular body with rack and pinion, no objectives or eye-pieces, \$34.00.

## Large Spencer Binocular Stand No. 56



This stand is constructed to provide a means for using the binocular microscope when necessary to examine different parts of an unusually large object. The body tube is the regular binocular body, like that on Nos. 54 and 55. It is interchangeable, so that the same body may be used on either of the other stands.

**The Base** of No. 56 is a metal framework into which is embedded a heavy white "opal" glass plate—260 mm. by 310 mm. This base supplies a convenient table on which to work with large objects, as well as a base for the upright which supports the horizontal arm (275 mm. long), at the end of which arm is hinged a short arm, carrying the binocular body.

The upright support is 250 mm. high. By turning the wheel at the top, the horizontal arm may be easily raised and lowered through a distance of 150 mm. on a quick-acting screw enclosed within the hollow support. The binocular may be brought low enough to examine anything on the base, or raised high enough to examine anything on an extra base, as indicated in the illustration. The screw turns easily, and the arm stays at the height when

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is left. The horizontal arm is free to slide back and forth through a sleeve which in turn is free to revolve around the perpendicular support. These movements, together with the hinged arm supporting the binocular, admit of easily and quickly bringing the objectives over any part of the large base; at the same time always keeping the oculars in a normal comfortable position, just as they are used on Nos. 54 and 55. All of these joints may be securely clamped; holding the binocular body in any desired location.

The illustration shows No. 56 stand with the binocular body attached; also with the combination base and stage of No. 55, as both would be used with transparent objects. The arm of No. 55 is shown lying by the side of the base. The whole is finished in alcohol-proof black and nickel, and is sent out in a dull finished mission case.

## Advantageous Features

A large, substantial base, upon which a dissection may be carried on under the binocular.

An easy and convenient means for raising and lowering the horizontal arm through a long range.

No danger but that the arm will stay where it is put.

A most convenient means for bringing the binocular body over any portion of the stage.

All parts may be rigidly clamped in any position.

The oculars are always in a convenient position for the worker.

Having either of the smaller binocular microscopes, it is not necessary to buy a special binocular body for this stand. All parts are interchangeable.

Telegraphic Code	Catalogue No.	Paired Objectives Equiv. Foc. mm.	Paired Huyghenian Oculars	Price
Fiftisixa	56A	40	10x	\$ 75.00
Fiftisixab	56B	48, 32	6x, 10x	90.00
Fiftisixac	56C	55, 40, 25	4x, 6x, 10x	105.00
Fiftisixad	56D	55, 48, 32, 25	4x, 6x, 10x	117.00
Fiftisixae	56E	55, 48, 40, 32, 25	4x, 6x, 10x	129.00

The prices given above do *not* include any of the parts of No. 55. No. 56 Stand only, without binocular body, \$26.00. Binocular body, \$34.00.

## Binocular Microscopes Table of Magnification

	4x	5x	6x	8x	10x	12x	15x	20x
55 mm. ....	8	10	12	15	19	22	27	38
48 mm. ....	13	16	19	23	29	34	44	58
40 mm. ....	15	18	23	27	34	40	51	68
32 mm. ....	20	24	29	35	46	52	69	92
25 mm. ....	32	40	49	60	78	90	117	156

**New Spencer Binocular Microscope No. 57**



This new microscope has been produced to meet a demand for a binocular which may be quickly and easily converted into an ordinary dissecting microscope. No. 80 shows the combination base and stage of this instrument in connection with the monocular erecting body which in turn may be replaced by an arm holding the ordinary magnifiers.

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**The Body Tube** is the standard binocular body.

The **Arm** holding the binocular body is not only entirely removable but may be raised on a heavy rod which telescopes into the arm to supplement the range of the rack and pinion by 40 mm., which is a great convenience when a high object is placed on the stage. The range of the rack and pinion is 60 mm. The arm may also be rotated on this pin to bring the objectives over different parts of the stage. There is a free distance of 40 mm. from the axes of the objectives to the arm.

**The Stage** and base is similar to that of No. 55. The plate glass which is embedded in the aluminum frame to form the stage is 100 mm. x 142 mm. This frame is combined with the base in one casting.

The instrument is furnished with hand-rests, and a black and white background to fit under the glass stage. It is sent out in a polished mahogany cabinet.

## Advantageous Features

The same instrument may be combined as a binocular or as a dissecting microscope with either the monocular erecting body or the ordinary magnifiers.

Provision is made for unusually high objects on the stage.

The arm provides a means for working with deep as well as large dishes.

The objectives may be used over different parts of the stage.

A very large stage, with 80 mm. from the objective to the

There is plenty of room between the adjustment buttons and the stage.

Telegraphic Code	Catalogue No.	Paired Objectives Equiv. Foc. mm.	Paired Huyghenian Oculars	Price
<i>Fiveva</i>	<b>57A</b>	40	10x	<b>\$ 60.00</b>
<i>Fivevab</i>	<b>57B</b>	48, 32	6x, 10x	<b>75.00</b>
<i>Fivevac</i>	<b>57C</b>	55, 40, 25	4x, 6x, 10x	<b>90.00</b>
<i>Fivevad</i>	<b>57D</b>	55, 48, 32, 25	4x, 6x, 10x	<b>102.00</b>
<i>Fivevae</i>	<b>57E</b>	55, 48, 40, 32, 25	4x, 6x, 10x	<b>114.00</b>

Binocular body and arm, \$34.00.

Combination base and stage, in case, \$11.00.

## Paired Objectives

Model No. ....	100P	101P	102P	104P	107P	107PI
Obj. Foc. mm. . .	55	48	40	32	25	25
Price per Pair . . . .	\$12.00	12.00	12.00	12.00	12.00	12.00

## Paired Oculars

Huyghenian Oculars							Orthoscopic Oculars	
Catalogue No. ....	<b>134P</b>	<b>136P</b>	<b>138P</b>	<b>140P</b>	<b>142P</b>	<b>144P</b>	<b>148P</b>	<b>149P</b>
Obj. Foc. mm. ...	4x	5x	6x	8x	10x	12x	15x	20x
Price per Pair. ....	<b>\$3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>3.00</b>	<b>10.00</b>	<b>10.00</b>

## New Spencer Portable Microscope No. 60

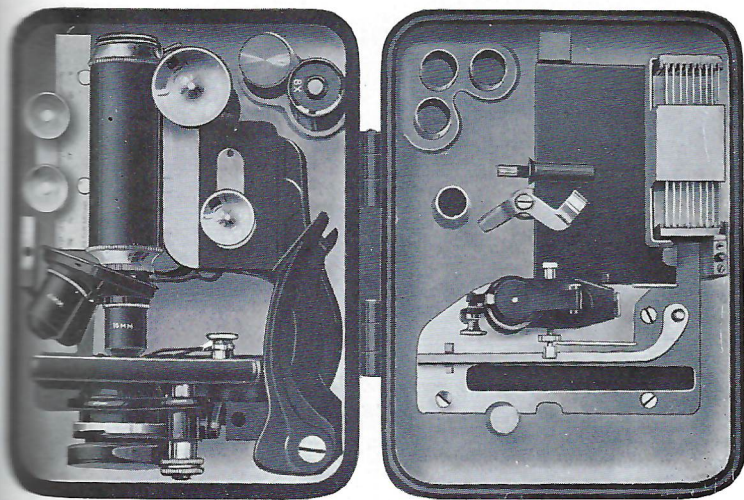


The closed case



The microscope is enclosed in a metal case, the two halves of which are hinged together. Each half is a single thin casting of magnalium—a light alloy of aluminum which is resistant to weather conditions. The wall is strengthened around the edge by a narrow band of increased thickness, which is sufficient for holding a felt buffer to make the case dust-tight. This buffer is buffed into the metal. There is absolutely no glue used to fasten any of the pads.

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The open case; showing No. 60 complete, the mechanical stage, and the camera lucida in position

The outside is beautifully finished in an imitation leather enamel, which is baked on and which is permanent. This, together with the rounded edges and corners, makes an exceptionally neat case— $8\frac{3}{4}$  inches long,  $6\frac{1}{2}$  inches wide, and  $3\frac{3}{4}$  inches thick in its extreme over-all dimensions. The microscope is rigidly held in place in the case by two strong pins which fit into depressions in the arm. To prepare for using, it is only necessary to lift the instrument from the case, turn the legs to position and pull the draw tube. The instrument goes into the case with the objectives in position on the nosepiece. Caps are furnished for protecting the objectives, which may be used when desired.

It is provided with our very successful and simple side fine adjustment, each division of the graduated button of which represents a movement of 1 micron in the body tube.

For further detail, see description of No. 62, which is identical excepting for the fine adjustment.

## Advantageous Features

Light, compact, complete. Case with rounded corners.

Substantial and large when in use.

Easily and quickly handled; comfortably carried.

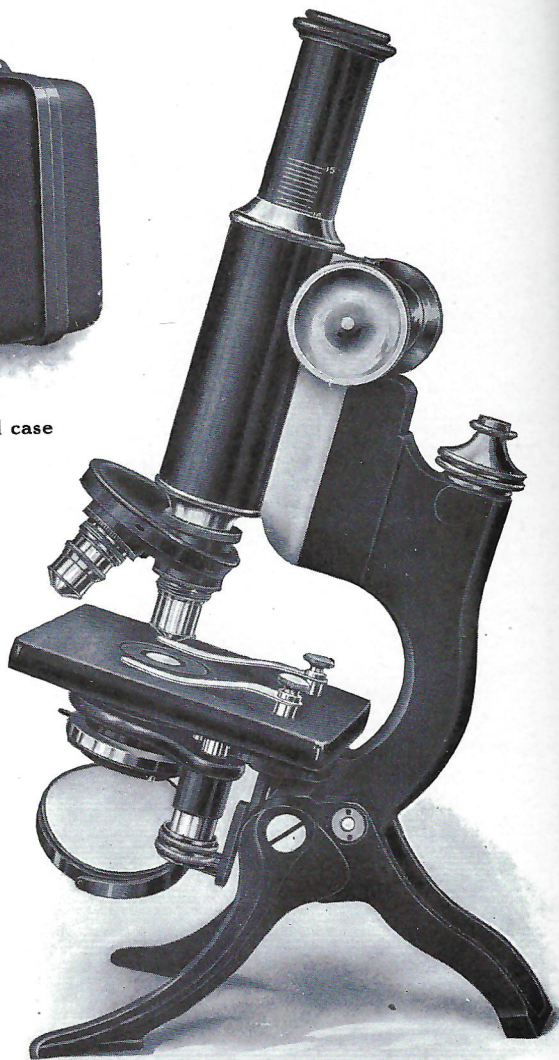
Beautifully and substantially finished, outside and inside.

Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Eye Pieces	Price
<b>60B</b>	.....	Double	16, 4	10x	\$ 65.00
<b>60D</b>	.....	Double	16, 4	6x, 10x	66.50
<b>60E</b>	N. A. 1.20	Double	16, 4	10x	74.00
<b>60F</b>	N. A. 1.20	Double	16, 4	6x, 10x	75.50
<b>60H</b>	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	100.00

## New Spencer Portable Microscope No. 62



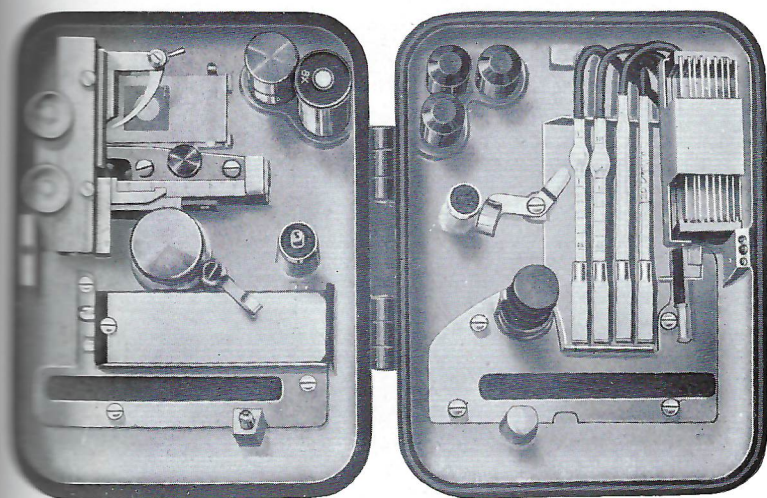
The closed case



This instrument is identical with No. 60, with the exception that the fine adjustment is type C instead of the side adjustment.

The arm is light and graceful; allowing an arm-to-axis distance of 80 mm. The stage is rigidly fastened to the arm. It is 88 mm. wide and 110 mm. deep. It is completely covered with vulcanite which is vulcanized directly to the stage casting.

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The open case with microscope removed; showing mechanical stage, haemocytometer, haemaglobinometer, box of cover glasses, slides, extra eyepiece, oil bottle, caps for objectives, all in position

It is provided with the quick-screw substage with automatic lock for the upper iris, as described on page 6.

The three legs replace the regular base and pillar, and make a very stable support for the microscope when it is set up.

The instrument, complete, with all accessories weighs  $10\frac{3}{4}$ ; with three objectives and two eyepieces only, it weighs  $9\frac{1}{2}$  lbs.

The objectives are especially mounted in short mounts, with threads for holding the caps. They are the same price as the regular objectives.

The instrument is beautifully finished in alcohol-proof black and yellow.

## Advantageous Features

A large, complete instrument in small capacity.

No turning the stage. Objectives stay on nosepiece.

The solid metal case will not come apart—no glue whatever.

The case contains more accessories than ever before contained in such a small space.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Eye Pieces	Price
Sxitob	62B	.....	Double	16, 4	10x	\$60.00
Sxitod	62D	.....	Double	16, 4	6x, 10x	61.50
Sxitoe	62E	N. A. 1.20	Double	16, 4	10x	69.00
Sxitof	62F	N. A. 1.20	Double	16, 4	6x, 10x	70.50
Sxitoh	62H	N. A. 1.20	Triple	16, 4, 1.8 Oil-imm.	6x, 10x	95.00

Modified No. 485 mechanical stage, \$17.00.

Modified No. 500 camera lucida, \$22.00.

Modified No. 505 camera lucida, \$12.00.

See blood apparatus for prices and selection.



**Spencer Microscope No. 64**

## New Spencer Microscope No. 64

This new instrument is the result of an effort to produce a microscope with a practical and efficient side fine adjustment to be sold at a price corresponding with that of a similar instrument equipped with the older type of fine adjustment. We have succeeded, without sacrificing quality in the least.

**The Body Tube** is our standard size; taking the standard oculars and objectives.

**The Arm** is identical with that of Nos. 25 and 44. It is strong and graceful; affording plenty of room for grasping, and providing an arm-to-axis distance of 80 mm.

The fine adjustment referred to is of the simplest possible construction; there being nothing but the screw and the bell crank lever involved. There are no gears, cams, balls, or inclined planes, all of which tend to produce lost motion, lateral displacement or both. The screw passes back and forth through the arm. There are buttons on *both* ends. The lever is fulcrummed in the proportion of 5:2; one complete revolution of the screw, therefore, moves the tube through .2 mm.

**The Stage** is large—108 mm. deep by 112 mm. wide. It is covered with vulcanite vulcanized directly to the metal. The iris diaphragm in the stage is so arranged that it is automatically locked open when a condenser is placed in the simple spiral focusing substage ring which is supplied with the instrument when a condenser is ordered.

### Advantageous Features

A side fine adjustment instrument at a moderate price.

A side fine adjustment instrument with buttons on *both* sides of the arm.

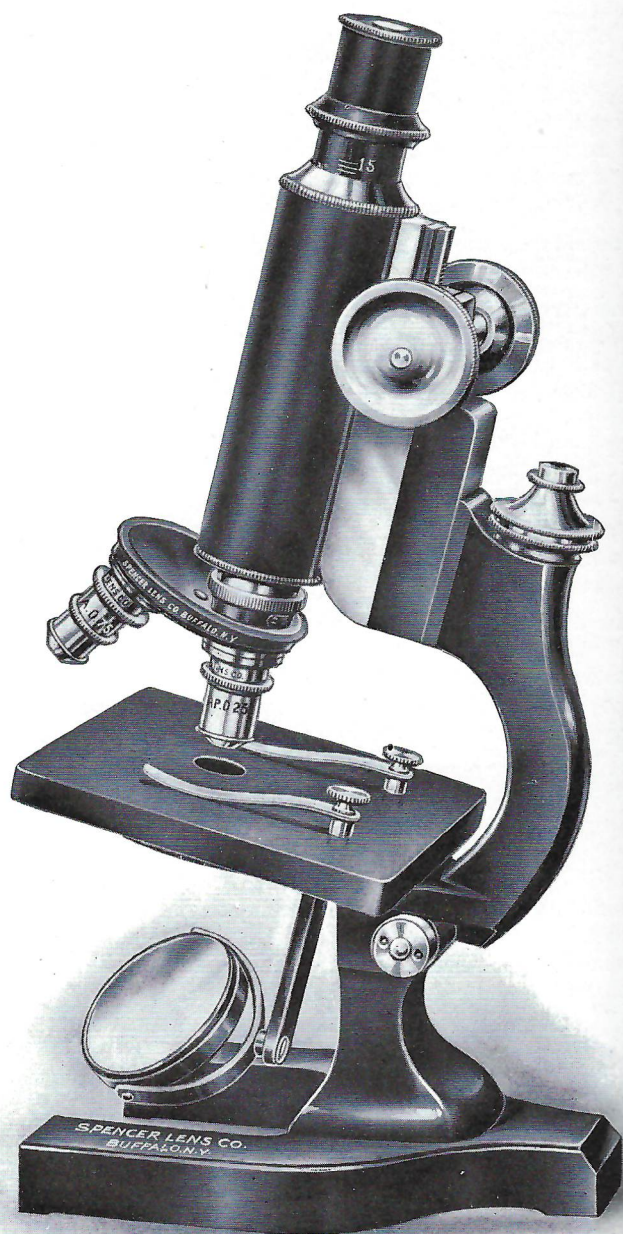
A simple adjustment, not likely to get out of order.

No lost motion, and no side thrust with its lateral displacement.

The fine adjustment ceases to work when the objective rests on the cover glass.

A large, convenient, substantial microscope.

Telegraphic Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Sextifora	64A	.....	.....	16, 4	10x	\$27.50
Sextiforb	64B	.....	Double	16, 4	6x, 10x	31.50
Sextiforc	64C	.....	.....	16, 4	10x	29.00
Sextiford	64D	.....	Double	16, 4	6x, 10x	33.00
Sextifore	64E	N. A. 1.20	Double	16, 4	10x	37.00
Sextiforf	64F	N. A. 1.20	Double	16, 4	6x, 10x	38.50



Spencer Microscope No. 65

## Spencer Microscope No. 65

We offer this microscope for elementary and general laboratory work; a large, high-grade microscope at a very moderate cost.

**The Body Tube** is our standard size; the graduated draw tube, taking the standard size eyepieces, is adjustable in cloth-lined sleeve; or in metal fitting when so specified.

**The Arm** forms a handle by which the microscope may be carried by the whole hand. The distance from the arm to the optical axis is 80 mm.

It is equipped with our standard lever type fine adjustment where one complete revolution of the screw moves the tube through .5 mm.

**The Stage**—112 mm. by 108 mm.—is covered with a heavy sheet of genuine vulcanite rubber vulcanized directly to the stage. The iris diaphragm, operated by a knurled ring, works nearly in the plane of the upper surface of the stage. A substage ring, with spiral slot for focusing the condenser, can be applied at any time without returning the microscope to the factory. Attached to this ring is an automatic device by which the upper iris is locked open when the condenser is in place.

**The Mirror** is the standard 50 mm. mirror; plane on one side and concave on the other.

The instrument is generally finished in a black alcohol-proof enamel; the smaller parts being finished in yellow lacquer which is also alcohol-proof.

It is sent out in a polished hardwood cabinet, with lock and key.

### Advantageous Features

Black body tube, avoiding reflection of light.

Extra large stage, with long distance from axis to arm.

Convenient handle for carrying the instrument.

Low, compact construction.

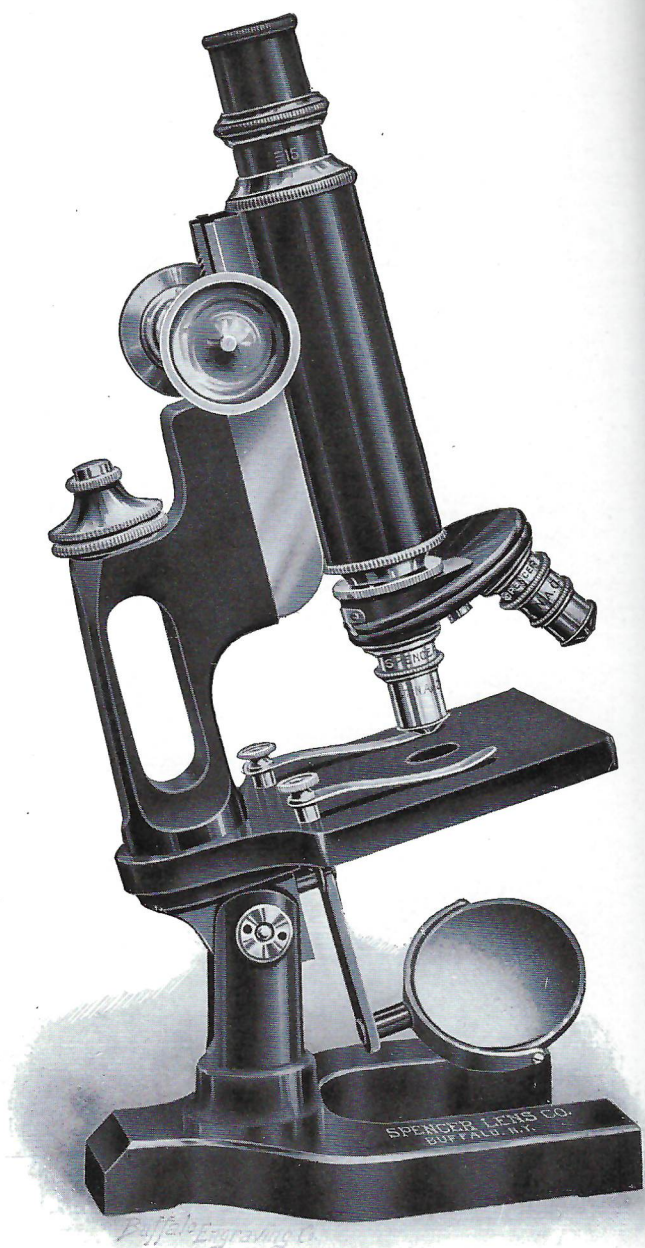
Iris diaphragm, operated by knurled ring and automatically locked open when condenser is in place.

Fine adjustment bearings automatically lubricated.

Fine adjustment ceases to work when objective touches the cover glass.

Standard superior optics scientifically corrected for the most critical work; objective lenses mounted directly into metal cells.

Designation Code	Catalogue No.	Abbe Condenser	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghe- nian Eye Pieces	Price
Stanfa	65A	.....	.....	16, 4	10x	\$27.50
Stanfb	65B	.....	Double	16, 4	10x	31.50
Stanfc	65C	.....	.....	16, 4	6x, 10x	29.00
Stanfd	65D	.....	Double	16, 4	6x, 10x	33.00
Stanfe	65E	N. A. 1.20	Double	16, 4	10x	37.00
Stanff	65F	N. A. 1.20	Double	16, 4	6x, 10x	38.50



Spencer Microscope No. 66

## Spencer Microscope No. 66

We offer this microscope for elementary and general laboratory work; a splendid microscope at a very moderate cost.

**The Body Tube** is our standard size—35 mm. outside—with Society screw thread, taking standard size eyepieces; adjustable in cloth-lined sleeve; or with metal fitting when so specified.

**The Arm** is of handle type; having a distance from optical axis to base of the arm of 60 mm. The fine adjustment is the standard type; one revolution of the screw moving the tube .5 mm.

**The Stage** is of brass, covered with a heavy sheet of rubber vulcanized directly to the stage plate. Size of stage, 103 mm. by 95 mm. (or 112 mm. if preferred). The iris diaphragm is operated by a knurled ring reached from any side; so arranged as to work very nearly in the plane of the upper surface of the stage and so mounted as to permit the attaching of a spirally focusing substage ring to hold an Abbe condenser when desired.

**The Mirror** is plane on one side and concave on the other—30 mm. diameter—mounted on a swinging bar.

The instrument is finished throughout in our special alcohol and reagent proof *black* lacquer, with the exception of the smaller parts which are finished in an *alcohol-proof* colorless lacquer, thus making it very durable and giving it a very rich appearance as well as preventing reflections.

The cabinet is of hardwood with polished finish.

### Advantageous Features

Black lacquered body tube, avoiding reflection of light into the eyes.

Alcohol-proof finish.

Handle arm for safety in handling.

Low, compact construction (considerably lower than those of other makers), affording great ease and comfort in using.

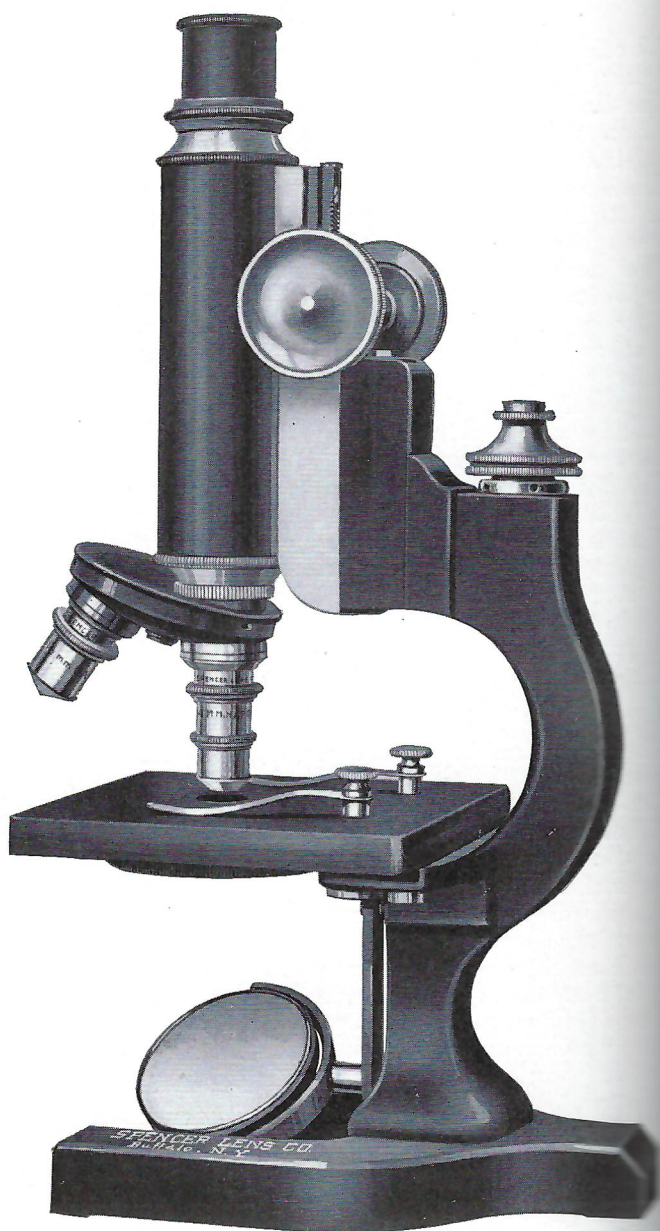
The iris diaphragm is automatically locked open when the condenser is in place.

Iris diaphragm working nearly flush with the upper surface of the stage and operated by a knurled ring reached from any side.

Fine adjustment bearings automatically lubricated.

Our standard superior optics, scientifically corrected for the most critical work; objective lenses mounted directly into the metal mount.

Telegraphic Code	Catalogue No.	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Sixtisia	66A	.....	16, 4	10x	\$27.50
Sixtisib	66B	Double	16, 4	10x	31.50
Sixtisc	66C	.....	16, 4	6x, 10x	29.00
Sixtisid	66D	Double	16, 4	6x, 10x	33.00
Sixtisie	66E	Double	16, 4	10x	37.00
Sixtisif	66F	Double	16, 4	6x, 10x	38.50



Spencer Microscope No. 72

## Spencer Microscope No. 72

We offer this microscope for elementary and general laboratory work, especially to meet the demand for a large, high-grade instrument without the joint for inclination.

**The Body Tube** is our standard size—37 mm. diameter outside—with Society thread; the graduated draw tube taking standard size eyepieces; adjustable in cloth-lined sleeve; or with metal fitting when so specified.

**The Arm** is of handle type, which may be grasped with the whole hand. The arm-to-axis distance is 75 mm. The fine adjustment is the standard lever type in which one complete revolution of the thread moves the tube .5 mm.

**The Stage** is of brass, covered with a heavy sheet of genuine vulcanite rubber vulcanized directly to the stage plate. Size of stage, 112 mm. by 108 mm. The iris diaphragm is operated by a knurled ring so arranged as to work very nearly in the plane of the upper surface of the stage, and so mounted as to permit the attaching of a substage ring to hold an Abbe condenser when desired.

**The Mirror** is plane on one side and concave on the other—50 mm. diameter—mounted on a swinging bar.

The microscope is finished throughout in alcohol-proof black lacquer; excepting the smaller parts which are finished in a transparent lacquer—also alcohol-proof.

### Advantageous Features

Black lacquered body tube, avoiding reflection of light into the eyes.

Extra large stage, with long distance from optical axis to base of the arm offering unusual capacity.

Low, compact construction (considerably lower than those of other makers), affording great ease and comfort in using.

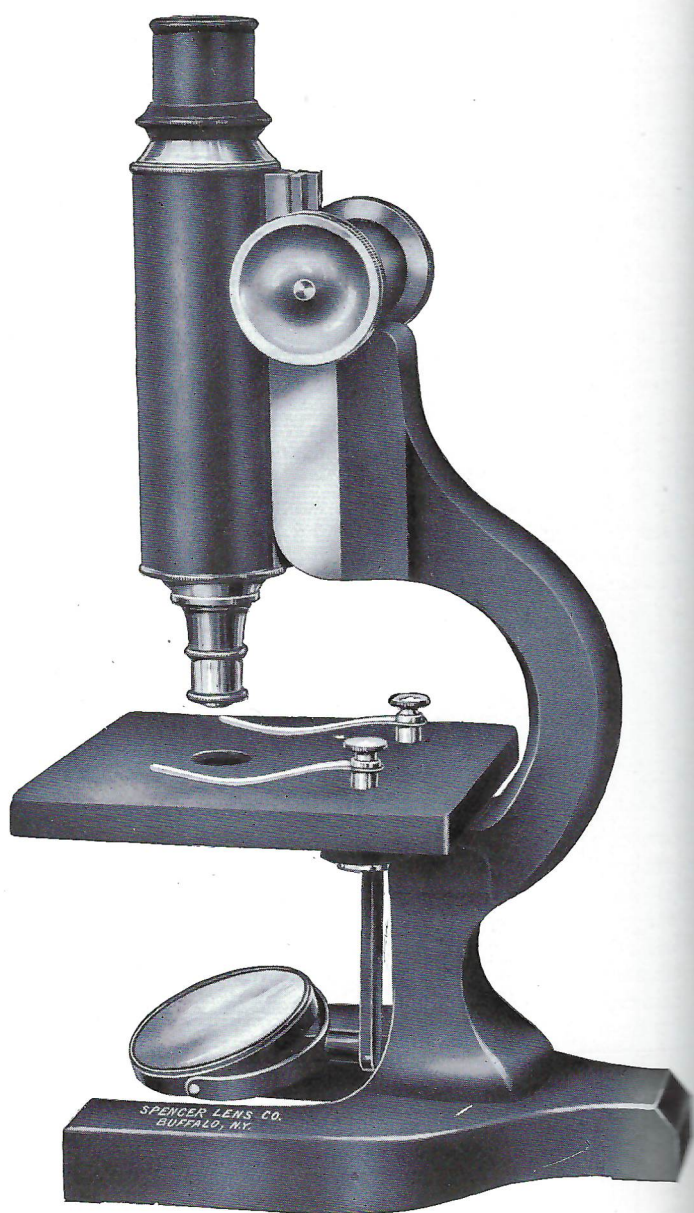
Iris diaphragm, working nearly flush with the upper surface of the stage and operated by a knurled ring reached from any side.

Fine adjustment bearings automatically lubricated.

Our standard superior optics, scientifically corrected for the most critical work; objective lenses mounted directly into the metal mount.

Telegraphic Code	Catalogue No.	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Seventwoa	72A	.....	16, 4	10x	\$26.00
Seventwob	72B	Double	16, 4	10x	30.00
Seventwoc	72C	.....	16, 4	6x, 10x	27.50
Seventwod	72D	Double	16, 4	6x, 10x	31.50

Substage ring and Abbe condenser N. A. 1.30 supplied at an additional cost of \$6.00. It may be added at any time.



Spencer Microscope No. 74

## Spencer Microscope No. 74

This microscope is offered for commercial, household, or elementary school purposes where the magnification required is not great. It will be found satisfactory for work in elementary zoology and botany as taught in the common schools, and for examinations of insect and plant life as well as such substances as starches, drugs, earths, cements, fibres, fabrics, meats for suspected parasites, paper-making materials, prints, etc.

**The Body Tube** is the standard size—37mm. outside diameter, with graduated draw tube taking the standard size eyepieces.

**Focusing Adjustment:**—coarse adjustment only by diagonal rack and pinion.

**The Arm** is of handle type which may be grasped with the whole hand.

**The Stage** is of brass, covered with a very heavy and durable black lacquer. It is 112mm. x 108mm. in size, and the distance from the optical axis to the base of the arm is 75mm.

**The Mirror** is plane on one side and concave on the other—50mm. in diameter, mounted on a swinging bar.

**Finish:**—The body tube, arm, stage, pillar and base are all in a special alcohol and reagent proof black lacquer. The pinion buttons, slide bearing and knurled collars at the top and bottom of the body tube are in natural bright lacquer (also alcohol-proof), thus giving it a very rich and durable finish as well as preventing all reflections. The cabinet is of hard wood, polished finish, with handle and catch.

### Advantageous Features

Black lacquered body tube, avoiding reflection of light into the eyes.

Extra large stage, with very long distance from optical axis to arm.

Handle arm which may be grasped with the whole hand.

Low, compact construction affording great ease and comfort in use.

Telegraphic Code	Catalogue No.	Nose Piece	Achromatic Objectives Equiv. Foc. mm.	Huyghenian Oculars	Price
Seventiforx	74 X	.....	Divisible 32-14	10x	\$17.50
Seventifory	74 Y	.....	Divisible 32-14		
			Special 5	6x, 10x	23.00
Seventiforz	74 Z	Double	Divisible 32-14		
			Special 5	6x, 10x	27.00
Seventifora	74 A	.....	16, 4	10x	25.50
Seventiforb	74 B	Double	16, 4	10x	29.50

The divisible objective (32mm. and 14mm.) gives with the 6x eyepiece, magnifications of 17 and 65 diameters; with the 10x eyepiece, 35 and 130 diameters.

## New Spencer Dissecting Microscope No. 80



This dissecting microscope is an entirely new design to meet a demand for a capacious instrument which is at the same time light and easy to handle.

**The Stage** of the instrument, together with the base, consists of a single strong casting into the top of which is embedded a plate glass—100 mm. x 146 mm.—to form the exceptionally large stage. A black and white background is provided with the instrument; this slips into place beneath the plate glass. The standard mirror also swings at the end of a mirror bar beneath the stage. Hand-rests, which are easily detachable, accompany the instrument.

**The Rack-and-Pinion Adjustment** is ample for extreme range of the arm carrying the magnifier. The illustration shows the instrument with the Spencer Erecting Body No. 85. The arm carrying this body is easily removable; to be displaced by a double-jointed arm for carrying any of the magnifiers which is included in the prices. This arm is also equipped with a provision for carrying the camera lucida above the magnifier.

## SPENCER LENS COMPANY

The instrument is beautifully finished in alcohol-proof black enamel. It is sent out in a handsome polished mahogany case.

### Advantageous Features

The exceedingly large stage.

The light construction.

The long range of the rack-and-pinion adjustment.

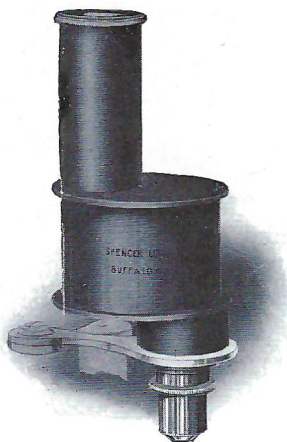
Tele-graphic Code	Catalogue No.	Magnifier	Equivalent Focus mm.	Working Distance mm.	Price
Atia	80A	9x Doublet	27.8	15	\$12.50
Atib	80B	6x & 12x Doublets	41.6 & 20.8	22 & 12	13.75
Atic	80C	9x Triple Aplanat	27.8	24.5	15.25
Atid	80D	6x & 12x Triple Aplanat	41.6 & 20.8	36.8 & 18.4	18.75
Atie	80E	9x Veraplanat	27.8	24.5	17.75
Atif	80F	6x & 12x Veraplanat	41.6 & 20.8	36.8 & 18.4	23.75

**No. 80** Stand only, without magnifiers or lens arm, in case, **\$11.00**

### Spencer Monocular Erecting Body No. 85

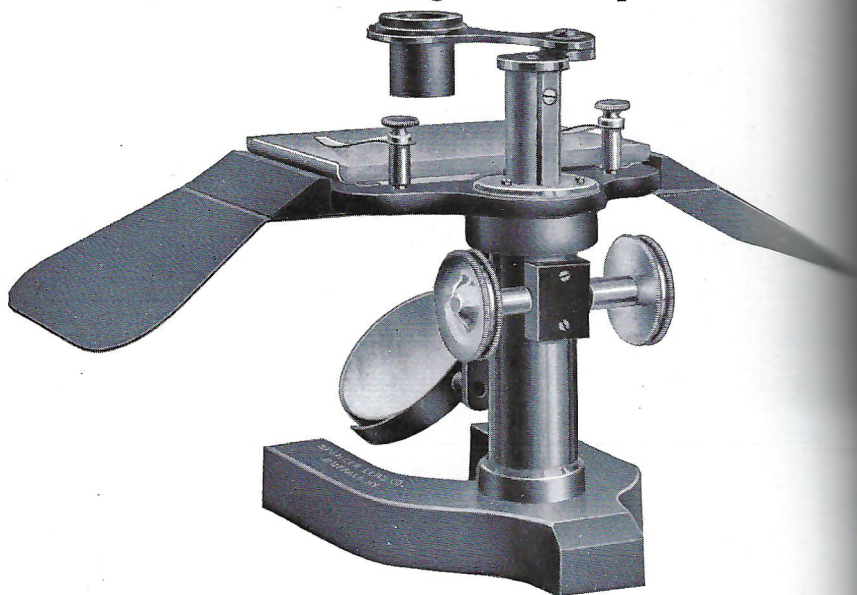
This erecting body may be used on No. 80 or No. 82 dissecting stands. In connection with these stands it is a great help where fine dissections must be carried on under a high magnification.

The porro prism system erects the image to make the dissection easier. The lower side of the prism box is provided with a Society screw, taking in any of the regular microscope objectives; and the tube on the upper side takes in any of the standard oculars. The erecting body is provided with a long double-jointed arm with a long pin which fits into the socket at the top of the support controlled by the rack and pinion.



Telegraphic Code	Catalogue No.	Achromatic Objectives	Eye Piece	Price
Atifia	85A	No objective	ocular	\$11.00
Atifib	85B	No objective	10x	12.50
Atific	85C	16 mm.	10x	17.50

## Spencer Dissecting Microscope No. 82



An extremely well made, thoroughly serviceable and convenient instrument at a very moderate cost.

**The Focusing** is accomplished by diagonal rack and pinion. *Two milled pinion heads* allow either hand to be used in focusing.

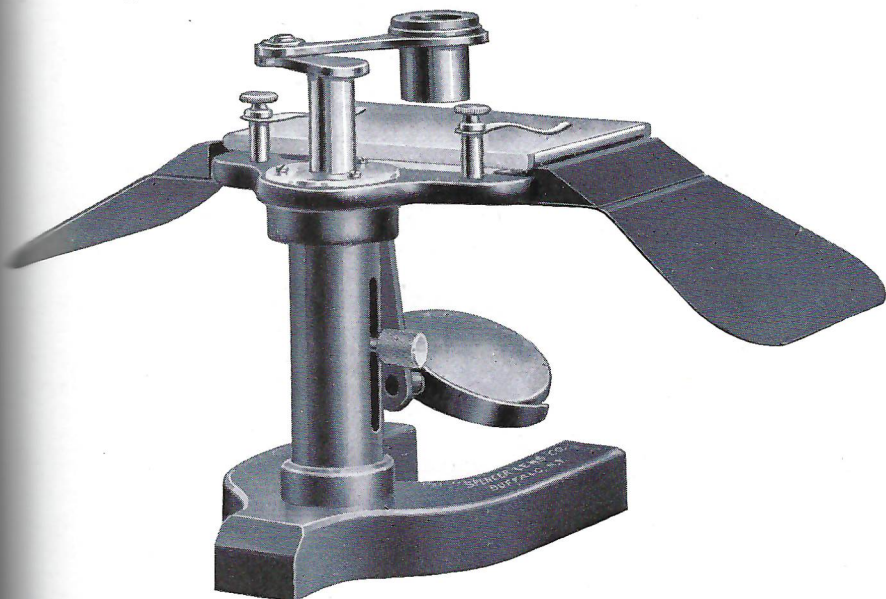
**The Extra Large Stage** is covered by a heavy, polished glass plate—75 mm. x 100 mm. Openings are provided at the edges of the stage, so that metal hand-rests may be readily attached. These hand-rests are regularly supplied. A black and white background fits beneath the glass plate.

**The Jointed Lens Arm** is so mounted that the lens may be used over any part of the stage. The mirror fork is substantially fastened to a swinging mirror-bar, and carries a mirror 50 mm. in diameter—one side being concave, the other plane. We advise the use of our triplet and veraplanat magnifiers with this microscope, but, if cost will not permit, the less expensive doublets will be found to be very satisfactory. In neat hardwood cabinet.

Telegraphic Code	Catalogue No.	Lens and Magnification	Equivalent Focus mm.	Working Distance mm.	Price
Atitoea	82A	9x Doublet	27.8	15	\$ 9.00
Atitob	82B	6x & 12x Doublets	41.6 & 20.8	22 & 12	9.75
Atitoc	82C	9x Triple Aplanat	27.8	24.5	11.75
Atitod	82D	6 & 12x Triple Aplanat	41.6 & 20.8	36.8 & 18.4	15.75
Atitoe	82E	9x Veraplanat	27.8	24	14.75
Atitof	82F	6x & 12x Veraplanat	41.6 & 20.8	36.8 & 18.4	20.75

**No. 82** Stand only, without magnifiers or arm, in case.. \$8.00

## Spencer Dissecting Microscope No. 84



In this microscope we have combined efficiency with a very low cost; adapting it to general laboratory use.

**The Focusing** is accomplished by means of a button at the side of the pillar which moves the strong cylindrical lens arm support; giving a steady, smooth movement, so that high power lenses can be satisfactorily used.

**The Extra Large Stage** is covered by a heavy, polished glass plate—75 mm. x 100 mm. Openings are provided at the edges of the stage for metal hand-rests. A black and white background fits beneath the glass plate.

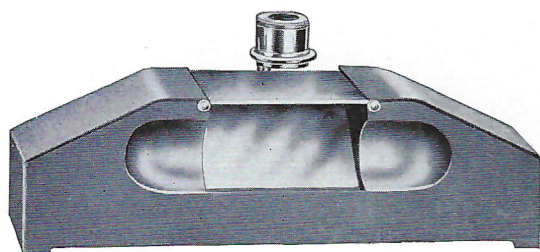
**The Jointed Lens Arm** is so mounted that the lens may be used over any part of the stage. The mirror fork is substantially fastened to a swinging mirror-bar, and carries a mirror 50 mm. in diameter—one side being concave, the other plane. While our triplet magnifiers will be found to be of very great advantage for use with this microscope, if cost will not permit, our doublets will be found to be very satisfactory. In neat hardwood cabinet.

Telegraphic Code	Catalogue No.	Lens and Magnification	Equivalent Focus mm.	Working Distance mm.	Price Without hand-rests
Atifora	84A	9x Doublet	27.8	15	\$ 6.75
Atiforb	84B	6x & 12x Doublet	41.6 & 20.8	22 & 12	7.50
Atiforc	84C	9x Triple Aplanat	27.8	24.5	9.50
Atiford	84D	9x & 12x Triple Aplanat	41.6 & 20.8	36.8 & 13.4	13.00

Metal hand-rests, not included in prices above, per pair, \$ .75

## Spencer Dissecting Microscope No. 86

This form of instrument is very popular for all elementary dissecting work. The stand is low and is made of white wood,

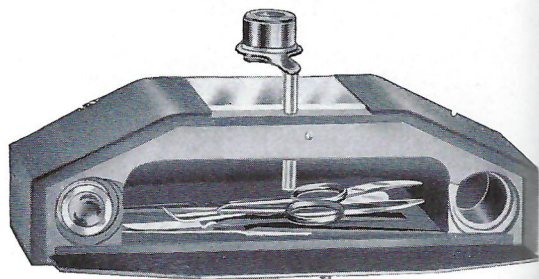


*Front View*

neatly finished. The top surface is inclined at either end to form convenient hand-rests. The stage is a glass plate, underneath which a mirror is set at an angle to reflect the light to the object. On our new improved

stand, the parts of the block at either side of the mirror are cut out to allow light from the sides to strike the mirror, thus doing away with the necessity of the operator facing the source of light in order that the light may strike the mirror.

The block is hollow beneath and back of the mirror; forming a convenient receptacle for dissecting tools and the lenses. This is closed by a door which is hinged at the lower edge of the block. This is most convenient, because it is not



*Back View*

necessary to remove the specimen from the stage or the lens from the holder when a new dissecting tool or lens is wanted.

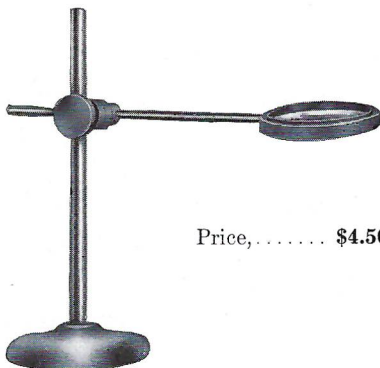
The lens is held in an arm which permits movement from side to side and provides for focusing. A black and white metal background is furnished with each instrument.

Telegraphic Code	Catalogue No.	Lens and Magnification	Equivalent Focus mm.	Working Distance mm.	Price
<b>Atisia</b>	<b>86A</b>	9x Doublet	27.8	15	<del>\$2.50</del>
<b>Atisib</b>	<b>86B</b>	6x & 12x Doublet	41.6 & 20.8	22 & 12	<del>3.25</del>
<b>Atisic</b>	<b>86C</b>	9x Triple Aplanat	27.8	24.5	<del>5.25</del>
<b>Atisid</b>	<b>86D</b>	6x & 12x Triple Aplanat	41.6 & 20.8	36.8 & 13.4	<del>8.75</del>

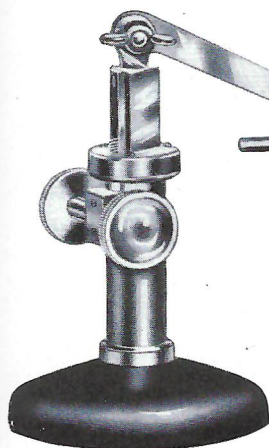
## Mounted Dissecting Magnifier No. 88

This is a double convex lens, 2 inches in diameter, with a focal length of 6 inches. It is mounted so that it can be used in any position (by tightening one screw only) over dishes and over large objects where a large field and a low magnification is desired.

Telegraphic Code, Atiate



Price, ..... \$4.50



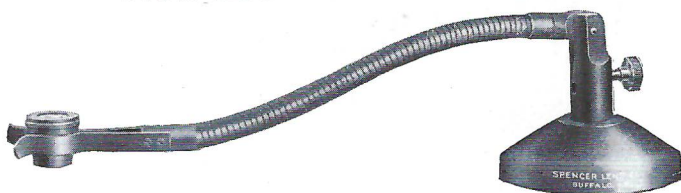
Telegraphic Code, Ninti

## Lens Holder No. 90

This holder is mounted on a heavy, round japanned iron base. The adjustment for height is accomplished by a rack and pinion. Beside this adjustment, the double jointed arms are so arranged that the lens may be moved to any position. This stand is particularly useful when working over large dishes.

Holder, without lens, ..... Price, \$8.00

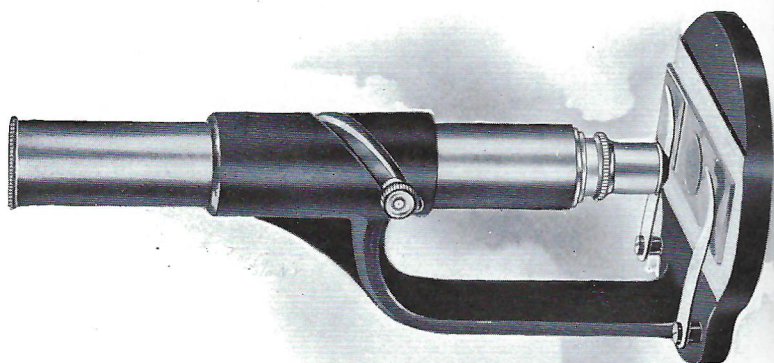
## New Lens Holder No. 92



This new flexible lens holder consists of a standard to which is hinged a flexible arm, 12 inches long, at the end of which is a spring clamp for the magnifier. At the side of the standard is a screw by which the magnifier may be conveniently and delicately focused; thus offering a marked improvement on the older forms of jointed arms heretofore offered.

Telegraphic Code, Nintito. No. 92, New Holder, without lens, Price, \$3.00

## Demonstration Microscope No. 96



This microscope is made for passing from student to student during class demonstration. It is made entirely of aluminum; thus is very light. The objective is accurately and easily focused by a spiral movement so arranged that the objective may be securely fastened in any focus. The slide is placed upon the stage as in any other microscope, there being no danger of disturbing the cover glass.

Telegraphic Code, Nintisia, No. 96A, Microscope Stand, with 8x Eyepiece .....	\$ 6.00
Telegraphic Code, Nintisib, No. 96B, Microscope Stand, with 8x Eyepiece and with one 16 mm. objective.....	11.00



## Bulls-Eye Condenser

Plano-convex lens mounted upon stand adjustable to any position. For illuminating opaque objects, etc.

Diameter of lens, 75 mm.

Telegraphic Code, Onehun  
Catalogue No. 100

Price, ..... \$6.00

## THE OPTICAL SYSTEMS

Our optical parts have been long and favorably known for their remarkable properties. The standards of efficiency attained, are accounted for by the scientific exactness in our methods of design, manufacture and inspection. They are made after the very latest and highest perfected formulae and methods of construction, under the immediate and rigid oversight of our scientific director. This very important and unusual supervision in the application of our formulae, avoids grave errors which so often prevail when less qualified supervision is employed. We have thus attained a degree of efficiency which has merited our optics their enviable reputation.

In manufacturing our objectives, we follow in its general principles the method first adopted by Professor Abbe at Jena, by which the complete mathematical formulation of the objective is first perfected; all of its elements clearly determined, such as the actual indices of refraction in the several optical glasses employed, the radii of the curved surfaces, the thicknesses of the lenses and the distances of separation, so that this work of prior calculation does away with all the uncertainties of experimental or empirical methods. This, in connection with the most exact methods of manufacture attainable and the most rigid and careful supervision, has produced most satisfactory results.

In our objectives, we have obtained a sharp, critical definition to the edge of the field, and at the same time have secured exceptionally long working distances and an unusual flatness of field. The uniformity of our objectives enables us to guarantee the numerical apertures and the focal distances of our objectives to be as marked thereon.

These finished objectives are finally subjected by special scientific methods to the most severe test possible, so to preclude the possibility of sending out any that are not uniformly excellent and of high grade. The varieties of optical glass used by us are carefully chosen from those made by the Jena and Paris optical glass works, and are selected with especial reference to their durability. We use such kinds only as long experience has shown to be most reliable, and that will not deteriorate under any influences of climate or atmosphere; in fact, we guarantee the permanence of all our optical parts.

By thus availing ourselves of the many new varieties of these optical glasses which are now offered for our selection, we are enabled to furnish objectives which are more perfectly corrected for spherical and for chromatic aberration than has hitherto been practicable.

## SPENCER LENS COMPANY

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We have no hesitancy whatever in stating that our microscope objectives are the very best that it is possible to make for the work for which they are intended.

Our microscope objectives are mounted directly into the metal, and are thus unharmed when cleaned with a solvent.

Our objectives are corrected *for a tube length of 160 mm. and for a cover glass thickness of 0.18 mm.* Objectives of low power (8 mm. and under) are not very sensitive to variations in these respects, but the higher power dry objectives and water-immersion lenses cannot be expected to show their best qualities *except under the conditions named.* A homogeneous oil-immersion lens is not affected by the cover glass thickness, but a strict adherence to the correct tube length is necessary.

The tube length is measured from the top of the draw tube to the lower edge of the body tube nosepiece; the graduation on the draw tube always indicating what length is being used. When, however, a nosepiece is attached to the body tube, thus increasing its length, the draw tube is pushed in sufficiently to compensate therefor. In actual service, the draw tube may also be used to compensate for difference in cover glass thickness, if those of 0.18 mm. are not at hand. In that case, lengthening the tube compensates for a thinner cover glass, while shortening it corrects the effect of one that is thicker.

For example, a 4 mm. 0.85 numerical aperture objective corrected for cover glass 0.18 mm. thick, would need, when its full aperture is employed, that the tube should be lengthened 30 mm. to compensate for the use of a cover glass that is only 0.15 mm. in thickness. We can at all times furnish measured cover glasses of any exact thickness at a slight advance over ordinary prices.

When so desired, we correct our objectives for other tube lengths than 160 mm., or for any different cover glass thickness.

All of our objectives with a numerical aperture of 0.85 or higher, except the oil-immersion lenses, can be furnished, when desired, in adjustable mounts. This is an advantage that is best appreciated by the experienced and skillful worker, who is thus enabled by means of the adjusting collar to correct his objective for any thickness of cover glass.

All of our objectives and nosepieces are made with the Society screw, carefully tested with the standard gauge furnished us by the Royal Microscopical Society.

With our eyepieces, condensers, etc., we have taken the same scientific care as with our objectives.

Our eyepieces are made to fit the standard tube adopted by the Royal Microscopical Society and are interchangeable with those of the European makers.

## Achromatic Objectives



16 mm.



4 mm.



1.8 mm.

The 40 mm. and 32 mm. Achromatic Objectives are combinations having very large, flat fields and excellent definition for very low power work.

The 30-22 mm. Variable Objective is excellent for drawing to exact size with a camera lucida, since, within its limit, any variation of magnification may be obtained.

The 25 mm. Objective is excellent for its penetration and clear definition; giving a magnification slightly higher than the objectives mentioned above.

The 16 mm. Objective is the standard power for medium low magnifications. We have given special attention to bringing out its exceptionally clear, crisp definition and large and brilliant flat field.

The 12 mm., 8 mm. and 5 mm. Objectives are very useful intermediate power for magnifications ranging between those of the more generally used 16 mm. and 4 mm. objectives. They leave nothing to be desired in definition and other qualities involved in objectives of the highest grade.

**New 4 mm. (N. A. 85) Objective.** In this new objective, we have very successfully combined wide, angular aperture and long working distance. Heretofore, it has been necessary to choose between these two very important qualities—or to buy two objectives. This objective not only possesses the clear-cut definition in a brilliant flat field which is characteristic of Spencer objectives, but it also has the resolving power consistent with its wide angle of aperture. *In addition, the working distance is sufficient for any regular haemacytometer work.*

**The 3 mm. Objective.** In this objective, the chromatic and spherical corrections are as carefully considered as in the preceding objective. The brilliancy of the field and the flatness are remarkable for an objective of its power, while the definition is clear and acute.

**The 3 mm. Water-Immersion Objective,** with its greater aperture, provides for greater resolution and at the same time retains other excellent qualities of the dry objective of like power. It is very superior for studying living forms under water.

# SPENCER LENS COMPANY

**The 1.8 mm. Oil-Immersion Objective** might properly be termed a semi-apochromat, on account of its exceptional spherical and chromatic corrections throughout the whole limit of the aperture. The brilliantly illuminated object stands out in clear, crisp outlines, while the finest details are clearly resolved. It is a most desirable objective for critical cytological and bacteriological work.

**The 15 mm. Oil-Immersion Objective** accomplishes results in higher power definition and resolution which are not quite reached by the objective just described. It possesses the same qualities, so far as brilliant flat field is concerned. The illumination is exceptional in an objective of its power.

The front lenses of the immersion objectives are securely burnished as deeply into their cells as is possible without reducing the desirable working distance. Every precaution is taken to avoid leaking of oil.

The higher power achromatic objective with the greater aperture may be used very advantageously with the orthoscopic or compensating oculars.

All of the objective mounts are marked not only with the equivalent focus but also with the initial magnification which, multiplied by the magnification indicated on the ocular, gives the magnification of the combination.

## Achromatic Objectives

Telegraphic Code	Catalogue No.	Equivalent Focus		Num. Aperture	Working Distance*		Diam. of the † real field		Price	
		mm.	inches approx.		With 160 mm. tube length and 10x eye piece		mm.	mm.	Fixed Mount.	Adjust. Mount.
<b>Onoon</b>	<b>101</b>	48	2	0.10	28.0		6.5		\$ 4.00	
<b>Onoto</b>	<b>102</b>	40	1 3/4	0.10	28.0		6.3		4.00	
<b>Onofor</b>	<b>104</b>	32	1 3/8	0.10	15.0		4.7		4.00	
<b>Onosix</b>	<b>106</b>	30-22 variable	1 3/8 to 1 9/10	.....	25.0		15.0			\$20.00
				.....	2.0		8.0			
<b>Onosev</b>	<b>107</b>	25	1	0.25	9.5		3.3		5.00	
<b>Onoate</b>	<b>108</b>	16	2/3	0.25	5.0		2.1		5.00	
<b>Onono</b>	<b>110</b>	12	1/2	0.40	1.8		1.4		8.00	
<b>Ononto</b>	<b>112</b>	8	1/3	0.50	1.5		1.0		8.00	
<b>Ononfor</b>	<b>114</b>	5	1/3	0.70	0.4		0.55		8.00	
<b>Ononate</b>	<b>118</b>	4	1/6	0.85	0.46		0.40		8.00	18.00
<b>Ontoto</b>	<b>122</b>	3	1/8	0.85	0.26		0.30		8.00	18.00
		Water Im.								
<b>Ontofo</b>	<b>124</b>	3	1/8	1.15	0.22		0.30		20.00	24.00
		Oil-Im.								
<b>Ontosev</b>	<b>127</b>	1.8	1/4	1.30	0.13		0.20		27.00	
		Oil-Im.								
<b>Ontoate</b>	<b>128</b>	1.5	1/6	1.30	0.10		0.14		40.00	

\*Working distance is the distance between the front lens and cover glass.

†Real field is the distance of the circular area seen through the microscope and measured in the plane of the object.

## Huyghenian Oculars

We were the first to adopt the method of designating the Huyghenian oculars in accordance with their magnifications. These designations have heretofore been based on the magnifications of the image projected the distance of the optical tube length. The indicated magnification is now based on the size of the image projected the distance of distinct vision, i. e., 250 mm., (10 inches). A 10x ocular now takes the place of the 8x, and a 5x takes the place of the 4x. The equivalent foci are practically unchanged. A new 4x has been added to the list. All our oculars fit the standard tube.



Telegraphic Code	Catalogue No	Power	Equivalent Focus	Price
<b>Onthrefor</b>	<b>134</b>	4x	62.5 mm.—2½ in.	<b>\$1.50</b>
<b>Onthresix</b>	<b>136</b>	5x	50 mm.—2 in.	<b>1.50</b>
<b>Onthreate</b>	<b>138</b>	6x	40 mm.—1⅔ in.	<b>1.50</b>
<b>Onforo</b>	<b>140</b>	8x	30 mm.—1⅓ in.	<b>1.50</b>
<b>Onforto</b>	<b>142</b>	10x	25 mm.—1 in.	<b>1.50</b>
<b>Onforfor</b>	<b>144</b>	12x	20 mm.—⅔ in.	<b>1.50</b>

## New Orthoscopic Oculars

To meet the demand for a larger field, and also for higher power in the oculars than are featured with the Huyghenian oculars, we offer this new series of Orthoscopic oculars which will be found very helpful in many kinds of work.

Telegraphic Code	Catalogue No.	Power	Equivalent Focus	Price
<b>Onforfiv</b>	<b>145</b>	8x	30 mm.—1⅓ in.	<b>\$5.00</b>
<b>Onforsix</b>	<b>146</b>	10x	25 mm.—1 in.	<b>5.00</b>
<b>Onforsev</b>	<b>147</b>	12x	20 mm.—⅔ in.	<b>5.00</b>
<b>Onforate</b>	<b>148</b>	15x	16 mm.—⅔ in.	<b>5.00</b>
<b>Onfornin</b>	<b>149</b>	20x	12 mm.—½ in.	<b>5.00</b>

## Magnification Table

Tube length, 160 mm.

Image distance, 250 mm.

Objectives mm.	Initial Magnification	OCULARS								Objectives mm.
		4x	5x	6x	8x	10x	12x	15x	20x	
48	2.2	8	11	13	18	22	27	33	44	48
40	2.8	11	14	17	22	28	33	42	56	40
32	4	16	20	24	32	40	48	60	80	32
30-22	2-4.5	4-9	5-12	8-19	10-24	15-35	18-43	20-48	30-70	30-22
25.4	6	24	30	36	48	60	72	90	120	25.4
16	10	40	50	60	80	100	120	150	200	16
12	15	60	75	90	120	150	180	225	300	12
8	20	80	100	120	160	200	240	300	400	8
5	36	144	180	216	288	360	432	540	720	5
4	44	176	220	264	352	440	528	660	880	4
3	60	240	300	360	480	600	720	900	1200	3
1.8	95	380	475	570	760	950	1140	1425	1900	1.8
1.5	109	436	545	654	872	1090	1308	1635	2180	1.5

## Apochromatic Objectives

The superiority of the apochromatic objectives is due, among other things, to the fact that three colors of the spectrum instead of two, as is the case with the achromatic objectives, are brought to one focus; thus practically doing away with the secondary spectrum. The difference between the focal lengths of the intervening colors is so slight that images with an apochromatic objective are nearly equally sharp for all colors of the spectrum. This superior color correction is obtained in all zones of the objective, whereas in the achromatic objectives the best color correction is for one zone only.

The apochromatic systems are also spherically corrected for all zones, which makes them the superior for either central or oblique illumination. This in connection with the color correction insures better definition, and permits an increased numerical aperture which means greater resolution. The greater amount of light obtained, permits using higher oculars. They are especially adapted to photo-micrography. The two lower powers of 16 mm. and 8 mm. focal distance are constructed with especial reference to flatness of field, and show greater perfection in this respect, even with the lowest power eyepiece, an advantage of especial value in photo-micrographic work.

The difference between the apochromatic and achromatic objectives is visually more striking on unstained objects where there is no color to be confused with the chromatic colors due to the secondary spectrum in the achromatic objective. On such objects, the apochromatic objectives show no color fringes and the outlines are sharper and clearer. They are, therefore, superior in differentiating slight variations in color or tint.

These exceptional qualities can be obtained only by the use of fluorite lenses in connection with glass. We have been extremely careful in the selection of this natural product, and fortunate in obtaining a supply well suited to the purpose.

The objectives are carefully and securely mounted in a neat mounting. The 4 mm. and 3 mm. dry objectives are furnished in adjustable mounts to correct for variation in thickness of cover glasses. This is not necessary with the lower power objective nor with the immersion objectives.

## Apochromatic Objectives

Telegraphic Code	Catalogue No.	Equivalent Focus		Num. Aperture	160 mm. tube length and 10x Comp. eye piece		Price, Net
		mm.	Inch Aperture		**Working Distance mm.	***Real Field mm.	
<b>Onfivo</b>	<b>150</b>	16	$\frac{2}{3}$	0.30	2.6	1.5	<b>\$17.00</b> Fixed Mt.
<b>Onfivto</b>	<b>152</b>	8	$\frac{1}{3}$	0.60	1.2	0.75	<b>23.00</b> " "
<b>Onfivfor</b>	<b>154</b>	4	$\frac{1}{6}$	0.95	0.26	0.32	<b>32.00</b> Adj. Mt.
<b>Onfivsix</b>	<b>156</b>	3	$\frac{1}{8}$	0.95	0.16	0.24	<b>36.00</b> " "
<b>Onfivate</b>	<b>158</b>	2	$\frac{1}{12}$	1.30	0.17	0.16	<b>70.00</b> Fixed Mt.
<b>Onsixo</b>	<b>160</b>	1.5	$\frac{1}{16}$	1.30	0.13	0.12	<b>85.00</b> " "

## Compensating Oculars

The compensating oculars are made especially for use with apochromatic objectives, to correct the chromatic difference of magnification in the image, which is thus made free from color fringes all over the field, while the diaphragm of the ocular shows a reddish-yellow margin.

These oculars can also be used to good advantage with achromatic objectives of high numerical aperture.

The focal distances of the compensating oculars are arranged in the same manner as the Huyghenian; being marked with the magnification they give when used with the 160 mm. tube length. The initial magnification of an objective multiplied by the ocular number gives quite accurately the magnification of the combination for the tube length above named.

These oculars can be used for photo-micrography and for projection work as well as for visual uses.

The 5x and 10x oculars may be supplied with extra large field lens, iris diaphragm and adjustable eye lens, at an extra cost of \$7.00.

Thus equipped, they can be used only on stands Nos. 5, 10 and 16. They are threaded to fit the thread on these stands which holds the bearing for the small draw tube. They are especially valuable in photo-micrography.



Telegraphic Code	Catalogue No.	Power	Equivalent Focus		Price, Net
			mm.	inches	
<b>Onsixfor</b>	<b>164</b>	1.5x	170	7	<b>\$5.00</b>
<b>Onsixsix</b>	<b>166</b>	5x	50	2	<b>5.00</b>
<b>Onsixate</b>	<b>168</b>	10x	25	1	<b>5.00</b>
<b>Onsevo</b>	<b>170</b>	15x	16	$\frac{2}{3}$	<b>7.50</b>
<b>Onsevtto</b>	<b>172</b>	20x	12.5	$\frac{1}{2}$	<b>7.50</b>

# SPENCER LENS COMPANY

## Magnifications of Apochromatic Objectives

In combination with compensating eyepieces. Tube length, 160 mm., distance of image, 250 mm.

Objectives	Initial Magnification	COMPENSATING EYE PIECE					Objectives
		1.5x	5x	10x	15x	20x	
16 mm.	10	15	50	100	150	200	16 mm.
8 mm.	20	30	100	200	300	400	8 mm.
4 mm.	40	60	200	400	600	800	4 mm.
3 mm.	60	90	300	600	900	1200	3 mm.
2 mm.	82	123	410	820	1230	1640	2 mm.
1.5 mm.	110	165	550	1100	1650	2200	1.5 mm.

## Helier Objectives

For

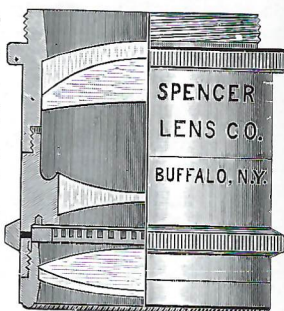
Photo-Micrographic Work

These objectives range from 30 to 120 mm. in focal distance and have an aperture of 1:4.5 of the focal distance. They are corrected anastigmatically within an angle of about 60°, so that with the full aperture, a field of that measurement is utilized entirely free from astigmatism and perfectly flat; while cutting down the aperture increases the useful field to an even larger angle.

In these objectives there is, of course, no difference between the visual and chemical foci; moreover, the sharply defined image is wholly free from distortion up to the extreme margin of the field; the small number of reflecting surfaces secures a very brilliant image; and by the use of these Heliers it is possible to satisfactorily photograph an object of much larger area than is practicable with the microscope objectives of similar focal distance.

All of these objectives are mounted with iris diaphragms so graduated as to show clearly the diameter of the free diaphragm opening.

The 30 mm. and 60 mm. objectives are made with the Society screw, while the 90 mm. and 120 mm. are made to fit the lower end of the body tube (when nosepiece is removed) of our Nos. 5, 10 and 16 stands for photo-micrography. All are used without eyepieces and are especially well suited to be used as projection objectives.



# SPENCER LENS COMPANY

## Heliar Objectives

Telegraphic Code	Catalogue No.	EQUIVALENT FOCUS		Field	Price
		Millimeters	Inches		
Onsevsix	176	120	5	} 60°	\$35.00
Onsevate	178	90	3 $\frac{3}{4}$		30.00
Onateo	180	60	2 $\frac{1}{2}$		26.00
Onateto	182	32	1 $\frac{1}{4}$		22.00

## The Spencer Combined Photo-Micrographic and Projection Objective

These objectives represent a type of construction between the microscopic and the photographic objectives. They have the same aperture as the Heliar objectives. They are free from distortion, astigmatism, curvature of field and focal difference for visual and chemical rays. Their very excellent spherical correction permits them to be used with Huyghenian eyepieces. The field covered by these lenses is somewhat smaller than that of the Heliars, but will be found large enough for almost all requirements. The 32 mm. objective, for example, permits the photographing of an object 14 mm. in diameter at a bellows length of 320 mm.; giving an image 140 mm. in diameter. They are mounted with iris diaphragm and made with Society screw.



186-188

Telegraphic Code	Catalogue No.	EQUIVALENT FOCUS		Price
		Millimeters	Inches	
Onatesix	186	32	1 $\frac{1}{3}$	\$20.00
Onateate	188	16	$\frac{2}{3}$	18.00

## Micro-Projection Objectives

### New Spencer Micro-Teleplat Objectives

After long and careful research along the line of micro-projection, with a view of producing a lens of superior qualities for such work, we offer herewith our new Micro-Teleplat objectives. These objectives are made from selected glass, and after formulae which insures unusual brilliancy and a very large flat field, with sharp definition to the extreme edge of the field. They are constructed somewhat after the formulae of photographic objectives; the lower powers having a speed of F. 5, while the higher powers have a value of F. 3;—sufficient for brilliant projection and unusual covering power. We cannot recommend

## SPENCER LENS COMPANY

them too highly to those who want to attain the highest accomplishments in micro-projection.

They also give excellent results in photo-micrography.

The mountings are handsomely finished in dull black; doing away with all reflections. The 60 mm. and the higher power objectives are provided with the Society screw, so they may be used on any microscope. The 90 mm. and the 125 mm. may be mounted to fit to the large tube of Nos. 5, 10 and 16; or especially adapted to the micro-attachments on the Spencer Delineascopes.—See delineascope catalogue. When ordered by themselves, the purpose for which they are to be used should be stated.

### Micro-Teleplat Objectives

Telegraphic Code	Catalogue No.	Equivalent Focus mm.	Price
Asevfisix	8756	125	\$20.00
Asevfivate	8758	90	20.00
Asevsixo	8760	60	20.00
Asevsixto	8762	48	20.00
Asevsixfor	8764	32	20.00
Asevsixsix	8766	24	15.00
Asevsixate	8768	16	15.00
Asevsevo	8770	8	15.00
Asevsevtto	8772	4	10.00

### Spencer Micro-Projection Objectives

These objectives are constructed more nearly after the formulae of the regular microscope objectives. They are achromatic and give excellent results. The fields are unusually flat and the definition is sharp and distinct.

They are mounted in neat mountings, provided with the Society screw, and finished in dull black to prevent reflections.

Catalogue No.	Equivalent Focus mm.	Price
8780	60	\$4.50
8782	40	4.50
8784	32	4.50
8786	16	5.00
8788	8	8.00
8790	4	8.00

## Photographic Lenses



### The Spencer Acuplats

The Spencer Acuplats are composed of two symmetrical systems; each system being composed of two uncemented lenses. They are anastigmatic and especially adapted to the critical needs of the scientist in his laboratory and in the field, as well as for particular photographic work generally.

The fact that there are but four uncemented lenses in all, means that the liability to strain found in cemented lenses is removed, and that more light is transmitted because of the small number of lenses involved. Each system may be used separately as a long form objective with excellent results.

The acuplats are not only free from astigmatism but are also free from spherical and chromatic aberrations, ghost and flare. They give a remarkably strong, sharp image to the extreme corners of the plate for which they are rated:—in fact, the uniform precision and sharpness from center to margin are unexcelled.

They are neatly mounted in handsome black lacquered barrels, with iris diaphragm, or they may be fitted to any of the standard shutters.

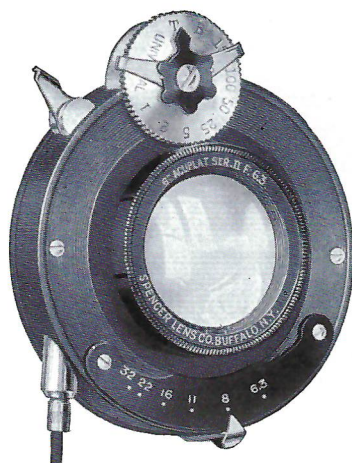
### Spencer Acuplats—Series I

This series is especially designed for photo-engraving, but they give most excellent results wherever extremely critical work is demanded and where speed is not a vital factor. They are apochromatic as well as anastigmatic. The foci for the different colors of the spectrum register exactly; making them indispensable for three-color work and for color photography.

# SPENCER LENS COMPANY

## Spencer Acuplats—Series I

Telegraphic Code	Catalogue No.	Size of Plate Covered at Full Aperture	Speed	Equiv. Focus in inches	Diam. Lenses in inches	Price	EXTRA FOR PRISM FOR PHOTO-ENGRAVING	
							Aperture Prism Mounting	Price
Ex	1	6½x8 ½	8	9	1¼	\$ 45.00	2½	\$ 48.00
Excel	2	8 x10	8	12	1⅔	60.00	2½	48.00
Excelo	3	10 x12	8	15	2	90.00	3	75.00
Exceller	4	12 x15	8	18	2½	120.00	3	75.00
Excelling	5	18 x20	8	24	3⅓	200.00	3½	90.00
Excellent	6	22 x28	9	30	3¾	285.00	4	120.00
Excelsis	7	36 x40	10	48	4½	460.00	4½	190.00
Excelsior	8	48 x60	15	72	5	1,000.00	5	250.00



## Spencer Acuplats—Series II

This series is constructed on the same general principles as those involved in all our acuplats. Their pronounced anastigmatic qualities coupled with their speed, the brilliant images, and their clear, crisp definition to the extreme corners of the plate, make them most desirable for hand camera work.

Telegraphic Code	Catalogue No.	Size of Plate at F. 6.3	Equiv. Focus in inches	Diam. of Lenses in inches	PRICE				
					In Lens Barrel with Iris	With Ilex General Shutter	With Ilex Universal Shutter	With Compound Shutter	With Lens Barrel Only
Onfor	14	3¼x4¼	5½	1⅝	\$28.00	\$32.00	\$36.00	\$40.00	\$4.50
Onfiv	15	4 x5	6¼	1⅞	30.00	35.00	39.00	43.00	4.50
Onsix	16	3¼x5½	7	1⅞	36.00	41.00	45.00	48.00	4.50
Onsev	17	5 x7	7⅞	1¼	40.00	46.00	50.00	53.00	4.50

## The Spencer Port-land, F-4.5



**Soft-Focus Lens**

The Port-land Soft Focus lens is especially adapted for artistic home photography—the making of pictures worth preserving. Art critics the world over are recognizing the fact that the photographic artist can express his ideals and have as much personality in his pictures as a painter. In order to realize these ideals, it is often necessary to defy tradition and make one's negatives more or less soft or diffused, instead of hard and wiry-sharp. To accomplish this, it is necessary to have the aid of a lens capable of giving a sharp or soft picture at will; one that gives a softness and roundness to the subjects that is so necessary in serious picture making.

The Port-land lens fulfills these requirements and more. It has a peculiar property of rendering sunlight and brightly lighted objects with a wonderful luminous quality. No matter how diffused a picture you make, it never loses the form of the subject.

### Advantageous Features

It gives any degree of diffusion from very soft to sharp.

It does not lose form of subject when diffused.

It holds the aerial perspective and atmosphere.

It gives the luminous quality of sunlight.

It gives as brilliant a picture against the light as with it.

It has even illumination all over the plate.

It is adapted to both portrait and landscape work.

It makes the pictures tell exactly the story you want them to tell and no other.

It is put up in a handsome black lacquered mounting, with iris diaphragm, and is adapted to most of the standard shutters and cameras.

No.	Size of Plate covered at full aperture. Inches	Diameter Inches	Equivalent Focus Inches	Speed	Diameter Flange Inches	Net Price
2	4 x 5	1½	6	F-4.5	2¾	\$20.00
4	6½ x 8½	2	9	F-4.5	3¼	25.00
6	8 x 10	2	11½	F-5.6	3¼	25.00
8	11 x 14	2¾	15	F-5.6	4½	50.00
10	14 x 17	3½	18	F-5.6	5½	75.00

## Nature Study Glasses



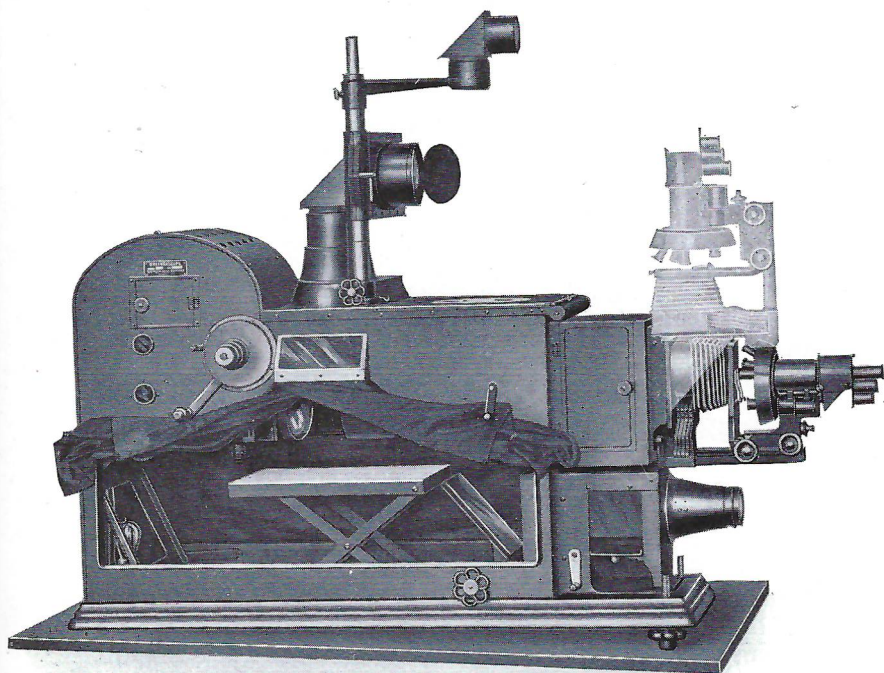
To satisfy the many inquiries made of us every year for recommendation of a good field glass for bird and nature study work, we offer a glass particularly adapted for these purposes and which we feel confident will satisfactorily meet every need. It is a field glass of extra quality, both optically and mechanically. It has a very large field of view, excellent illumination, magnifies four diameters. It is black-morocco covered, bars and tubes are made of metal, black oxidized. Length when closed is  $3\frac{1}{2}$  inches; when extended,  $4\frac{1}{2}$  inches; weight, including case, 17 ounces. In solid leather case.

NATURE STUDY GLASS..... \$8.00

Catalogue No. 198

Telegraphic Code, Oninate

## Spencer Delineascopes



### Spencer Delineascope—Model 8

For transparent, opaque, vertical, microscopic, broadside projection we have incorporated many new and original features.

For uniqueness in design, convenience in operating, quick and simple adaptability from one kind of projection to another, and in attained results, Spencer delineascopes offer many advantageous features which strongly appeal to those desiring to accomplish the most satisfactory projection.

Made in several models, from the simplest to most complete. Separate catalogue sent free on request.

# Magnifiers

In the manufacture of all our magnifiers we use the same care and follow the same exact methods as in formulating and making our microscope objectives, so that they are of a far better quality than the cheaper class of lenses usually offered.

We furnish our magnifiers in three different styles of mounting, according to the different purposes for which they are to be used.

A,—for dissecting stand.

B,—for desk use, with hexagonal handle.

C,—in folding pocket case.

## Doublet Magnifiers



A



B



C

These doublet magnifiers are composed of two separate plano convex lenses, very carefully and accurately ground and polished and substantially set in a rich black lacquered mount. Types B and C are nickered. They give excellent definition and an exceptionally flat field with greater focal length than is usually found in this type of lens.

Telegraphic Code	Catalogue No.	Magnification	FOCAL DISTANCE		Distance Working mm.	Real Field mm.	Mount.	Price
			Milli-meters	Inches Approx.				
Tooto	202	6x	41.6	1.6	22	22	A—For Dissecting Microscopes	\$1.00
Toofor	204	9x	27.8	1.1	15	16		1.00
Toosix	206	12x	20.8	0.8	12	11		1.00
Tooate	208	18x	13.9	0.5	8	8		1.25
Toten	210	24x	10.4	0.4	6	5.5		1.50
Toonto	212	6x	41.6	1.6	22	22	B Hexagon Handle	1.00
Toonfor	214	9x	27.8	1.1	15	16		1.00
Toosix	216	12x	20.8	0.8	12	11		1.00
Toonate	218	18x	13.9	0.5	8	8		1.25
Totoo	220	24x	10.4	0.4	6	5.5		1.50
Tototo	222	6x	41.6	1.6	22	22	C Fold'g Case	1.25
Totofor	224	9x	27.8	1.1	15	16		1.25
Totosix	226	12x	20.8	0.8	12	11		1.25
Totoate	228	18x	13.9	0.5	8	8		1.50
Tothro	230	24x	10.4	0.4	6	5.5		1.50

# SPENCER LENS COMPANY



## No. 240 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.

Price, each . . . . . \$ .35

## Triple Aplanatic Magnifiers



A



B



C

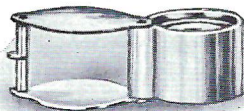
These lenses are remarkable for their great working distance and their unusually large, flat field. They are perfectly achromatic and free from distortion.

Telegraphic Code	Catalogue No.	Magnification	FOCAL DISTANCE		Working Distance mm.	Diam. Real Field mm.	Mount.	Price
			Milli-meters	Inches Approx.				
Tofivsix	256	6x	41.6	1.6	36.8	30	A—For Dissecting Microscopes	<b>\$3.50</b>
Tofivate	258	9x	27.8	1.1	24.5	20		<b>3.50</b>
Tosixo	260	12x	20.8	0.8	18.4	15		<b>3.50</b>
Tosixto	262	18x	13.9	0.5	12.1	10		<b>3.50</b>
Tosixfor	264	24x	10.4	0.4	9.2	7.5		<b>3.50</b>
Tosixsix	266	6x	41.6	1.6	36.8	30	B—Hexagon Handle	<b>3.50</b>
Tosixate	268	9x	27.8	1.1	24.5	20		<b>3.50</b>
Tosevo	270	12x	20.8	0.8	18.4	15		<b>3.50</b>
Tosevto	272	18x	13.9	0.5	12.1	10		<b>3.50</b>
Tosevfor	274	24x	10.4	0.4	9.2	7.5		<b>3.50</b>
Tosevsix	276	6x	41.6	1.6	36.8	30	C—Folding Case	<b>3.50</b>
Tosevate	278	9x	27.8	1.1	24.5	20		<b>3.50</b>
Toateo	280	12x	20.8	0.8	18.4	15		<b>3.50</b>
Toateto	282	18x	13.9	0.5	12.1	10		<b>3.50</b>
Toatefor	284	24x	10.4	0.4	9.2	7.5		<b>3.50</b>

## The New Spencer Veraplanats



A



C

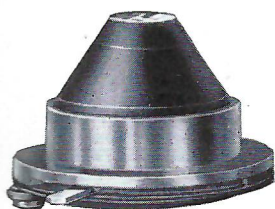
These new magnifiers are the result of computation and experimentation to obtain the highest possible results so far as the most critical definition, large, clear, flat fields and long working distances are concerned. We heartily recommend them to those who must have the best.

# SPENCER LENS COMPANY

## The New Spencer Veraplanats,—Continued

Telegraphic Code	Catalogue No.	Magnification	FOCAL DISTANCE		Working Distance	Diam. Real Field mm.	Mount.	Price
			Milli-meters	Inches Approx.				
Toatesix	286	6x	41.6	1.6	36.8	33	A—For Dissecting Microscope	\$6.00
Toatesev	287	9x	27.8	1.1	24.5	24		6.00
Toateate	288	12x	20.8	0.8	18.4	18		6.00
Toatenin	289	18x	13.9	0.5	12.1	12		6.00
Tonino	290	27x	9.5	0.4	8.5	8		6.00
Toninthre	293	6x	41.6	1.6	36.8	33	C—Folding Case	6.00
Toninfor	294	9x	27.8	1.1	24.5	24		6.00
Toninfiv	295	12x	20.8	0.8	18.4	18		6.00
Toninsix	296	18x	13.9	0.5	12.1	12		6.00
Toninsev	297	27x	9.5	0.4	8.5	8		6.00

## Substage Condensers



Abbe Condenser and Mounting

Two kinds of substage condensers are in most general use:—the achromatic which are corrected for two colors of the spectrum; and the Abbe which are non-achromatic.

The achromatic condensers are superior to the Abbe, and for the most exacting visual work, and for photomicrography, they are practically a necessity. The fact that they are spherically, as well as chromatically corrected, means that they furnish to the objective a cone of light suited to the most critical conditions.

The non-achromatic Abbe condensers are very generally used for routine work. We manufacture two kinds:—one of N. A. 1.20 and another of N. A. 1.40.

Both condensers are mounted with an iris diaphragm beneath them to modify the amount of light, and are also provided with a ring beneath the iris to hold a blue glass for cutting out the yellow rays of artificial light; or to hold a "center stop," which to some extent will provide dark field illumination. The mounting is like the cut above for the friction collar substages or is swung on the arm of the drop-swing condenser mounting.

No matter what the aperture of the objective or condenser may be, nothing greater than N. A. 1.0 can be obtained unless an immersion fluid be placed between the upper surface of the condenser lens and the under surface of the slide.

Telegraphic Code	Catalogue No.	Description	Price
Threhun	300	Abbe Condenser N. A. 1.20	\$ 7.50
Threofiv	305	Abbe Condenser N. A. 1.40	9.00
Threonfiv	315	Achromatic Condenser N. A. 1.30	25.00

## Dark Field Illuminator No. 340



The construction of this illuminator is such that it can be used on *any* microscope. The condenser is mounted in a solid piece of brass with slots at the end for the stage clips of the microscope. The illuminator being held in this way permits the use of ordinary slides on the top surface.

After the Abbe condenser has been removed, concentrate the light from the *plane* mirror on the little ring on the top surface of the illuminator. The illuminator should be carefully centered by making the little ring concentric with the field of a low-power (16 mm.) objective, and the light should be so manipulated that this ring is brightly and evenly illuminated. Direct sunlight can be used. Very good results can be obtained by using a Welsbach light with a bulls-eye condenser No. 100. The best source of light is the new electric arc light No. 360 or incandescent lamp No. 370 or No. 375.

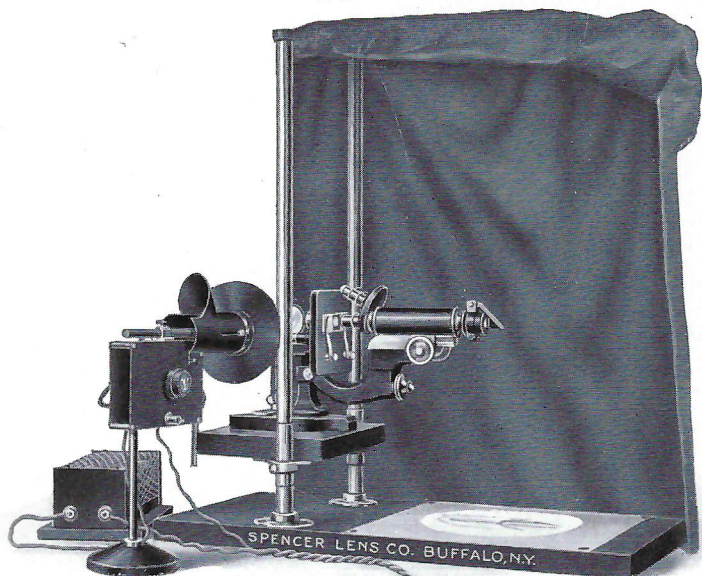
The specimen should be so mounted that the space between the slide and cover glass is as thin as possible, and both slide and cover glass should be perfectly clean. A drop of immersion oil should be placed between the illuminator and the under side of the slide; care being taken to eliminate any air bubbles.

When an oil-immersion objective is used, the little special diaphragm accompanying the illuminator should be placed back of the back lens system. In our objectives this is done by unscrewing the nicked portion from the lacquered part and placing the special diaphragm in the larger diaphragm thus exposed.

Price, in neat case, including special diaphragm,..... \$10.00

Telegraphic Code, **Threforo**

## Drawing Apparatus No. 345



This apparatus is made as simple as possible and yet possesses the general advantages and practical features that enable the worker to attain a very high degree of efficiency.

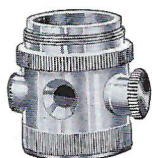
The lamp is No. 360, with a disc at the end of the condenser tube upon which to reflect the image of the substage condenser by the mirror until the image is coincident with the center of the disc. In this way the light is properly centered without putting the eye to the eyepiece.

The microscope is supported on an adjustable shelf which can be raised or lowered on the vertical rods; thus enabling one to get any desired magnification which is impossible to obtain with fixed supports. There are two curtains and they hang freely; thus avoiding all interference with the hands in drawing. If one desires, the arc lamp can be put in line with the microscope and the mirror turned aside.

For a reflector beyond the ocular, to throw the image onto the drawing board, a *prism* is used; thus avoiding the defects of a mirror. Any compound microscope can be used.

Telegraphic Code	Catalogue No.	Description	Price
Threforfiv	345	Complete drawing apparatus as described, including drawing board with curtains, supports, etc., hand-feed arc lamp No. 360, rheostat No. 365 and prism No. 346 without microscope	\$33.00
Threforsix	346	Prism only . . . . .	5.00
Threforsev	347	Mirror for use in place of prism . . . . .	2.50

## Vertical Illuminators



No. 350 Vertical Illuminator is constructed to screw into the nose piece between it and the objective. The light is directed into the opening in the side until it strikes the silvered surface of a prism from whence it is reflected down through the objective 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 turned slightly to reflect the light down through the objective as desired.

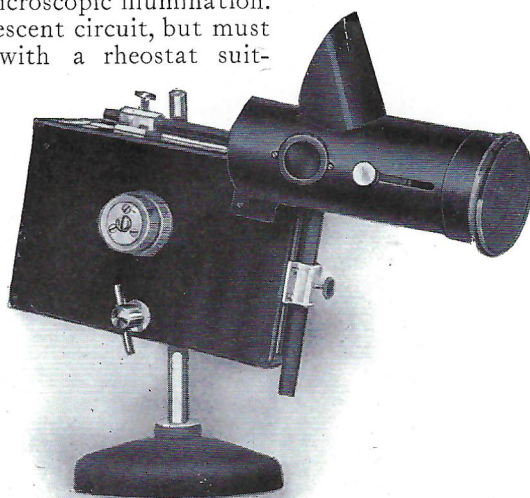
Vertical Illuminator No. 355 is like No. 350, excepting that it is provided with a cover glass for reflection instead of the prism. It also has a means for providing openings of three different sizes.

Code	No.	
Threfivo	350	\$6.50
Threfiviv	355	6.50

## Electric Arc Lamp No. 360

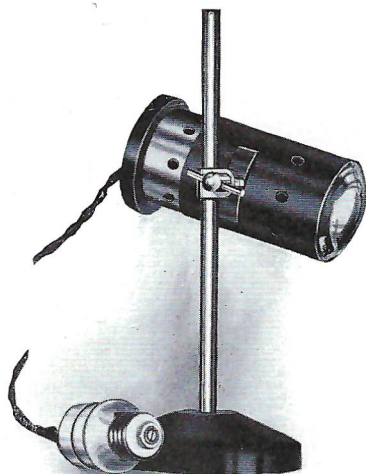
Although designed especially for use with the dark field illuminator and the vertical illuminator, this lamp serves excellently as a lamp for general microscopic illumination. It works on any incandescent circuit, but must always be provided with a rheostat suited to the voltage.

The carbons may be moved independently or at the same time. The arc may be observed through the little window at the side of the tube. The condenser may be focused to and from the arc. The lamp is provided with a blue glass and a ground glass, either or both of which fit into a groove in front of the condenser. It is adjustable as to height and angle on its upright support.



Telegraphic Code	Catalogue No.	Description	Price
Thresixo	360	Lamp with five-foot connecting cord, blue glass and ground glass.....	\$14.00
Thresixto	362	Fixed rheostat for 110 volts—5 amperes..	5.50
Thresixfor	364	Fixed rheostat for 220 volts—5 amperes..	9.00
Thresixsix	366	Extra carbons, each.....	.05

# Incandescent Electric Lamps



No. 370



No. 375

- 370, This new lamp is supplied with a 16 candlepower mazda bulb, with a metal reflector back of it. The condensing lens is 60 mm. in diameter. The bulb may be focused to and from the condenser by telescoping the tube containing it into the tube supporting the condenser. The lamp is supplied with a blue glass and a ground glass, which are held in front of the condenser by a ring not shown in the illustration. The lamp is adjustable as to height and angle.

Tele-  
graphic  
Code

- Thresevo 370, complete on standard with five feet of cord and socket, and with bulb for 110-volt current..... \$ 9.00
- 372, Extra bulbs for the above..... 1.00

- 375, The large, cylindrical portion of this lamp is 4 inches in diameter and 5¼ inches long. The condensing lens is 60 mm. in diameter. In front of the lens is a receptacle for the blue glass and ground glass which accompany the lamp. The lamp is adjustable as to height and angle.

Tele-  
graphic  
Code

- Thresevfi 375, complete on standard, with five feet of cord and socket and with 50 candlepower concentrated filament bulb for 110-volt current..... 11.00
- Thresevsix 376, same as above, with bulb for 220-volt current.... 11.50
- Thresevsev 377, same as above, with concentrated filament mazda bulb for 110-volt current, 110 watts,—about 100 candlepower..... 12.00
- Thresevate 378, extra bulbs for No. 375..... 1.00
- Thresevnin 379, extra bulbs for No. 376..... 1.50
- Threateo 380, extra mazda bulbs for No. 377..... 2.00

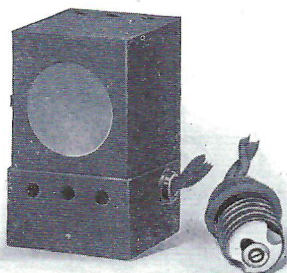
# SPENCER LENS COMPANY

## Incandescent Gas Lamp

Code	No.		
<b>Threatethre</b>	<b>383</b> ,	This lamp is exactly like No. 375, with the exception that the inverted gas mantel is substituted for the electric bulb.	<b>\$9.00</b>

## New Miniature Electric Lamp

This is constructed primarily for use directly beneath the stage of the microscope, being placed between the feet of the instrument. It is low enough to work beneath the regular substage condenser, but it can be stood on end as shown in the illustration and used in conjunction with the mirror. It is supplied with a four candle-power incandescent bulb which works on the regular 110-volt current. A blue glass and ground glass accompany each lamp.



Code	No.		
<b>Threatefiv</b>	<b>385</b> ,	Complete, with bulb and five feet of cord and socket.	<b>\$3.00</b>
<b>Threatesix</b>	<b>386</b> ,	Extra bulbs for the above.	<b>.50</b>

## Low Voltage Miniature Lamp



This lamp was designed by Dr. Thos. G. Lee of the University of Minnesota to give maximum light with minimum heat in as compact form as possible. The lamp is designed to set beneath the stage of the microscope. It rests on a black fibre base and is supplied with a six candle power Mazda bulb, back of which is a parabolic reflector. A ground glass and blue glass may be easily removed and replaced.

The small bulb takes a six-volt current which may be had from the ordinary circuit by using a transformer suited to the voltage furnished and the number of lamps used.

One transformer may be made to serve for all the lamps used in a laboratory, or for one single lamp. In ordering, be sure to specify the current used and the number of lamps to be used on their circuit.

Code	No.		
<b>Threateate</b>	<b>388</b> ,	Miniature lamp complete, with three foot connections to transformer.	<b>\$2.50</b>
<b>Threnino</b>	<b>390</b> ,	Transformer for 220-volt alternating current.	<b>4.00</b>
<b>Threninon</b>	<b>391</b> ,	Transformer for 110-volt alternating current.	<b>4.00</b>

Transformer prices, include five feet of cord and plug for ordinary socket. Write for further information if more than one lamp is to be used on a transformer, or if direct current is to be used.

## Micrometers

- 400, STAGE MICROMETER**, glass object slide with finely-ruled scale, 1 mm. divided into 100 parts. . . . . **\$3.00**  
 This micrometer is not so much intended for direct measurements as for the standardizing of the eyepiece micrometers.  
 Telegraphic Code, **Forhun**
- EYEPIECE MICROMETER.** Circular glass disc with finely-ruled scale; to be laid upon the diaphragm of ordinary Huyghenian eyepieces.
- 405, 5 mm. divided into 50 parts (to 0.1 mm.)** . . . . . **1.25**  
 Telegraphic Code, **Forofiv**
- 410, 5 mm. divided into 100 parts (to 0.05 mm.)** . . . . . **1.50**  
 Telegraphic Code, **Forten**



No. 420

**MICROMETER EYEPIECE**, with fixed scale. This provides a more convenient method of using the scale above described. The ruled glass disc is fixed in place, and the eye lens is mounted in an adjustable sleeve which permits an exact focusing upon the scale.

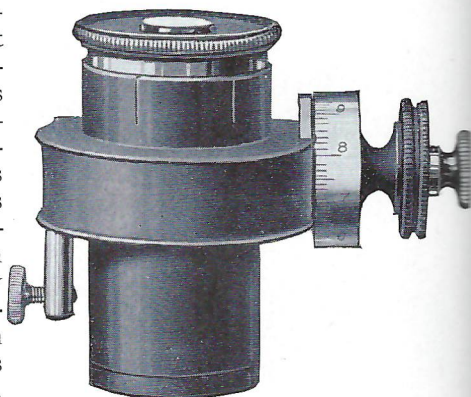
- 415, MICROMETER EYEPIECE 4x** . . . . . **4.00**  
 Telegraphic Code, **Foronfiv**
- 420, MICROMETER EYEPIECE 8x** . . . . . **4.00**  
 Telegraphic Code, **Fortoo**

### Micrometer Eyepiece No. 425

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 being exactly equivalent to one revolution of the screw which moves it. 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 necessary.

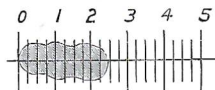
The scale is 5 mm. long and is divided into twenty spaces; each millimeter is marked by a line of double length. As the screw is made with a pitch of  $\frac{1}{4}$  millimeter, one revolution of the screw moves the scale  $\frac{1}{4}$  of a millimeter, or one of the intervals.

Upon the axis of the screw is placed an adjustable drum which may be set to any desired position. This is graduated with 100 divisions, for reading of which an index pointer is fastened on top of the micrometer case.



## SPENCER LENS COMPANY

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; as for example, line No. 0 in the sketch, then, holding the milled head of the screw fast, the drum is turned until the index stands at zero. Now turning the screw until the line



which the other edge of the object just overlaps is coincident with that edge, the reading of the drum added to the number of full quarter millimeter divisions covered (nine in the sketch) gives the apparent length of the object—its real length depending on magnification used.

With an ordinary or filar micrometer it would have been necessary to move the cross hairs over the whole length of the object, which in the above instance would have required nine full revolutions besides the fractional turning of the drum, while with our screw micrometer it was only necessary to move the scale over a part of one space.

For measurements of less accuracy this micrometer can also be used without turning the screw; simply using the subdivisions of the scale as in the ordinary micrometer.

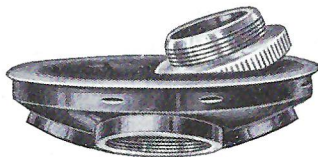
Price, in case. . . . . \$25.00

Telegraphic Code, Fortofiv

## Revolving Nosepieces



No. 450



No. 455

The new circular dust-proof nosepieces have become so popular that we have discontinued the old type.

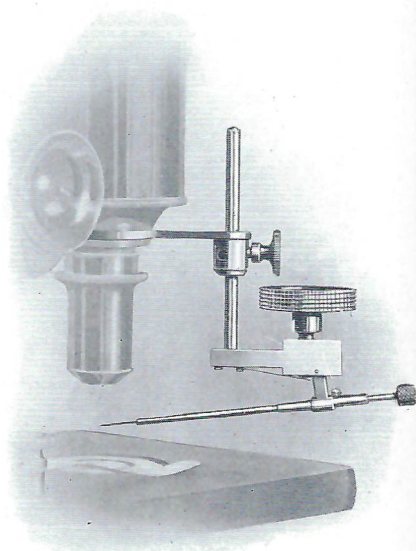
These new nosepieces are very carefully made. We have taken the greatest care to see that they are perfectly centered and that they are strong enough to remain so. They are neatly finished in alcohol-proof enamel, with the focal lengths of the objective used neatly engraved on the edge of the revolving portion.

Code No.

<b>Forfivo</b>	<b>450,</b>	Double nosepiece. . . . .	<b>\$4.00</b>
<b>Forfivfiv</b>	<b>455,</b>	Triple nosepiece. . . . .	<b>5.50</b>
<b>Forsixo</b>	<b>460,</b>	Quadruple nosepiece. . . . .	<b>7.00</b>

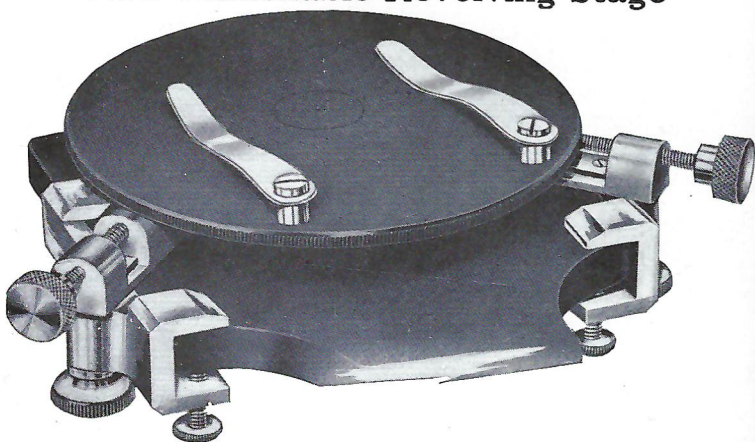
## New Attachable Mechanical Finger

This instrument is designed for isolating and handling very small objects under the microscope. It is adjustable as to height and azimuth in the forked support which is clamped between the shoulder of the objective and the tube. A small rod slides through a sleeve so mounted that it may be delicately tilted to any desired angle by means of a fine screw with large knurled head which works against a very light spring. It enables one to perform the most delicate manipulations while watching the operation under the microscope.



Code	No.		
Forateo	480,	Mechanical finger.....	\$14.00

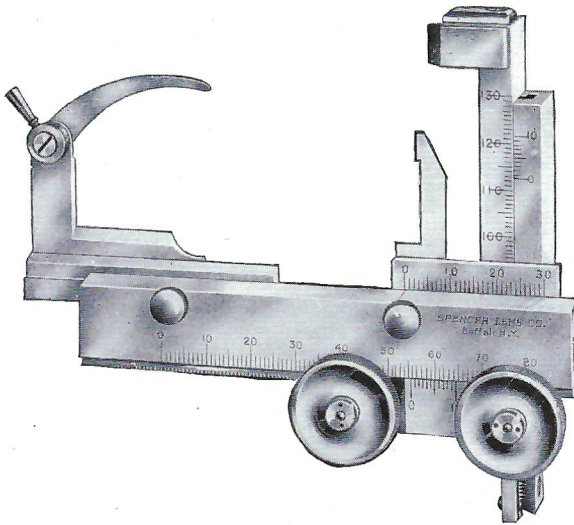
## New Attachable Revolving Stage



This instrument is so constructed that it may be quickly and easily attached to any ordinary microscope. It may be centered accurately by centering screws which also provide a mechanical movement; carrying any particular point over an area 5 mm. in diameter. The disc in the center may be removed when dealing with transparent objects.

Code	No.		
Forateto	482,	Attachable revolving stage.....	\$18.00

## Spencer Attachable Mechanical Stage No. 485



The common-sense features and general accuracy and efficiency involved in Spencer mechanical stages have compelled such general recognition that they are now considered the standard type. They may easily be clamped to any rectangular microscope stage—a feature originated by us nearly ten years ago, and since used.

A stop at the front always insures its return to the same position on the microscope stage; so that should work be interrupted and the mechanical stage removed, when it has been replaced, any part of the specimen under observation may be instantly found by noting the vernier readings. The vernier of the lateral movement is placed slightly to one side of the arm of the microscope where it can easily be read.

The movements of this mechanical stage are by diagonal rack and pinion, and are entirely firm and reliable; permitting the most delicate adjustments. The range of movement is large in both directions; giving 85 mm. lateral motion and 40 mm. vertical.

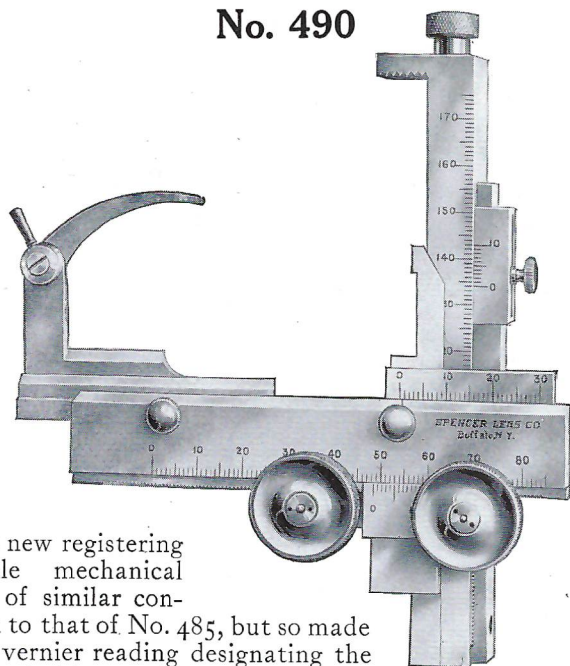
The slide rests upon the surface of the microscope stage and is held in place at one end by an adjustable stop with spring clip and at the other end by an adjustable stop; permitting the use of slides of varying lengths.

The adjustment buttons are near to one another, so that both may easily be moved by the fingers of one hand. Their position relative to each other always remains unchanged.

Code No.

**Foratefive 485, Mechanical stage, complete, in mahogany cabinet... \$16.00**

## Spencer Attachable Mechanical Stage No. 490



This new registering attachable mechanical stage is of similar construction to that of No. 485, but so made that the vernier reading designating the locations of objects taken on one microscope will register with the readings for the same objects taken on any other microscope. The vernier for the vertical movement is adjustable; which adjustment, together with the fact that the arms holding the slide are adjustable, incorporates this very desirable registering feature. The vernier which records the lateral movement is located between the buttons which operate the rack-and-pinion movements, where it can be easily read.

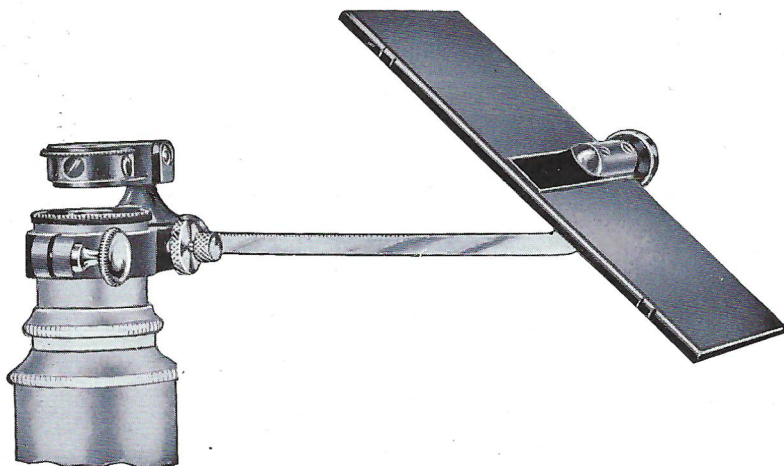
This mechanical stage also differs from No. 485 in that it meets the demand for handling a 3 inch x 2 inch slide. By arranging the clamp at the front of the stage so that it does not interfere with the slide, and by providing sufficient range, rigidity and accuracy, this very desirable feature is provided. The range of movement is exceptionally large in both directions; giving 85 mm. lateral motion and 65 mm. vertical.

The adjustment buttons are near to one another; which relative position is always sustained.

The registering feature of this stage, its adaptability for handling 3 inch x 2 inch slides, as well as its greater range of vertical movement will commend it to the laboratory worker.

Code	No.	
Fornino	490,	New registering attachable mechanical stage, complete, in mahogany cabinet. . . . . \$18.00

## Abbe Camera Lucida No. 500



**One Which Shows the Whole of the Field, the Object, and the Pencil Point Clearly**

The original Abbe principles have been retained, but the prism is so mounted that the opening in the silvering can be lowered in the case of the higher power oculars, or raised with the lower powers until it comes to the exact focus of the ocular. With the higher powers, the prism will nearly touch the upper lens. At the same time, the eye can be brought so close to this opening that the pupil takes in all of the divergent rays coming from the whole of the field of the ocular; making the field appear as large and the object very nearly as distinct as though the camera were not in position.

The prism can be so centered with one hand by two concentric screws (shown in the cut at the right of the draw tube), that the field is free from color to the extreme edge.

The smoked glasses are so mounted, around and below the prism, that the light from the pencil and the object can be easily modified to make them equally distinct.

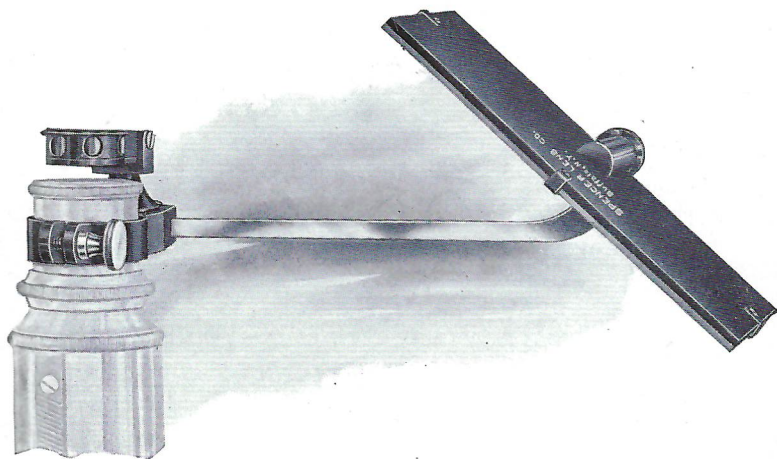
To change the ocular, or for more critical examination of the object, these parts can be turned back on a horizontal axis to a position entirely out of the way.

The very large mirror (70 mm. x 105 mm.) is supported on an adjustable, graduated mirror bar.

All in all, the camera is the neatest, most compact and usable ever produced.

Price, in case..... \$20.00  
Telegraphic Code, Fivhun

## Abbe Camera Lucida No. 505

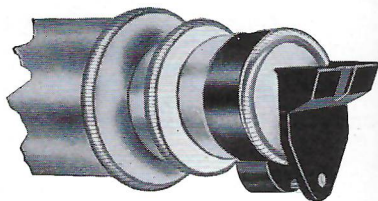


This camera is like No. 500, with the exception that the prism is permanently centered at the factory and that there is no means for modifying the light from the ocular. The prism is the same size and mounted in a similar way. There are no loose parts to get out of place when the prism is moved in and out of the optical center.

Price, in case. . . . . \$10.00  
Telegraphic Code, Fivofiv

## Wallaston Camera Lucida No. 510

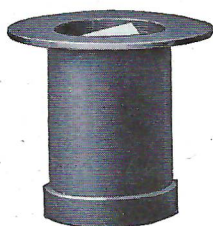
This is a simple prism so mounted that when the microscope tube is inclined, the image is apparently thrown upon the paper beneath, and the pencil point is plainly seen at the same time. The camera is held in place by a spring clamp which fits around the draw tube. It is so mounted that the prism may be easily swung in and out of the optical axis. It is a very good inexpensive camera lucida.



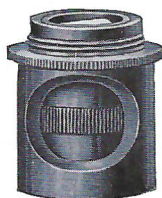
Price . . . . . \$4.50  
Telegraphic Code, Fivten

When ordering camera lucidas, please state the outside diameter of the draw tube upon which they are to be used. When no size is given, we will send those which fit our tubes as well as the tubes of the European makers, which are standard.

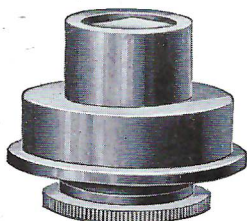
## Polariscopes



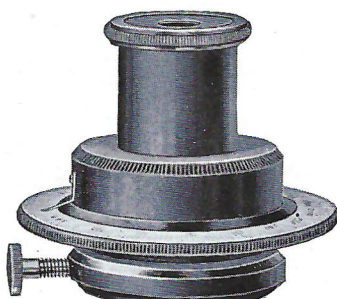
Polarizer A



Analyzer A



Polarizer B



Analyzer B

For convenience in selecting instruments adapted to all kinds of work, we have mounted each of the analyzers and polarizers in two different styles of mounts.

**POLARIZER A** is a simple mount, with flange fitting the ring regularly supplied with every condenser for holding the blue glass, and is, of course, used with the condenser.

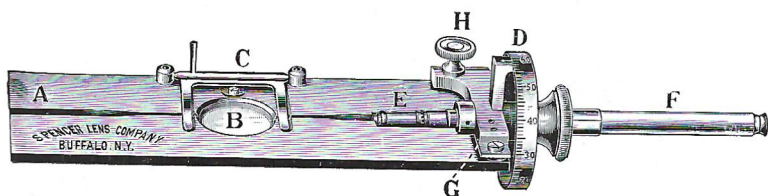
**POLARIZER B** is so mounted that it fits into the substage ring which holds the condenser after the same has been removed. The Nicol prism is free, and revolves with its mounting inside of the larger mounting fitting the substage ring.

**ANALYZER A** is mounted to screw into the microscope tube between it and the objective which is screwed into the lower end. The Nicol prism with its mounting is free to revolve inside of the outer mounting, so that the axis of the prism may be brought into any desired relation to that of the Nicol in the polarizer.

**ANALYZER B** is so mounted as to bring the analyzing Nicol above the ocular. The Nicol is mounted to give the largest possible field. The disc is graduated to degrees. The prism with this disc is easily removed for exchange of eyepieces. The whole analyzer is securely clamped in the tube in any desired position.

Code	No.		
<b>Fivtofv</b>	<b>525,</b>	Polarizer A, with Analyzer B.....	<b>\$20.00</b>
<b>Fivtoate</b>	<b>528,</b>	Polarizer B, with Analyzer B.....	<b>21.00</b>
<b>Fivthreto</b>	<b>532,</b>	Polarizer B, with Analyzer A.....	<b>18.00</b>
<b>Fivthrefiv</b>	<b>535,</b>	Polarizer A, with Analyzer A.....	<b>17.00</b>
<b>Fivforo</b>	<b>540,</b>	Selenite films properly mounted and engraved, for use with either style of polarizer, for red of the I, II, III and IV order, each.....	<b>1.50</b>
<b>Fivforfv</b>	<b>545,</b>	Mica films mounted as above, graduated to pro- duce differences of phase equal to $\frac{1}{8}$ , $\frac{1}{4}$ , $\frac{3}{8}$ and $\frac{1}{2}$ , each.....	<b>1.00</b>

## Capillary Rotator



### For the Study of Living Organisms

In the rectangular base plate, A, a circular glass thinner than the metal plate is inserted, so as to become the bed of a shallow chamber, B.

The capillary tube lies loosely in the longitudinal groove, and is firmly held in both bearings by the pressure of a double spring, C, so that the portion within the chamber may be turned with great precision and without any side motion.

For rotation, a drum, D, is provided, graduated in 100 divisions, through whose axis passes the special holder that carries the capillary tube. The drum and holder are so mounted upon the base plate with a spring, G, that the capillary tube may be raised parallel to itself when desired.

This instrument is especially intended for use with oil-immersion objectives. When used, the chamber is filled with the immersion oil until the capillary tube is covered; by this means, as the oil has the same refractive index as the capillary tube itself, the space intervening between the microscope objective and the organisms in the tube becomes a homogeneous medium; thus compensating for any unevenness in the structure of the capillary tube.

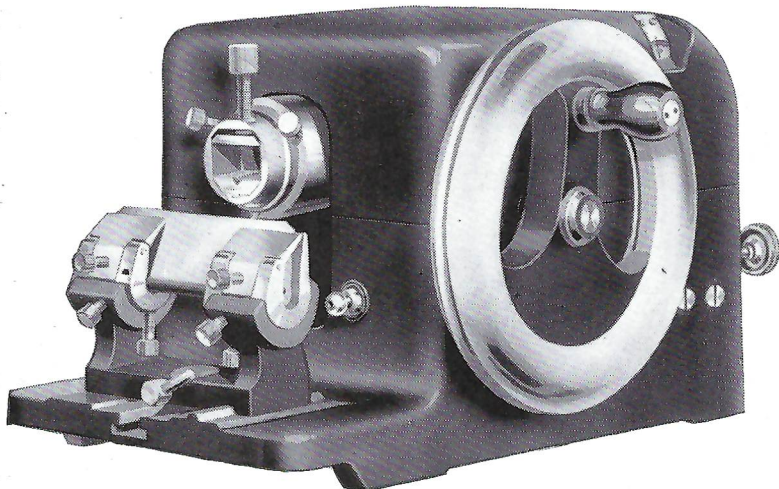
The capillary tube when filled is first clamped firmly in the holder which is inserted in the axis of the drum and lowered by the screw, H. The capillary tube is now laid in the Y-shaped bearings, and the double spring, C, is closed upon it. The apparatus is then placed on the microscope stage, so that the chamber is centered over the condenser. Using a low power objective, the desired place in the field is found by moving the tube holder; or, if that is insufficient, by moving the instrument itself.

The chamber is then filled with the oil, the observation with the immersion objective is begun, and when the object for investigation has been found, a rotation of the graduated drum will enable the observer to examine it on all sides.

560, Price, in case ..... \$12.00

Telegraphic Code, Fivsixo

## Rotary Microtome No. 820



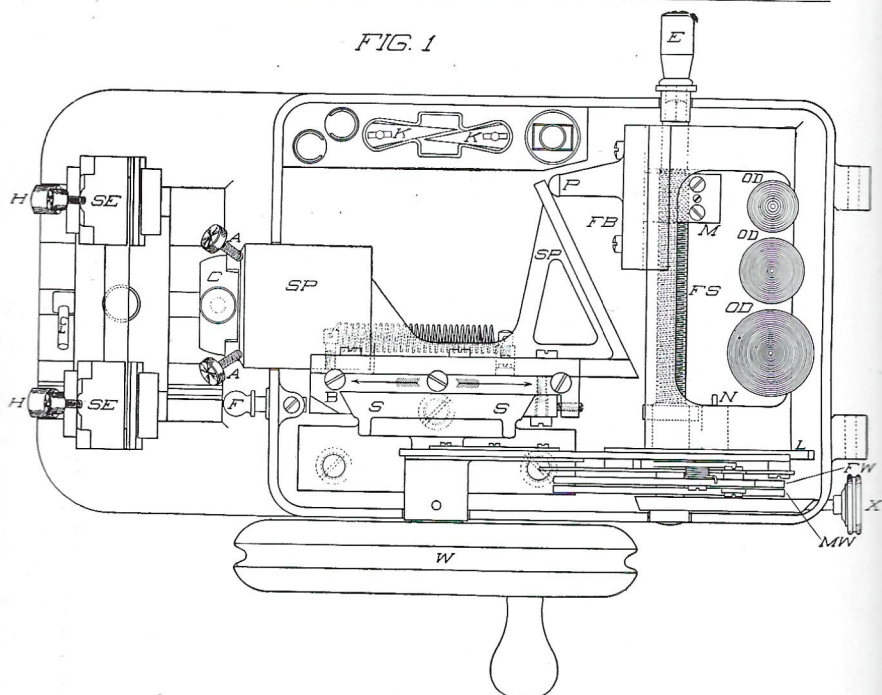
This new rotary microtome has been designed after an entirely new construction, and is offered for the most accurate and careful work. An inclined plane feed attachment, which is absolutely independent of the up-and-down movement on the perpendicular support, overcomes the inaccuracies inherent in earlier 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.

In this microtome, the sliding part which carries the object clamp (see S. P. Fig. 1) is carried up and down by the block, B, through which it is free to move backwards and forwards. It is, therefore, *independent of any lost motion* in the direction of the arrows which results from the fitting of this block to its upright support, S.

The polished inclined plane surface at the end of this sliding part is held firmly against a projection, P, which is a part of the very rigid feed mechanism which is independent of the up-and-down movement.

This feed mechanism is composed of a rigid bearing on which the feed block, FB, of which the point, P, is a part, is moved by the feed screw, FS. As this block is moved toward the side on which the balance wheel, W, is located, the sliding part, SP, is forced forward towards the knife one half as much, because the polished surface resting against the point, P, is set at the proper angle to accomplish this end. Thus any imperfection in the screw is reduced by one half. As the screw is cut with two threads to the millimeter, and as it is revolved by a ratchet feed wheel with 250 teeth, each tooth represents a feeding of the object forward one micron.

FIG. 1



The feed is so arranged that it can be set for sections of any thickness, from 1 micron to 60 microns, by turning the knurled button at the back of the case until the number 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.

The pawl which works into the teeth of the feed ratchet wheel, FW, is located at the end of an arm which swings on an axis identical with that of the screw. This arm is actuated by a connecting arm, running from it to an eccentric which revolves with the balance wheel, W. This eccentric is so located on the axis that the feeding is done when the object is at its upper limit, and thus above the knife, thereby avoiding the danger of forcing the face of the paraffin against the knife on the upward stroke.

By the side of the feeding ratchet wheel there is another ratchet wheel, MW, like it, but placed with the teeth running in the opposite direction. Working into the teeth of this wheel is a pawl fastened to the upright support of the sliding bearing of the feed block, FB. This pawl is kept away from the teeth of its ratchet wheel by a cam fastened to the arm carrying the feed pawl, and is allowed to engage the teeth only for an instant at the extreme end of the feeding stroke. This brings the wheels and feed

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screw to a definite stop, overcoming momentum, and always ensuring sections of exactly the thickness called for; which is, of course, a very essential feature.

The feed pawl is automatically lifted free from the teeth of its ratchet wheel on the return stroke; thus avoiding wear and the accompanying noise.

As a precaution against injury to the thread of the feed when the nut has reached its limit, provision has been made for throwing the feed mechanism out of commission. When the projection, M, presses against the pin, N, the lever, L, is released and is drawn down by a spring,—automatically stopping any further feeding.

To resume cutting, the block must be moved back by the little crank, E, which slips onto the opposite end of the screw. Then, if after raising the cover, the lever, L, be pulled up until it stops, the other parts will automatically resume their proper positions for cutting. The little crank just mentioned provides a means for moving the specimen to and from the knife with the delicacy of a microscope fine adjustment.

The foregoing unique and eminently efficient features in the feeding mechanism of this instrument are vital to the success of any microtome. They must also be accompanied by proper provision for rigidly holding the object and the knife.

The object clamp, C, is a part of a ball which fits into its socket in the front of the sliding part, SP. A flange projects from the back side of the object clamp against which the ends of the three set screws impinge to force the ball (clamp) into its socket; thereby securing the clamp as solidly as though it and its socket were one piece.

The object is easily, accurately and delicately oriented to any desired angle by loosening one or two screws and at the same time tightening the other screws. The angle can be changed in any plane without interfering with any desired angle already attained in any other plane. To rotate the object on the horizontal axis, it is only necessary to loosen one screw slightly. The clamp is arranged to hold discs (three of which are furnished with the microtome) or blocks equally well, and may be enlarged to hold extra large blocks. No clamp has ever been devised to equal it for rigidity, pliability and accuracy and ease of manipulation.

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  $1\frac{1}{4}$  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 much neater 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. We furnish the microtome complete, with motor and speed regulator, mounted on a neat microtome table, 38 inches long and 26 inches wide. When ordering motor, care should be taken to state the kind of current to be used and also the voltage.

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.

### Advantageous Features

The feed is independent of any inaccuracies due to the up-and-down movement of the object.

The inclined plane is an additional help toward accuracy.

The modified escapement in connection with the ratchet wheels insures against momentum causing inaccuracy.

The feeding is done when the object is above the knife.

The feed may be set for any thickness from 1 micron to 60 microns.

The adjustment for thickness is convenient and definite.

The total excursion of the feed is 37mm.—double that of most microtomes.

The feed pawl is automatically raised above the teeth on the return stroke.

The feeding is automatically stopped when the feed nut has reached its limit.

The adjusting of the object to the knife can be done more delicately than on any other microtome.

The object clamp is absolutely rigid, of great capacity, and is more easily and accurately oriented than any other.

The up-and-down stroke of 50 mm. is sufficient for cutting very large sections, also for cutting celloidin sections.

The knife is clamped at each end at the edge as well as at the back.

The knife clamps may be moved toward one another to provide additional rigidity when desired, and to permit using practically the whole of the cutting edge of the knife before resharpening.

The whole mechanism is covered.

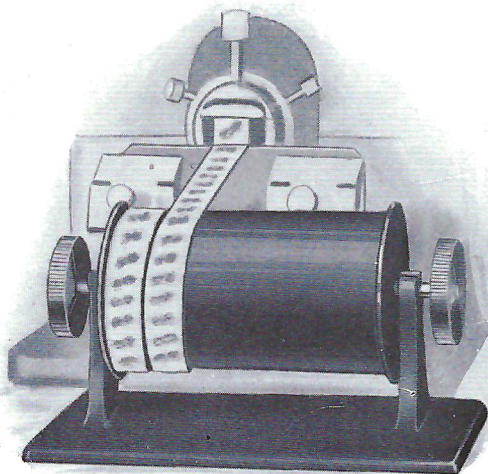
The object discs, knives, handles, etc., are provided for inside the case.

The microtome may be run by a motor.

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Code.	No.		
Atuo	820,	New Spencer Rotary Microtome with one knife, handle and back for sharpening, and with three object discs.....	\$100.00
Atufiv	825,	Knife holder for celloidin sections, extra.....	15.00
Ninforto	942,	Knife for paraffin sections, extra.....	5.00
Ninfortre	943,	Knife for celloidin sections, extra.....	5.00
Athreo	830,	Table with motor, and speed regulator enclosed for 110-volt direct current, extra.....	60.00
Athrefiv	835,	Same for 220-volt direct current, extra.....	75.00

### New Spencer Cylindrical Ribbon Carrier



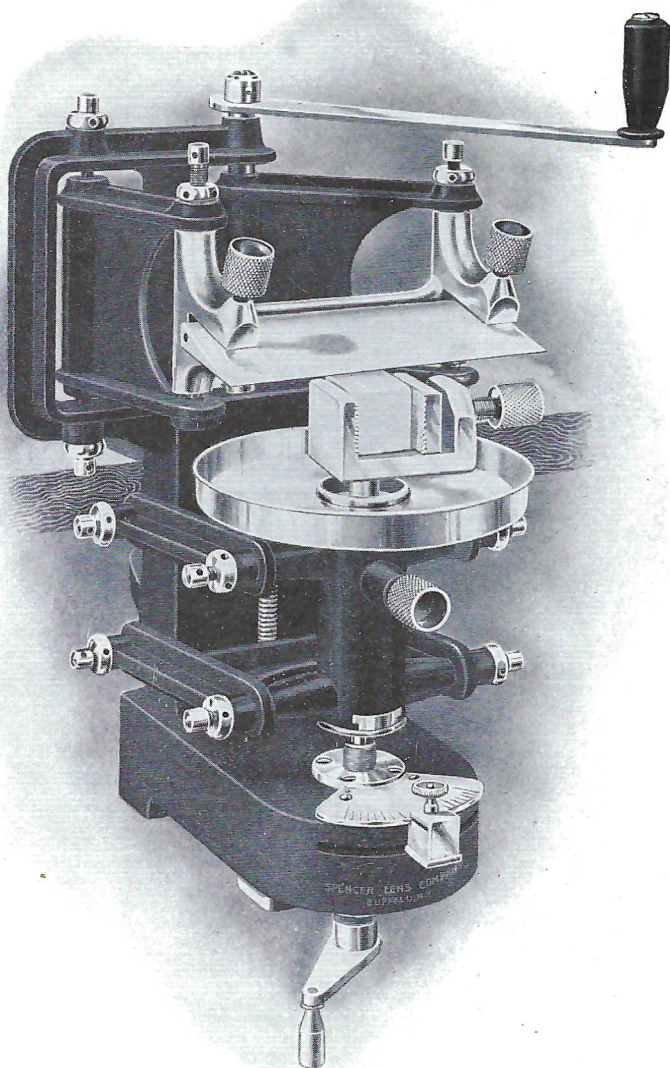
This ribbon carrier is compact and easy to operate. It is made after the suggestion of Dr. C. E. McClung of the University of Pennsylvania. The aluminum cylinder is mounted in an aluminum framework, under the base of which are little rollers, rolling in the direction of the long dimension of the frame.

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 one turn after another, each approximately 8 inches long, may be spread out in order on the paper.

The cylinder is  $4\frac{1}{2}$  inches long and  $2\frac{5}{8}$  inches in diameter. It is mounted to bring it as close as possible to the knife.

Code.	No.		
Ateforo	840,	Cylindrical ribbon carrier.....	\$8.00



**Automatic Laboratory Microtome No. 880**

## 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<sub>2</sub> 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 this medium.

Another important advantage in this method of construction is its convenience to the user. In most microtomes with sliding parts, these require frequent lubrication with oil, and in consequence are liable to be clogged with dirt, requiring frequent cleaning, and also to become loose and shaky; their construction being such that it is difficult for the user to clean or adjust them. In this microtome, lubrication is not required, and in its construction every joint is provided with pivot screws and check nuts, and by means of a steel pin sent for the purpose the owner may take the instrument apart and adjust or clean it as occasion may require.

The object clamp for paraffin or celloidin blocks has a pin or round shank which may be fastened by a clamp screw in a vertically movable socket which is supported by two vertically swinging arms attached at the back to the main frame by hardened steel pivot screws. Similar pivot screws at the front hold the socket in the swinging arms; thus providing for its vertical movement the same parallelogram principle as is applied to the knife. By this means, a very steady movement is secured and the top of the

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object always remains in the same horizontal position; thus further insuring uniformity of thickness in the sections.

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 is connected with the object-supporting socket by means of a ball-socket bearing, to which the object support is firmly held down 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.

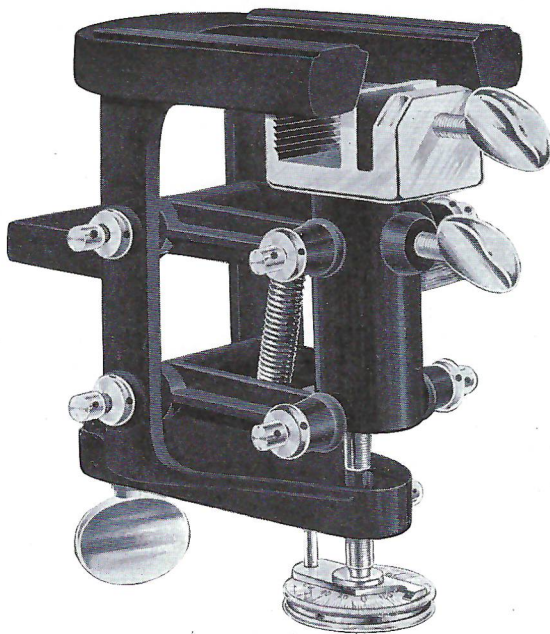
A long, vertical shaft, extending to the lever arm at the top of the main frame and connected at the bottom by a simple lever device, moves the pawl backward and forward simultaneously with the movement of the knife, so that wherever the index is placed on the graduated scale, the object is correspondingly raised at each swing of the knife. The crank at the bottom can be used independently of this automatic motion and provides for quickly raising or as quickly lowering the object whenever desired.

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 cannot 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.

Code	No.		
Ateateo	880,	Automatic laboratory microtome complete, with one knife and usual object clamp for paraffine or celloidin, in packing case, net.....	\$45.00
Ateatefiv	885,	Usual object clamp for paraffine or celloidin, if ordered separately, net.....	2.50
Ateateate	888,	Automatic Laboratory Microtome No. 880, with one knife, object clamp, and fitted with No. 930 freezing attachment for CO <sub>2</sub> .....	55.00
Ateatenin	889,	Automatic Laboratory Microtome No. 880, with one knife, object clamp, and fitted with No. 915 ether freezer.....	51.00

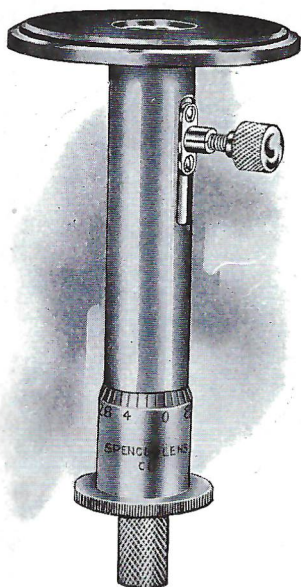
## Table Microtome No. 900



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 for paraffin blocks sets 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.

Ether freezing attachment No. 915 or CO<sub>2</sub> freezing attachment No. 930 may be substituted for the usual object clamp, and when so equipped makes a very satisfactory microtome for frozen section work. Knife No. 965 is especially made for this microtome.

Code	No.		
<b>Ninhun</b>	<b>900,</b>	Table microtome as shown . . . . .	<b>\$12.50</b>
<b>Ninotu</b>	<b>902,</b>	Table Microtome No. 900 fitted with No. 930 freezing attachment for CO <sub>2</sub> . . . . .	<b>22.50</b>
<b>Ninofor</b>	<b>904,</b>	Table Microtome No. 900 fitted with No. 915 ether freezer . . . . .	<b>18.50</b>



## Hand Microtome No. 905

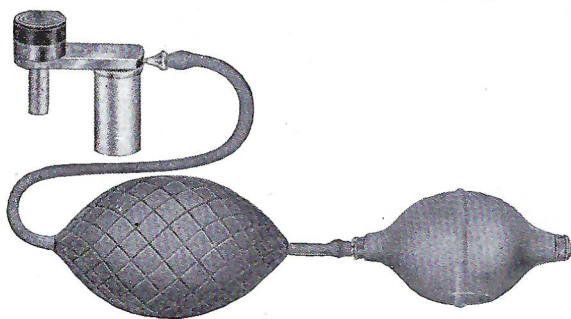
In this convenient but inexpensive microtome the object is placed in a clamp in the upper end of the tube, and is raised through the hole in the glass plate by an accurately cut screw, which is entirely enclosed and protected from dust and injury. The feed is accurate and finely graduated. Each division 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.

905, ..... \$6.00

Telegraphic Code, Ninofiv

## Ether Freezer No. 915

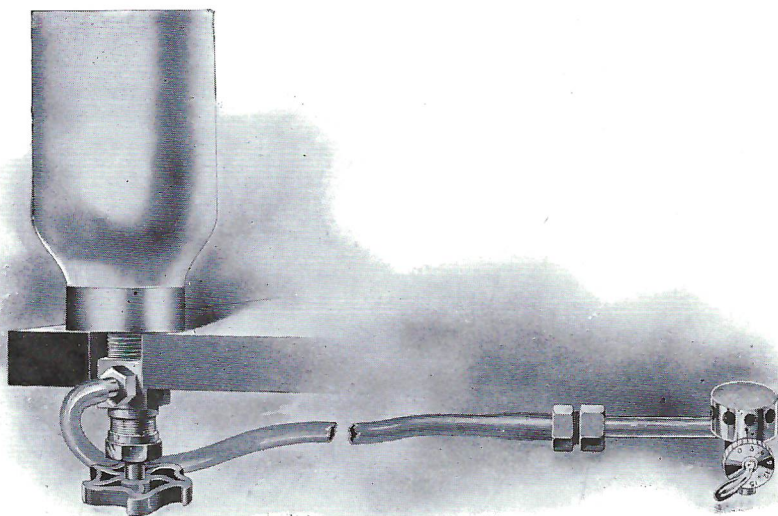


This freezing attachment consists of a freezing chamber of hard rubber which so prevents the radiation of the cold that the tissue is quickly frozen. It will freeze tissue, 15 mm. in diameter and 3 mm. thick, in one minute; using only 5 cc. of ether.

The ether is held in the metal tank, which for filling may be unscrewed from the support from which it is suspended. 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.

915, Ether freezer..... \$6.00  
Telegraphic Code, Ninonfiv

## Freezing Attachment For CO<sub>2</sub> No. 930



The superior qualities of this freezing chamber have been well recognized during the past ten years. It is substantially made, easy to operate, and eminently efficient. There is 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.

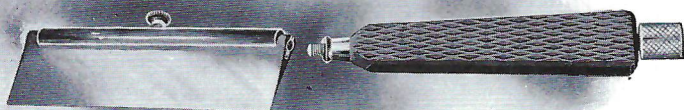
The chamber is provided with a pin like that on the object clamp, which fits into the same socket on the microtome. The chamber is connected with the CO<sub>2</sub> cylinder by a flexible copper tube.

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 and without any inconvenience caused by the freezing up of the chamber or the connections. By this method a section may be cut, stained and mounted ready for examination in one and one half minutes from the time the tissue is put on the chamber.

This freezing attachment may be used with Microtomes Nos. 880 and 900.

**930,** Complete, with copper tube connections..... **\$10.00**  
Telegraphic Code, *Ninthree*

## 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 lain 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.

For sharpening our microtome knives, we furnish, when ordered, our ebonized handle as shown in the cut. The steady-pins of the handle hold it in proper position, while the screw of the handle-rod engages directly with the corresponding thread cut in the knife and is tightened to a firm hold by means of the milled-head shown. The metal parts are finely nickel-plated.

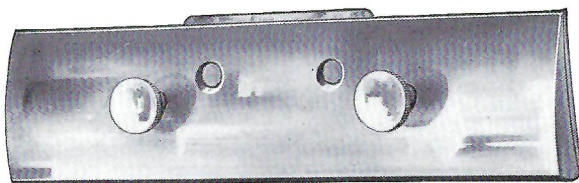
In order that the knife may rest upon the honing stone at the proper angle when being sharpened, we make the special plated steel honing back which appears in the cut. This slips over the back of the knife. The whole is handsomely polished and nickel-plated. All knives are furnished in plush-lined cases.

Telegraphic Code	Catalogue No.	Size:—Cutting Edge	Price
<b>Ninthrefiv</b>	<b>935</b>	50 mm., no handle	<b>\$ 2.00</b>
<b>Ninforo</b>	<b>940</b>	110 mm., no handle	<b>4.00</b>
<b>Ninfortu</b>	<b>942</b>	120 mm., no handle	<b>5.00</b>
<b>Ninforthre</b>	<b>943</b>	120 mm., no handle	<b>5.00*</b>
<b>Ninforfiv</b>	<b>945</b>	185 mm., no handle	<b>7.00</b>
<b>Ninfivo</b>	<b>950</b>	250 mm., no handle	<b>12.00</b>
<b>Ninfivfiv</b>	<b>955</b>	Handle for sharpening	<b>1.00</b>
<b>Ninsixo</b>	<b>960</b>	Back for sharpening	<b>.50</b>

All makes of microtome knives carefully reground and sharpened. Price, depending on size of knife and condition..... \$ .75 to \$1.25.

\*Ground for celloidin.

## Holder For Safety Razor Blades No. 964



**For use on any microtome which has a knife clamp**

This holder for safety razor blades is made of two strips of brass held together by two knurled headed screws. The contact surfaces of these parts are of such a curve as is usually used in the holders for the thin blades of the Gillette type.

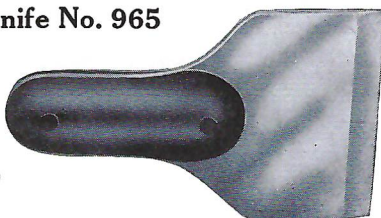
The thin edge of the blade projects beyond the upper edge of the holder just enough to keep it as rigid as possible and at the same time far enough to allow the specimen to pass by the holder after cutting the section. The holder is nickel-plated. It can be used on any microtome provided with a knife clamp.

When used with the new Spencer Rotary Microtome No. 820, the knurled headed screws may be removed if desired, as the unique knife clamp will hold the parts together without them.

Code No.  
**Ninsixfor 964**, Holder for safety razor blades..... \$4.00

## Microtome Knife No. 965

Code No.  
**Ninsixfiv 965**, Microtome knife, chisel blade form, cutting edge, 88 mm., for use on table microtome, especially where a freezing chamber is used..... \$4.00



## Hones

We have used the greatest care in the selection of our hones, to see that they are perfect in every respect and free from grit. By using the yellow Belgian hone first, and following it with the blue-green hone, the best and quickest results are obtained. A small rubbing block accompanies each blue-green hone.

Telegraphic Code	Catalogue No.	Description and Size	Price
<b>Ninsevo</b>	<b>970</b>	Yellow Belgian, 10 in. by 2¼ in., in wooden box	<b>\$2.75</b>
<b>Ninsevon</b>	<b>971</b>	Yellow Belgian, 6 in. by 1½ in., in wooden box	<b>1.40</b>
<b>Ninsevtu</b>	<b>972</b>	Yellow Belgian, 4 in. by 1 in., in wooden box	<b>.75</b>
<b>Ninsevfiv</b>	<b>975</b>	Blue-green, 10 in. by 2¼ in., in wooden box....	<b>.90</b>
<b>Ninsevate</b>	<b>978</b>	India oilstone, 3 in. long by ⅞ in. wide; an excellent stone for scalpels, cuts fast.....	<b>.60</b>

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## Strops

In selecting a strop, we have kept in mind the requirements of the microtome knives, and convenience in stropping.

- 980, Strop consists of a flat strip of wood with a handle at one end. On one side of this strip is cemented a piece of leather,  $1\frac{3}{4}$  inches wide and 11 inches long, into which a very fine carborundum powder has been rubbed. For finishing, the other side is covered by a very fine piece of leather of the same size \$ .90  
Telegraphic Code, Ninatoo
- 985, Strop is similar to No. 980, except that the leather is on one side only and is  $2\frac{1}{4}$  inches wide by 15 inches . . . . . 1.00  
Telegraphic Code, Ninatofv
- 990, Strop is like No. 985, except that the leather is the best shell butt horsehide . . . . . 2.25  
Telegraphic Code, Ninninty

## Fibre Blocks—Red, for holding specimen for sectioning

Catalogue No.	Size	Price per 100	Catalogue No.	Size	Price per 100
994	$\frac{1}{2} \times \frac{1}{2} \times \frac{3}{4}$	\$3.00	996	$\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4}$	\$4.50
995	$\frac{5}{8} \times \frac{5}{8} \times \frac{3}{4}$	3.50	997	$1 \times 1 \times \frac{3}{4}$	6.00

## Object Slides and Cover Glasses



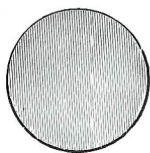
## Slides

Free from defects in the glass. The surfaces are plane, so that the slide lies flat upon the stage. Edges well ground.

- 1000, SLIDES, 75x25 mm. (3x1 inch) medium thickness, per gross \$ .85
- 1005, SLIDES, 75x25 mm. (3x1 inch) extra thin, per gross . . . . . .80
- 1010, SLIDES, 44x25 mm. ( $1\frac{1}{2}$ x1 inch) medium thickness, per gross .85
- 1015, SLIDES, 50x25 mm. (2x1 inch) medium thickness, per gross .90
- 1020, SLIDES, 75x38 mm. ( $3 \times 1\frac{1}{2}$  inch) medium thickness, per gross 1.40
- 1025, SLIDES, 75x50 mm. (3x2 inches) medium thickness, per gross 2.15
- 1030, SLIDES, 75x25 mm. (3x1 inch) one concave center, per dozen .60
- 1032, SLIDES, 75x25 mm. (3x1 inch) two concave centers, per dozen .90
- 1034, SLIDES, 75x25 mm. (3x1 inch) three concave centers, per doz. 1.20
- 1035, SLIDES, 75x25 mm. (3x1 inch), drop culture, cavity, 16 mm. diameter and 2 mm. deep, in polished plate glass, each . . . . .20

# SPENCER LENS COMPANY

## Cover Glasses



Best white glass

Uniform in thickness

Catalogue No.	Shape	Thickness	*Dimensions	Price per oz.
1050	Squares	No. 0—Selected, extra thin	15, 18, 22 or 25 mm.	\$1.50
1055	Squares	No. 1—0.13 to 0.17 mm.	15, 18, 22 or 25 mm.	.75
1060	Squares	No. 2—0.17 to 0.25 mm.	15, 18, 22 or 25 mm.	.60
1065	Squares	No. 3—0.25 to 0.50 mm.	15, 18, 22 or 25 mm.	.50
1070	Circles	No. 0—Selected, extra thin	15, 18, 22 or 25 mm.	1.50
1075	Circles	No. 1—0.13 to 0.17 mm.	15, 18, 22 or 25 mm.	.75
1080	Circles	No. 2—0.17 to 0.25 mm.	15, 18, 22 or 25 mm.	.60
1085	Circles	No. 3—0.25 to 0.50 mm.	15, 18, 22 or 25 mm.	.50

\*Always designate size wanted with catalogue number.

## Approximate Number of Covers Per Ounce

Circles	13mm.	16mm.	18mm.	22mm.	24mm.	Squares	13mm.	16mm.	18mm.	22mm.	24mm.
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

No. 1	Approx. No. per oz.	Per oz.	No. 2	Approx. No. per oz.	Per oz.
1090 22x30 mm.	120	\$1.00	1130 22x30 mm.	90	\$ .75
1095 22x40 mm.	106	1.00	1135 22x40 mm.	65	.75
1100 22x50 mm.	75	1.00	1140 22x50 mm.	62	.75
1105 22x60 mm.	65	1.25	1145 22x60 mm.	48	1.00
1107 22x70 mm.	54	1.25	1147 22x70 mm.	46	1.00
1110 24x30 mm.	110	1.00	1150 24x30 mm.	86	.75
1115 24x40 mm.	100	1.00	1155 24x40 mm.	62	.75
1120 24x50 mm.	70	1.00	1160 24x50 mm.	60	.75
1125 24x60 mm.	54	1.25	1165 24x60 mm.	40	1.00
1127 24x70 mm.	50	1.25	1167 24x70 mm.	38	1.00

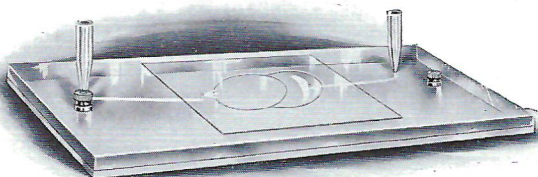
# SPENCER LENS COMPANY

## Mounting Cells

- 1170, Glass, 15 to 22 mm. diameter, 3 to 9 mm. deep, per ten.... \$ .90  
 1175, Rubber, 15 to 22 mm. diameter, 0.5 to 3 mm. deep, per ten .25

**IRRIGATION SLIDE.** This slide was designed by Prof. J. A.

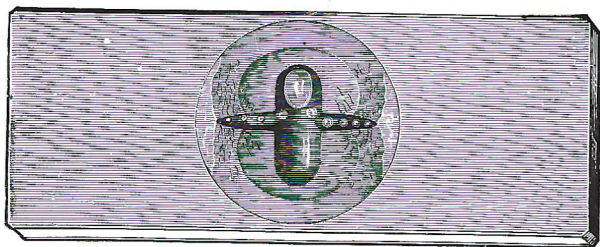
Long of the University of California. It consists of two 1 inch x 3 inch slides fastened together with miniature bolts. A thin layer of vaseline is held



between the slides, to prevent leaking of the fluid used. The fluid is carried to one of the short glass tubes by a small rubber tube. The fluid passes through the upper slide by way of the small glass tube to a groove on the under side of the slide which carries the fluid to a small hole leading upward to the deeper portion of the cell in the upper surface of the slide. The cell is covered with a cover glass, cemented on with vaseline to make it water-tight. The fluid passes to the shallower portion of the cell and from thence down through a small hole to a groove on the under side of the upper slide which leads to the other glass tube through which the fluid is carried away from the slide. The passages are all easily cleaned by simply separating the slides.

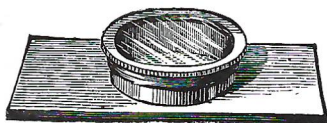
By this means, microscopic objects of different size may be examined with high powers for any length of time and while under the influence of a continuously moving current of any fluid the operator may desire to use.

- 1185, Irrigation slide..... \$7.00



No. 1190

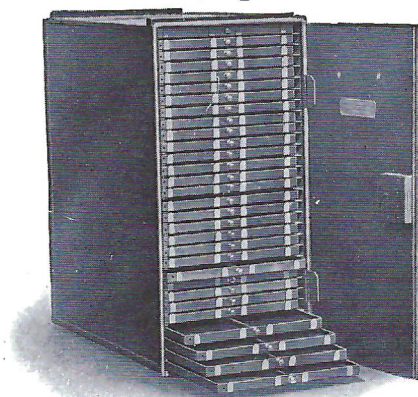
- 1190, LIFE SLIDE, Holman's. Deep central cavity connected by a small channel with shallower beveled cavity. Complete with cover. \$1.25



No. 1195

- 1195, LIFE BOX. Two glass plates, one on metal slip, the other adjusted to it by a sliding sleeve. For examining organisms in fluid. Diameter of cell, 25 mm., maximum depth, 8 mm., slip, 32x80 mm. Price, each..... \$2.00

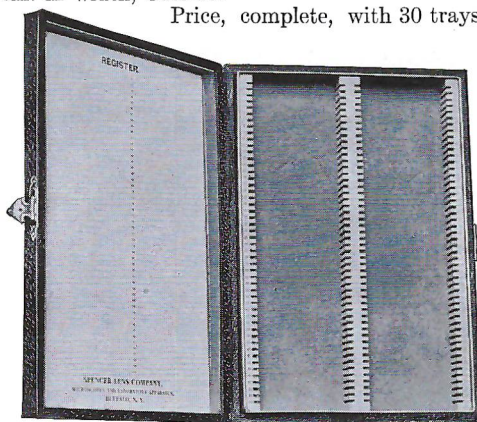
## Slide Receptacles



No. 1200

- 1200,** MINOT'S NEW METAL CABINET. This cabinet, designed by Dr. Chas. S. Minot, is very compact; occupying much less space than a wooden cabinet and affording much better protection against fire. It is strongly made of metal throughout, neatly finished on the outside in maroon-colored japan with bronze stripes. The inside finish is in black japan. It contains 30 japanned metal trays, each holding 24 glass slides, 75x25 mm. The trays are provided with convenient knobs and with card holders. The cabinet is furnished with a good brass lock, and measures 36.5 cm. in height, 32.5 cm. in depth, and 17.5 cm. in width, outside.

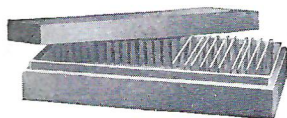
Price, complete, with 30 trays, each...\$20.00



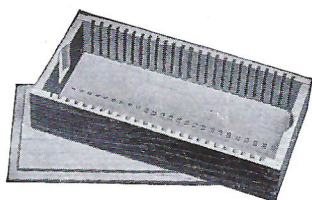
No. 1205

- 1205,** SLIDE BOXES, grooved to hold 100 objects, size 25x75 mm., covered with a heavy dark brown cloth, hinged cover and two catches.  
Price.....\$ .40
- 1210,** SLIDE BOXES, same as No. 1205, but grooved to hold but 30 objects. These boxes are especially desirable where it is necessary to keep objects which are constantly used in a secure and handy receptacle. We use these boxes with our botanical sets No. 1325.  
Price.....\$ .35

# SPENCER LENS COMPANY



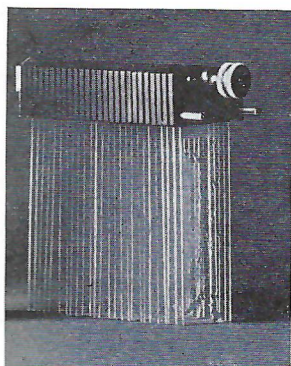
No. 1215



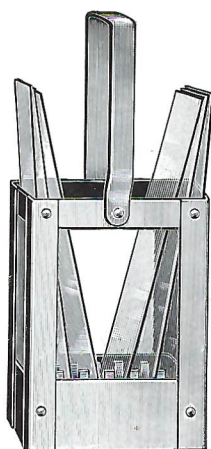
No. 1220

- 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 25 objects, size 25x75 mm., numbered and indexed, per 10..... \$1.00
- 1220, SLIDE BOXES, made of white wood, with closely fitting covers. Grooved to hold 25 objects, size, 25x75 mm., numbered and indexed, per 10..... \$.75
- 1225, SLIDE BOXES, same as No. 1220, but grooved to hold 12 objects, size of slide, 25x75 mm., numbered and indexed, per 10..... \$.55
- 1228, SLIDE BOXES, same as No. 1220, grooved to hold 25 objects, size of slide, 50x75 mm., per 10..... \$2.00
- 1230, SLIDE TRAYS, map form, to hold 14 slides, each..... .22
- 1235, SLIDE TRAYS, map form, to hold 20 slides, each..... .25
- 1240, SLIDE MAILING CASES, tops, middles or bottoms, per dozen.. .10

## Slide Holders



No. 1245



No. 1250

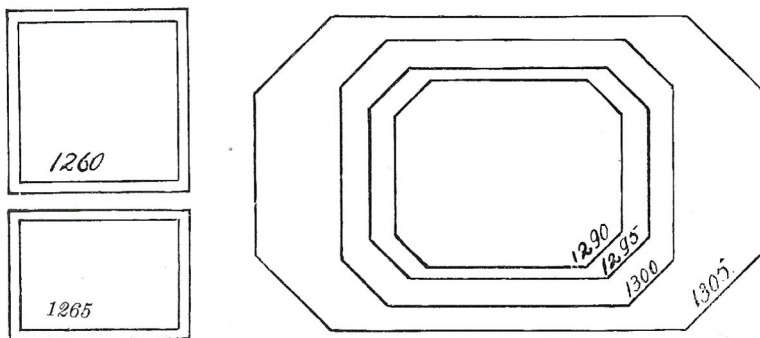
- 1245, MULTIPLEX SLIDE HOLDER. This slide holder was devised by Mr. Edward F. Miller, of the anatomical laboratory of the University of California. It holds 26 slides, and holds them so that there is no danger of disturbing the sections on the slide; each slide being separated from its neighbor by a hard rubber plate.
- The sections on the slides are all stained alike; because all the slides are carried together from one reagent to another.
- This is a great advantage in preparing a number of slides for class work, and in serial section work where the series covers more than one slide. Any jar or receptacle with an opening of sufficient depth to take in the slides will serve the purpose.
- Each, without jar..... \$1.75

# SPENCER LENS COMPANY

- 1250, BASKET SLIDE HOLDER.** This holder was made after a suggestion from Dr. S. H. Gage, of Cornell University. It is made entirely of nickeled brass. The slides are held apart by a "comb" arrangement at the bottom. It holds six slides or, if placed back to back, twelve slides may be put in at one time. It can be used with any receptacle for stain.

Each, without jar. . . . . \$ .90

## Labels



### Best White Paper, Gummed, Black Border, for Microscopical Use. 100 in a Box

<b>1260,</b>	<b>LABELS, 22 mm. square. . . . .</b>	<b>per 100, 8 cts. . . . .</b>	<b>per 1000</b>	<b>\$ .65</b>
<b>1265,</b>	<b>LABELS, 22 mm.x15 mm. . . . .</b>	<b>per 100, 8 cts. . . . .</b>	<b>per 1000</b>	<b>.65</b>
<b>1270,</b>	<b>LABELS, like No. 1260, in books of 500 labels, each. . . . .</b>			<b>.25</b>
<b>1275,</b>	<b>LABELS, printed like No. 1260 or No. 1265, with two lines of printing in blue or red, in lots of 12,000, per lot. . . . .</b>			<b>7.50</b>
<b>1280,</b>	<b>LABELS, printed same as No. 1275, but in black, in lots of 12,000 per lot. . . . .</b>			<b>8.25</b>

We can make these rates on lots of 12,000, because this quantity can be printed at one time most economically. Smaller quantities will cost much more proportionately. We can furnish labels without borders if desired. In ordering, be sure to send sample or clear copy, and state shape, and color of ink wanted.

<b>1290,</b>	<b>LABELS, red border, oblong, 23x30 mm.</b>			
	<b>100 in a box. . . . .</b>	<b>per 100, 8 cts. . . . .</b>	<b>per 1000</b>	<b>\$ .60</b>
<b>1295,</b>	<b>LABELS, red border, oblong, 27x37 mm.</b>			
	<b>100 in a box. . . . .</b>	<b>per 100, 8 cts. . . . .</b>	<b>per 1000</b>	<b>.60</b>
<b>1300,</b>	<b>LABELS, red border, oblong, 35x45 mm.</b>			
	<b>100 in a box. . . . .</b>	<b>per 100, 8 cts. . . . .</b>	<b>per 1000</b>	<b>.60</b>
<b>1305,</b>	<b>LABELS, red border, oblong, 40x65 mm.</b>			
	<b>100 in a box. . . . .</b>	<b>per 100, 8 cts. . . . .</b>	<b>per 1000</b>	<b>.65</b>
<b>1320,</b>	<b>LENS PAPER, JAPANESE. For cleaning lenses, per package. .</b>			<b>.20</b>

## Teachers' Helps in Structural Botany No. 1325

These helps consist of a set of thirty slides, carefully selected, and prepared to illustrate by the sections themselves the minute botanical structures met with in any elementary course in botany.

These slides have been prepared under the direct supervision of Dr. W. J. G. Land, of the University of Chicago. He has himself written a little book dealing briefly with the subject at hand and leading to a detailed description of the important features of each section, and illustrating the same by outline drawings in which these features are carefully pointed out.

By means of this book, the prepared slides and a reasonably good microscope, any teacher can bring his scholars into direct contact with the minute structures, and ought not to fail to make them as interesting and instructive as the larger ones.

We beg to repeat that this is NOT a cheap set, brought together at random, under the head of botany. The whole set is selected to cover the ground in a comprehensive way, and each section is prepared and selected to illustrate the particular subject at hand. In every instance, the structures referred to in the book may be seen.

The following is the list of the prepared slides:

- |                       |                          |                        |
|-----------------------|--------------------------|------------------------|
| 1. GLOEOTHECE.        | 14. BRYUM.               | 23. PINUS.             |
| 2. NOSTOC.            | . longitudinal section.  | . longitudinal section |
| 3. ULOTHRIX           | . capsule.               | . mature staminate     |
| 4. SPIROGYRA.         | 15. FERN (Adiantum.)     | . strobilus.           |
| . conjugation.        | . antheridia.            | 24. LILIUM PHILADEL-   |
| . zygospores.         | 16. FERN. (Osmunda.)     | PHICUM.                |
| 5. OEDOGONIUM.        | . archegonia.            | . transverse section   |
| 6. MUCOR.             | 17. FERN. (Pteris.)      | . ovary.               |
| . sporangia.          | . transverse section     | 25. LILIUM PHILADEL-   |
| 7. PEZIZA.            | . leaf showing sporan-   | PHICUM.                |
| . section apothecium. | gia.                     | . transverse section   |
| 8. COPRINUS.          | 18. FERN. (Pteris.)      | . anther.              |
| . transverse section  | . transverse section.    | 26. TILIA AMERICANA.   |
| . gills.              | . stem.                  | . transverse section   |
| 9. MARCHANTIA.        | 19. DIOON.               | . twig.                |
| . antheridia.         | . longitudinal section   | 27. CUCURBITA PEPO.    |
| 10. MARCHANTIA.       | . ovule.                 | . sieve tubes.         |
| . archegonia.         | 20. PINUS.               | 28. RANUNCULUS ACRIS.  |
| 11. MARCHANTIA.       | . transverse section     | . transverse section   |
| . sporophyte showing  | . needle.                | . root.                |
| . spores and elators. | 21. PINUS.               | 29. ZEA MAYS.          |
| 12. BRYUM.            | . radial, tangential and | . transverse section   |
| . antheridia.         | . cross sections of      | . stem.                |
| 13. BRYUM.            | . mature wood.           | 30. KARYOKINESIS       |
| . archegonia.         | 22. PINUS.               | . root tip of Trades-  |
|                       | . longitudinal section   | cantia Virginica.      |
|                       | . young ovulate strob-   |                        |
|                       | .ilus.                   |                        |

Put up in a neat, cloth-covered box, with hinge and clasp.

Price, with the book..... \$9.00

# SPENCER LENS COMPANY

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