

*Spencer*

RESEARCH  
MICROSCOPES



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SPENCER LENS COMPANY  
BUFFALO, NEW YORK, U. S. A.



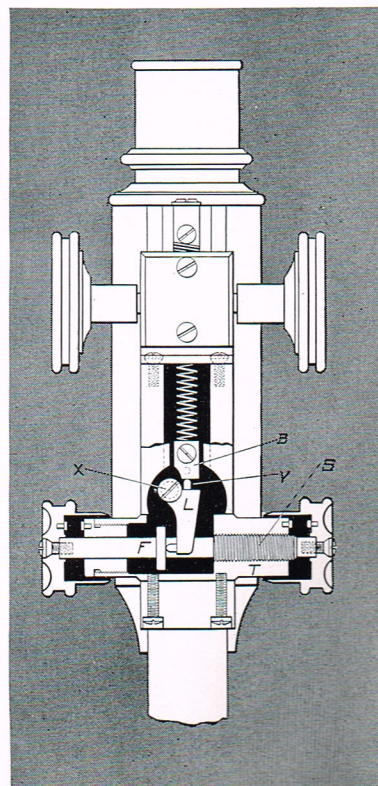
# Spencer MICROSCOPES

The microscope is an optical instrument, and as such must be judged primarily by its optical qualities. Although the Spencer Lens Company is responsible for many innovations and improvements in the mechanical features of the microscope, these improvements have always been either subservient to the optics, or supplementary thereto. The optics are the all important element and have consequently been given a correspondingly important place in our research and experimentation to produce the best optical parts. These exceptional achievements in our optical parts are not so patently apparent or easily demonstrated as are the unusual mechanical features. These superior mechanical characteristics are not only important in themselves, but are a measure of the efforts expended and successes achieved in the more important element in the microscope, i.e., the optical parts. Further discussion in detail of the optics will be taken up later. Though necessarily secondary, the mechanical parts are indispensable to the optical parts, and on their accuracy and adaptations to the purpose depends the efficiency of the optics. As in the optics, the Spencer Lens Company aims to lead in exactness, fitness of design and the development of new and useful devices in all the mechanical parts. The noteworthy and important new features on Spencer Microscopes are the placing of the **fine adjustment low on the arm**, so that the hand rests comfortably on the table while operating it; the provisions for operating the mechanical stages **with either hand**; and the **means by which the optical axis of the ocular may be made to sustain varying angular relations to the axis of the objective**, to suit the convenience of the operator.

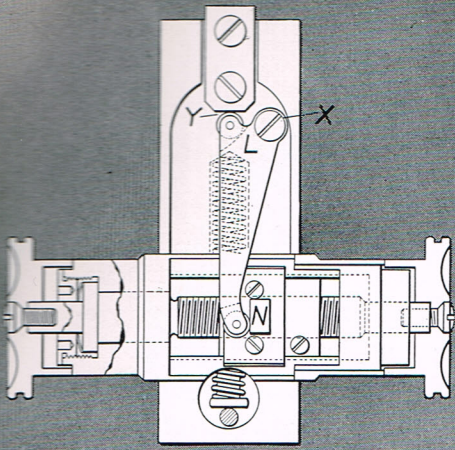
The new feature of most general application is the **new nosepiece** with its long shaft on which the revolving part turns. With the adjustable conical bearings at each end, the objectives on the revolving part rotate so accurately that their continued centering may be depended upon.

In relating the new, we must not forget some of the older time-tried features which have made a well deserved reputation for Spencer microscopes.

The fine adjustment is the all important mechanical element in the microscope stand. In Spencer microscopes the important constituent in this part is a micrometer screw and nut, built and fitted with the precision and accuracy of a measuring instrument. The long contact between thread and nut insures permanency as well as accuracy. The metals in contact forming the fine adjustment bearings have been carefully selected to avoid friction and oil grooves have also been incorporated in these bearings to provide a constant lubrication of the same. These parts in connection with the heavy bearings and the bell-crank lever make a fine adjustment







unsurpassed for accuracy, responsiveness and durability. All coarse adjustments are motivated by the diagonal rack and pinion and the bearing surfaces are provided with oil grooves.

See later description for the advantages of Spencer substages.

The inclination joint, on account of its carefully fitted conical bearings, is always responsive and retains indefinitely the necessary friction to hold the arm in any desired position.

Spencer microscopes are sturdily built and designed first of all for efficiency and convenience,

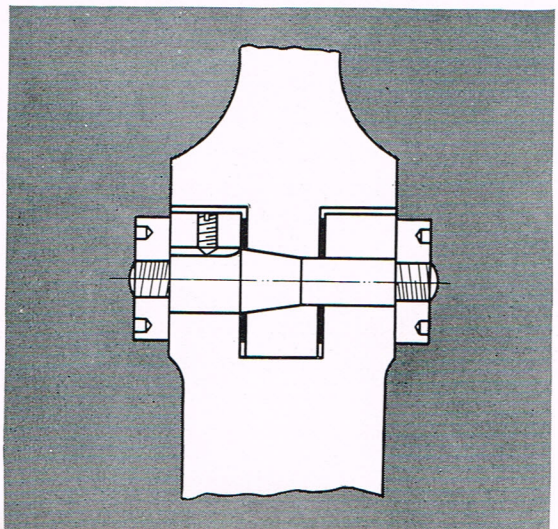
but with these qualities beauty is no less an element. One does better work with a beautiful instrument. It is an inspiration. We aim to make Spencer microscopes a joy. Their lines are symmetrical and graceful. The black finish is a handsome "velvet" enamel. The "white" parts are finished in rhodium, a lustrous new finish used only on Spencer instruments. It resembles, and has the warmth of silver, and the indestructibility and resistance to reagents of platinum. All instruments are listed with a double, triple or quadruple nosepiece, according to the number of objectives called for.

All Spencer microscopes are carefully assembled and rigidly inspected before leaving the factory. They are sent out in beautifully finished hardwood cabinets with compartments for accompanying accessories.



**Involved** in the variety of microscopes produced by the Spencer Lens Company there are, aside from the stands proper, three standard parts;—or groups of parts; each made in a diversity of forms to offer a broad selection to suit specific needs, or special tastes. We refer to the different styles of body tubes, the large number of stages,—plain and with mechanical stages,—and the choice of different constructions in the substage. The interchangeability of these parts permits a range of choice which the **particular worker** appreciates. The different parts are described and priced separately so that one may easily calculate the price of a microscope when a substitution, or addition, of parts is desirable.

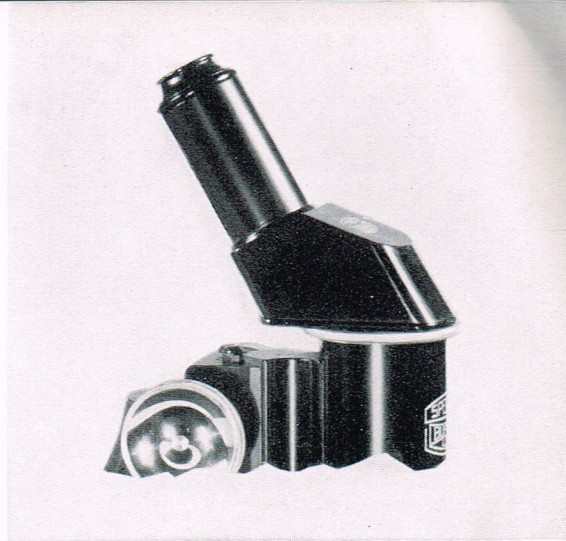
Each part is designated by its own particular letter. The number of each microscope is a combination of the letters of the parts involved. For instance:—No. 3LPH microscope is composed of No. 3 Stand, L Body Tube, P Mechanical Stage and the H optical outfit.





# THE BODY TUBES OR THE BODIES

On all the simpler microscopes the straight tube is intrinsically a part of the microscope. On most of them the tube length is now fixed at 160mm. Adjustable draw tubes to change the tube length may be had at the same price when desired. These draw tubes are graduated with a special mark indicating a tube length of 160mm. The draw tubes are fitted in special cloth-lined sleeves and work very smoothly. To get the best results one should be particular as to the proper tube length, especially when working with dry objectives using cover glasses of varying thicknesses. In either instance the upper part of the tube may be removed to make place for the Single Inclinocular.



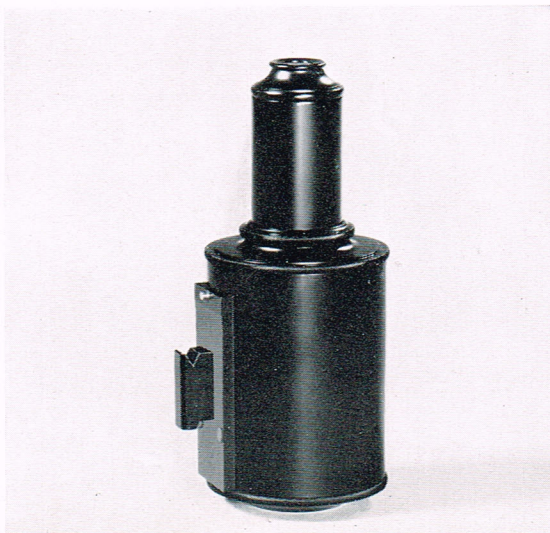
SINGLE INCLINOCULAR N screws into the upper end of the remaining part of the tube. This inclination of the ocular adds to the ease of operation when using the microscope for any length of time. The inclination ( $30^\circ$ ) is the comfortable angle. The addition of this part to the top of the body tube increases the mechanical tube length. This increase is compensated for by using a cylinder of clear glass polished at both ends which runs down into the body tube nearly to the objective. This corrects the optical tube length to 160mm. without cutting down the size of the field, as is the case where a compensating lens is used.

## BINOCULAR MICROSCOPES

On all Spencer binocular microscopes (No. 8 excepted) any of the binocular bodies may be used interchangeably. This same provision admits of an easy exchange between the binocular body and the single tubes made for binocular microscopes.

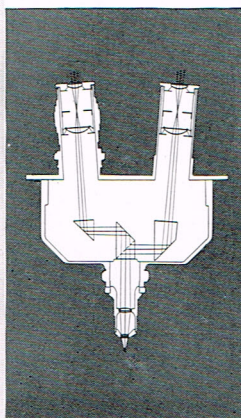
SINGLE TUBES. The single tube on all binocular microscopes is 50mm. in diameter; and is provided at the upper end with a removable reducer into which is mounted a graduated draw tube to vary the tube length, and regularly accompanies each research microscope.

See tube in position on No. 7 Microscope.



It is particularly useful for photomicrographic work. Where very low power objectives or special photomicrographic objectives (micro-teleplats) are used, it is usually used without the draw tube, where the large diameter is an advantage. For the most critical observation, where the most careful resolution is demanded, a straight tube, where there are no prisms to interfere with the light, is best.





## BINOCULAR BODIES

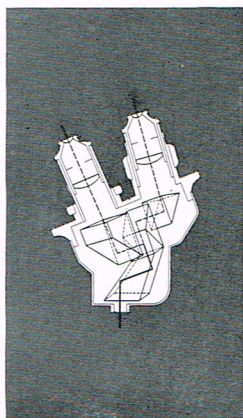
ON THE SPENCER BINOCULAR BODIES the eyepiece tubes are slightly converging ( $8^\circ$  included angle) which is the **normal angle** of convergence of the eyes when reading the words on this page, for instance. One looks into the two oculars in the natural easy way and blends the two images into one picture without the slightest difficulty. When one places a slide on the stage of the microscope, looking at it the eyes converge. Just so, no change is necessary when looking **into** the microscope.

Placed low on one tube is a knurled ring by the turning of which adjustment is made for varying interpupillary distances. A graduation is provided to indicate the distance of interpupillary separation. On the other tube there is a knurled ring to lengthen or shorten the tube to compensate for differences in the accommodation of the two eyes.

Mechanically the body is made up of a skeletal framework and a thin cover which fits snugly to the frame. When the cover is removed the enclosed prisms are fully exposed, which makes for ease and accuracy in placing, adjusting, and securing them rigidly in their proper relations so that they are not so apt to be dislodged in use. With the case removed one can, with a little care, remove from the prisms any accumulation of dust or dirt without disturbing the prisms.

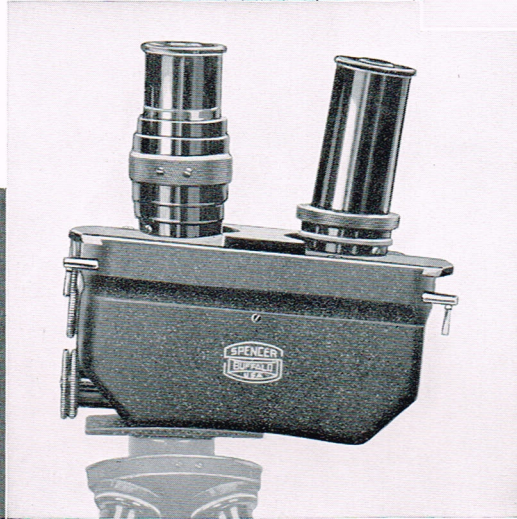
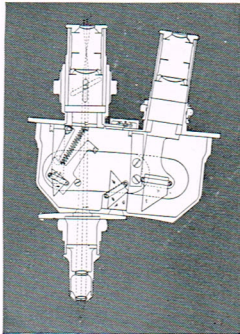
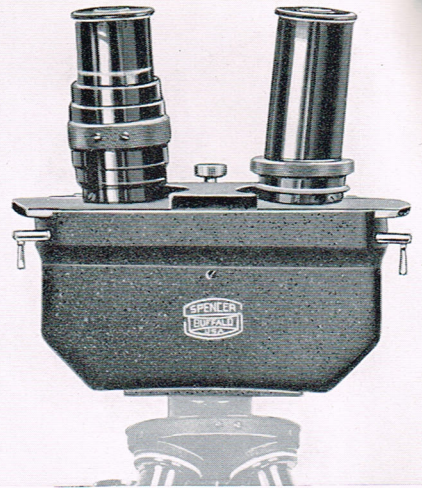
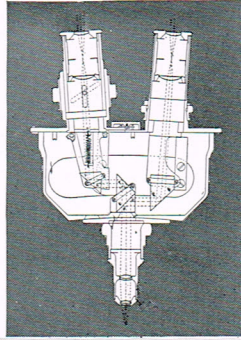
THE STANDARD BINOCULAR BODY, B. On the standard binocular body the ocular tubes are in a vertical plane passing through the centers of each. For further description see above illustrated on No. 3BWH.

THE DOUBLE INCLINOCULAR, L is like the binocular body described above except that the ocular tubes are inclined toward the operator  $30^\circ$  from the vertical. An extra prism is introduced to deviate the vertical beam from the objective by  $30^\circ$ . The thirty degrees was chosen after thorough, careful tests were made to determine the most comfortable and convenient angle of inclination. Illustrated on No. 3LPH.



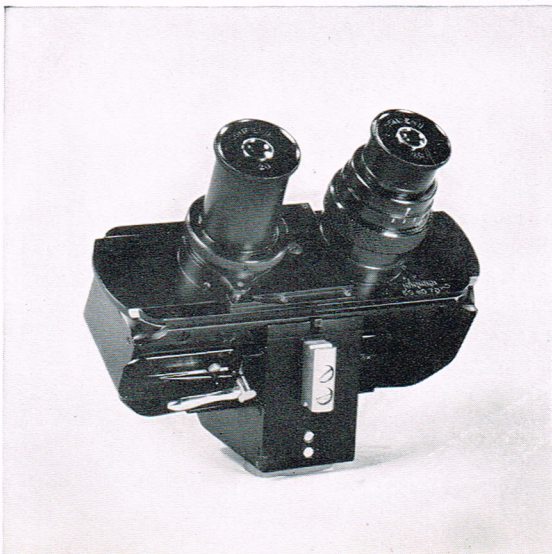


## COMBINATION BODIES



COMBINATION BODY TUBE, CB. Although a quick and convenient interchange between the binocular body and the single tube is provided on all binoculars, there are times when it is very desirable to get both the single tube picture and the binocular impression in quick

succession to help interpret the specimen. The ability to do this is greatly appreciated by careful observers. To meet this condition we offer our combination body tube where both the binocular body and single tube are combined in one. When used as a binocular the oculars are symmetrically disposed to the optical axis of the objective. When used as a single tube, the body is pushed to one side until the axis of one ocular coincides with the axis of the objective. In doing this all the prisms are automatically removed from the path of light. Illustrated on No. 7CBVG.

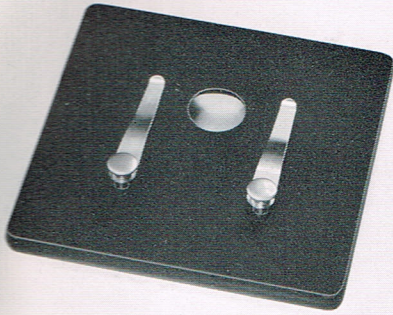


THE COMBINATION INCLINOCLULAR, CL, as the name implies, is a conjunction of the double inclinocular and the combination body. It serves all the purposes of the combination body and provides the comfort of the inclined oculars.

Like on the Combination Body Tube the eyepieces are adjustable for interpupillary distance, and one tube is adjustable to accommodate for differences in eyes. Research workers appreciate its convenience.

Illustrated on No. 5CLXG.





# STAGES

## RECTANGULAR

### PLAIN AND MECHANICAL

**Plain Rectangular Stage.** A large roomy stage with a sufficient distance between the arm and the objective is a very desirable feature on any microscope. The stage must also be so securely fastened to the microscope that there is no spring to bring the

object out of focus when the hand rests on the stage. Again, a plain stage should be made of such material that it will not discolor when in contact with the ordinary laboratory reagents. All these conditions are met in the Spencer bakelite stage. It is strong; will not break and is altogether very satisfactory. It is 125mm. square.

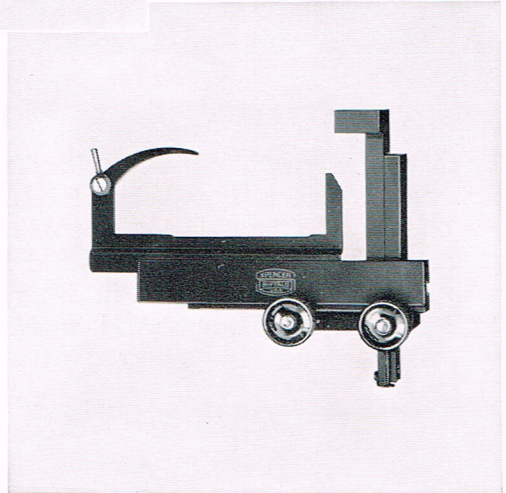
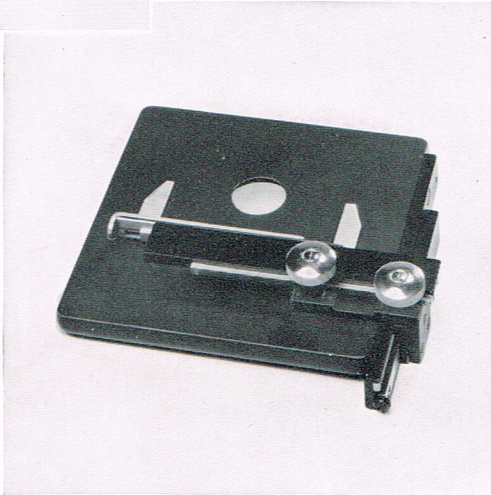
### Combination Stage and Mechanical Stage M.

The rectangular stage with a mechanical stage permanently fastened to the edge has made a very practical, popular and inexpensive combination. Buttons on vertical

axes operate the diagonal rack and pinion movement in both directions. The to and fro excursion is 50mm. and the lateral excursion 75mm. When a plain stage is desired, the part above the surface of the stage may be removed by sliding it off from its to and fro bearings. The slide clip on the right is permanently located. The one on the left slides to the left against the tension of an invisible spring when the finger presses against a convenient little projection. When released it grips the end of the slide with nothing in the way to interfere with the rotation of the objectives on the nosepiece.

This is a very sturdy stage. Slides up to 50mm. x 75mm. are easily accommodated.

It is illustrated on No. 33M and is also applicable to microscopes Nos. 3-13-30-64-66.

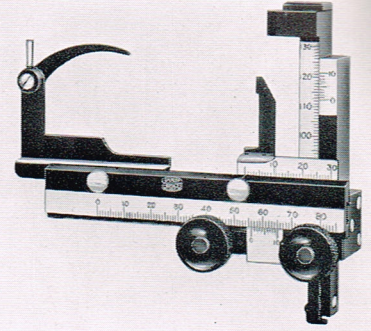


**No. 484 Mechanical Stage.** To those who already have a microscope with a rectangular stage and no mechanical stage, this instrument has a direct appeal. It may be fastened to any rectangular stage without any fitting and can be as easily removed, leaving the stage free of any incumbrances. It is sturdily built. The rack and pinion movements in each direction are free and even:—no trouble to place any portion of the specimen where it is wanted and leave it there. The to and fro movement is 50mm. and the lateral movement 75mm. It accommodates a slide 50mm. x 75mm. The slide is firmly held and in such position that one can focus to the extreme edge of the slide without the objective hitting any of the moving parts. It is applicable to microscopes Nos. 3-13-30-33-64-66.

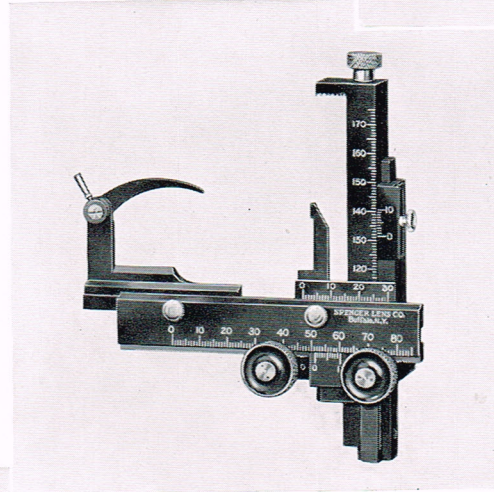


**No. 485 Mechanical Stage** is also easily attached to and detached from any rectangular stage. It is somewhat heavier in its construction than No. 484 and in addition is provided with graduations and verniers reading to 1/10mm. The lateral movement is graduated up to 75mm., and the to and fro movement to 50mm. It will accommodate slides 50mm. x 75mm. These movements are actuated by racks and pinions with the operating buttons on vertical axes. The movements are smooth and even—and positive.

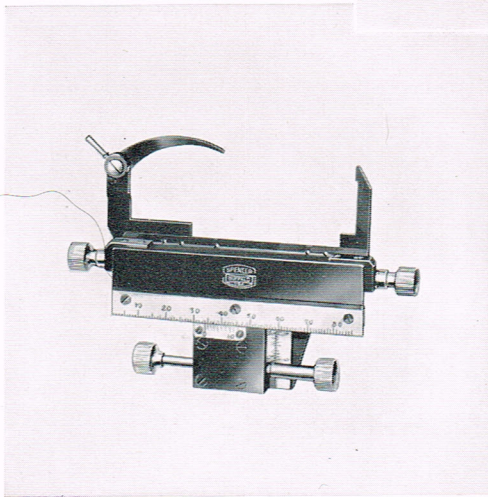
It is applicable to microscopes Nos. 3-13-30-33-64-66.



**No. 490 Mechanical Stage** is somewhat larger and heavier than No. 485. It is clamped to the stage somewhat differently to admit the use of large slides. It is provided with a movable stop and a movable vernier so that readings locating definite points taken on one microscope are made available on any microscope to which the stage may be attached. For instance:—If one should have a series of readings taken on any microscope with any stage, he can place a slide in this mechani-



cal stage, find the spot designated by the reading on the label and adjust the two verniers to make the reading correspond to the reading on the label. Once adjusted for one slide the readings will correspond for all. It is applicable to microscopes Nos. 3-13-30-33.



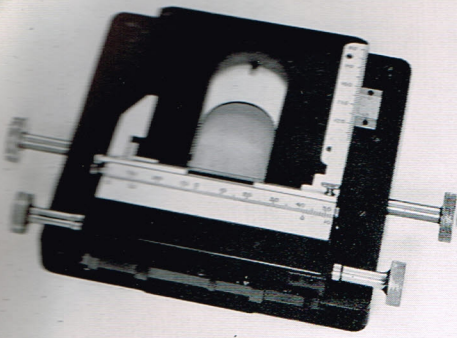
**No. 495 Mechanical Stage** was designed especially for the chemical and petrographical microscopes, but is applicable to any plain stage. It is easily attached but means for attachment must be provided at the factory for any microscope other than the chemical and petrographical. It is built low so that in revolving the stage it passes freely under the objectives not in use on the nosepiece, when the one in use is in focus. As shown in the cut, the operating buttons are on either side available to either hand. The to and fro movement is 25mm., and the lateral excursion 75mm., each graduated with verniers reading to 1/10mm.

It is easily removed from the stage. For one who wants a small compact **removable** stage on a revolving stage, this serves the purpose admirably.

**To obtain the best resolution**, the condenser should always be immersed. In order to prevent the objectionable smearing of oil over the surface of a stage, when the slide is moved about, we offer **the special Spencer slide clips**. By means of these special slide clips, the slide is raised approximately one millimeter above the surface of the stage. It is also held down against any tendency to raise with the objective when sticky oil is used on an oil immersion objective. These are slightly higher in price.

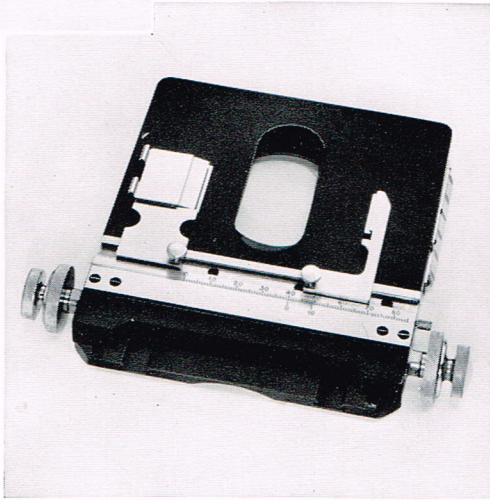
One who has worked with an oil immersion objective has often felt the annoyance of getting no response to the fine adjustment, because of the slide sticking to the front of the objective and rising with it.





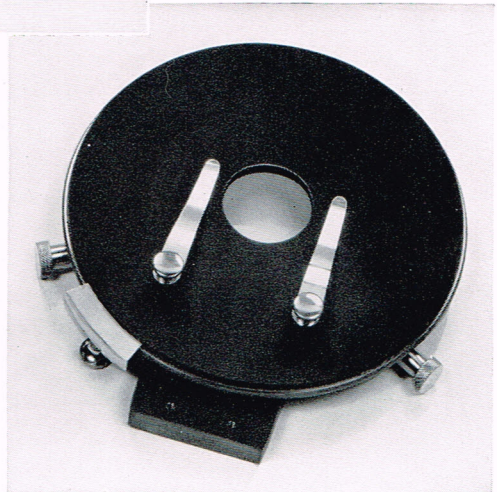
### Combination Stage and Mechanical Stage R.

This stage is 125mm. x 125 mm. The mechanical movements are motivated by concentric buttons on horizontal axes. The range of movement is 40mm. x 72 mm., with graduations and verniers reading to 1/10 mm. At a slight advance in price the operating buttons may be put on both sides of the stage. This has never been done before. It adds greatly to the comfort of the operator who can use either hand at will. The additional fact that these concentric buttons are in close proximity to the low fine adjustment buttons on the most recent research instruments is greatly appreciated by the operator. The stage, as illustrated, shows the buttons on both sides of the stage, and with the special Spencer slide clips. The slide clip may be removed from the stage and a large flat plate substituted on which petri dishes and other large objects may be placed. When used it is actuated by mechanical means in **both** directions. This stage is regularly priced as described above. See price list for price. This stage is illustrated on microscope No. 5LRH. It is applicable also to microscopes Nos. 3-7-13-30-33.



**Combination Stage and Mechanical Stage P.** The mechanical movements on this large stage (125mm. x 125mm.) are operated by buttons on horizontal axes. The to and fro movement (50mm.) is actuated by two pinions on a single shaft engaging two diagonal racks, one on either side of the opening in the stage. This double application of the moving power insures a steadier, smoother movement for such a large stage. The lateral movement (75mm.) is achieved by means of a quick acting sextuple screw and carefully fitted nut. With the buttons for both movements on both sides either hand may be used;—a great convenience. There are graduations and verniers reading to 1/10mm.

for each movement. The capacity is ample for slides as large as 50mm. x 75mm. The right hand slide clip is adjustable in a groove to accommodate slides of different lengths. The left slide clip is also adjustable in the same groove and is held against the end of the slide by the tension of an invisible spring. To put the slide in place, this clip is moved slightly to the left by pressure of the finger against a convenient little projection.



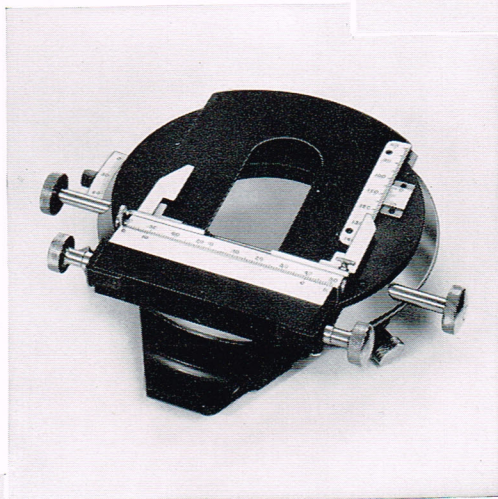
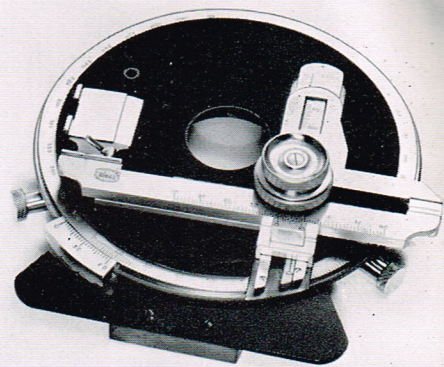
## CIRCULAR STAGES PLAIN AND MECHANICAL

**Plain Circular Stage T** is 150mm. in diameter. It is made with a bronze foundation covered with vulcanized rubber. It is equipped with centering screws to bring the center of revolution coincident with the optical axis. The edge is knurled. Provision is made whereby it may be clamped so it will not revolve. The edge may be either plain or graduated. When graduated it is provided with a vernier reading to 3 minutes of arc. It is regularly furnished without the peripheral graduations. See price list for prices of graduations.



**Circular Revolving Mechanical Stage V.** This stage is the same size as the plain circular stage just described, with the mechanical feature added by placing the bearing for the to and fro movement in a groove in the surface of the stage. The parts in this groove all remain below the upper surface of the stage so that a slide easily passes over them. By placing these bearings toward the center of the stage, the buttons operating the two movements are put on concentric axes which adds greatly to convenience in operation. It is equipped with the special Spencer slide clips. The to and fro movement is 50mm., while that of the lateral movement is 75mm. Verniers reading to 1/10mm. accompany the graduations for each movement. All the movable parts of the stage are easily entirely removed. A narrow plate accompanies the stage which, when placed in the groove, makes a plain circular stage. (See No. 7 microscope). The stage is regularly furnished with the periphery graduated and with a vernier reading to 3 minutes of arc, and with the special Spencer slide clips.

It is illustrated on No. 7CBVG and applicable also to microscopes Nos. 3-5-13-30-33.



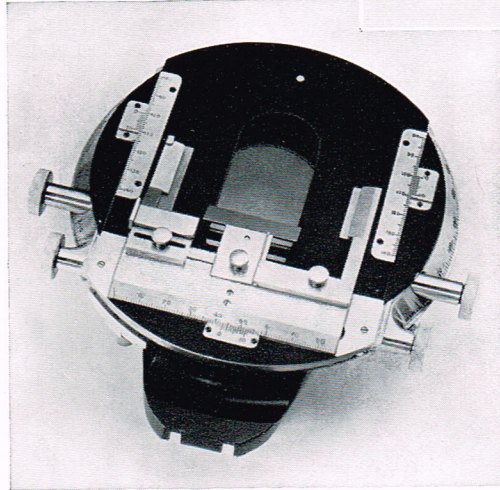
**Circular Revolving Mechanical Stage W.**

This stage is 150mm. in diameter. It is provided with the usual centering screws, and means for locking it so that it cannot revolve. The buttons for manipulating the movable parts are on horizontal axes,

placed far enough away from these parts to admit of easy operation. In this, and other essential features, this stage is identical with stage P. In fact, it is stage P incorporated in a circular revolving stage. With the buttons for both movements on both sides and with the special Spencer slide clips, the stage leaves little to be desired, especially when price is to be considered.

This mechanical stage is illustrated with the motivating buttons on **both** sides of the stage and with the simple slide clips. Like stage P, this stage is priced and will be supplied with the simple slide clips and with the buttons on **one** side only; unless the buttons on both sides or the special Spencer slide clips are specially ordered. The price for the buttons on both sides is given in the price list. If peripheral graduations are wanted, see price list for extra cost.

It is illustrated on No. 3BWH and is also applicable to microscopes Nos. 5-7-13-30-33.



**Circular Revolving Mechanical Stage X.** This mechanical stage is like stage W in all its essentials,—the same capacity, graduations, methods of movement, etc. It differs from W in that it is heavier, and that the operating buttons always sustain the distance each from the other and from the optical axis. One becomes accustomed to their fixed position and unconsciously reaches to the right place to contact them. It is regularly equipped with the special Spencer slide clips, with the operating buttons on both sides, with the graduated periphery and with a vernier reading to 3 minutes of arc.

When the slide clamps are removed, they may be replaced by a large plain stage which may be used as any plain stage. It may also be motivated by both of the mechanical movements.

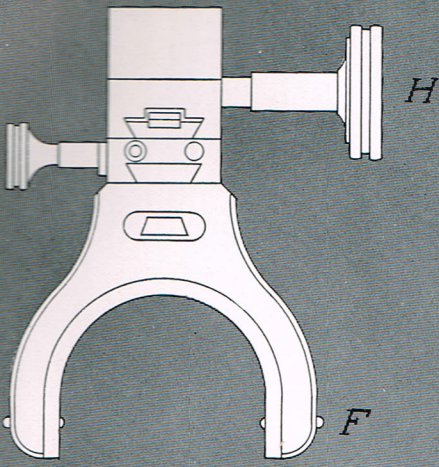
Illustrated on No. 5CLXG and applicable also to microscopes Nos. 3-13-30-33.



# SUBSTAGES

The **Spencer Substages** are unique in that the element supporting the substage optics is in the form of a fork, open in front for the entrance and exit of the substage parts as one unit, thus assuring permanent and proper relations between the optics and the attending mechanical parts, especially the proper position of the iris with reference to the condenser. One accustomed to the old style friction ring

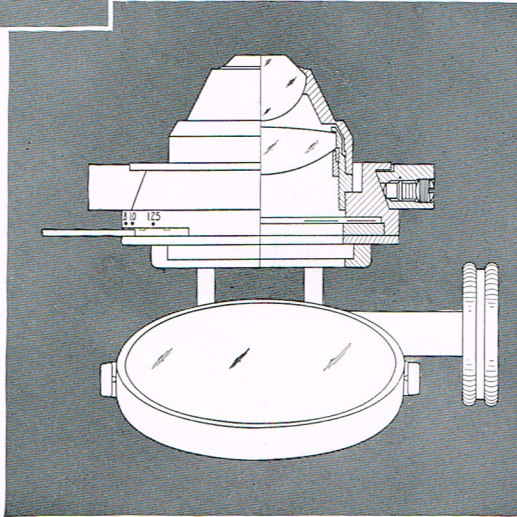
on a substage appreciates the ease by which this unit may be removed and replaced, and the accuracy with which the unit is held in the optical axis by means of two spring plungers. All substages are equipped with a mirror 50mm. in diameter, —concave on one side and plain on the other. All substages are actuated by diagonal rack and pinion for focussing the condenser.



## The Simple Substage.

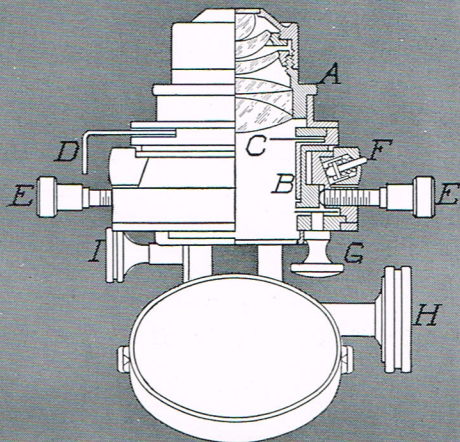
The simple substage consists of the focussing means and fork just described, the fork becoming the support for the condenser mounting and iris diaphragm, the leaves of which are of **bronze** to insure against rust. The mount of the iris is graduated to indicate the numerical

aperture used. A simple means (No. 326) for centering the condenser may be secured at an additional cost. It can be used for all condensers, and should certainly be used, even at a slight extra cost, when the achromatic condenser is supplied. The Spencer oblique light attachment (No. 327) can also be used on the simple substage. See description and price list. The addition of these parts makes a complete substage which for careful work is well worth the additional expense.



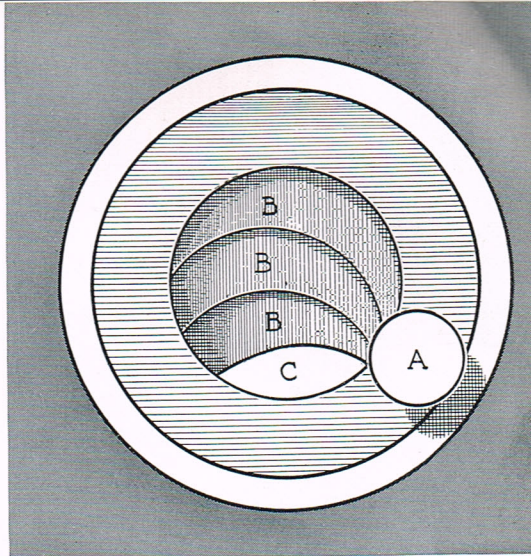
## The Complete Research Substage.

The complete research substage consists of the fork focussed by the diagonal rack and pinion, and also by a fine adjustment similar to that used for focussing the objectives. When high grade condensers, —or objectives utilized as condensers— are used for critical work, this fine adjustment feature is very important. Careful focussing of the light on the object is of consequence. The centering mechanism of the condenser and iris is substantial; with heavy screws so that the condenser is easily brought



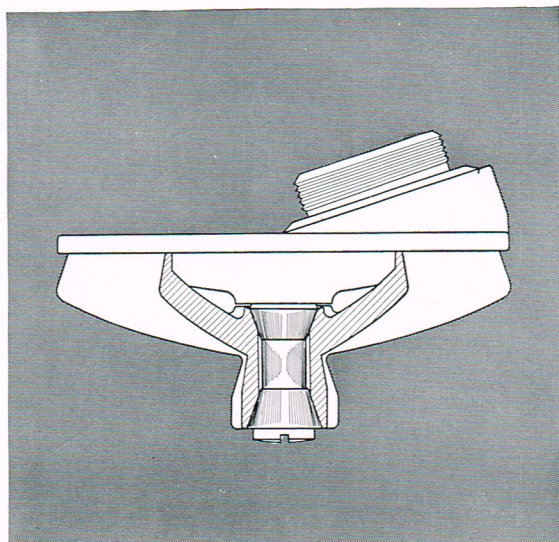


into alignment with the objective, where it stays. The leaves of the iris diaphragm, which is integral with the substage, are made of bronze. The diaphragm mounting is graduated to indicate the aperture used. Oblique light is obtained on Spencer microscopes by a device (No. 327) quite different from the old means of decentering the iris. It is independent of the iris diaphragm and consists of three bronze leaves (B) which rotate on a common axis at one end of each leaf; by turning a button (A) these leaves close the aperture from one side only to leave an opening (C) for the decentered light to strike the condenser. For the same amount of obliquity the volume of light is three times that admitted when the iris is decentered. The obliquity can be obtained from the desired azimuth by revolving the ring, to which the leaves are attached, around the optical axis. For simplicity and effectiveness it is without an equal. The complete substage is also furnished with an iris diaphragm which is used near the level of the stage when the condenser is not used. It is provided with adapters, by means of which one may use an objective as a condenser if he so chooses. Available on Nos. 5, 7 and 8 only.



### THE SPENCER DUAL CONE REVOLVING NOSEPIECES

The accuracy of the centering of the objectives on the nosepiece depends upon the precision with which the part holding the objective revolves on its axis. This, in turn, depends on the length of the shaft on which it revolves, and the bearings thereon. In the new Spencer Dual Cone Nosepiece the length of the shaft is doubled, and at each end is a conical bearing on which the revolving part rotates. The lower one of these cones is adjustable toward the other, and is forced toward the other by means of a screw to make a perfect fit at each end of the bearing, thus insuring accuracy of rotation. The accompanying cut shows the exactly fitted conical bearings at each end of the shaft.



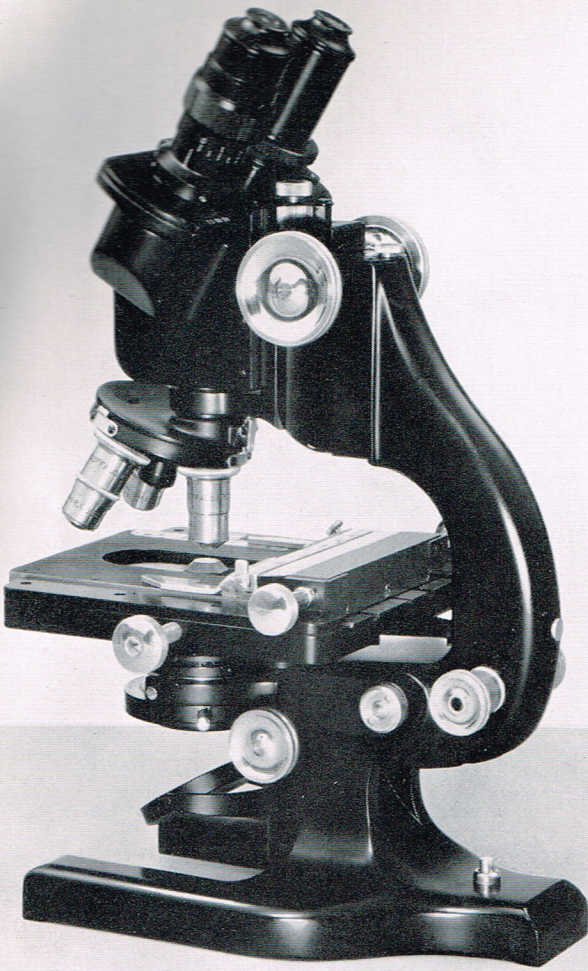
The long curved spring makes an easy release and at the same time insures a very definite stop, keeping each objective nicely centered.

Unless ordered differently the nosepiece suited to the number of objectives ordered will always be sent.

CATALOG NO.	DESCRIPTION
450	Double Nosepiece
455	Triple Nosepiece
460	Quadruple Nosepiece



# SPENCER MICROSCOPE No. 3



This microscope appeals to the research worker because it is large, and at the same time convenient, as is evidenced by the low position of the fine adjustment and its close proximity to the other working parts. A rigid connection in the hollow arm leads from the fine adjustment bearing at the top of the arm to the micrometer at the base. This serves the double purpose of connector and an extension of the fine adjustment bearing by providing an extra bearing at the lower end of the connector. This lengthening of the bearing helps greatly to support the weight of the body and adds to the quick responsiveness of the fine adjustment. There is a small knurled button on the top of the arm for regulating the tension in the fine adjustment as on No. 5.

This stand is made to accommodate the best in binocular bodies and mechanical stages. For achromatic objectives it is regularly equipped with the simple substage and Abbe Condenser N.A. 1.25. When apochromats are used the achromatic

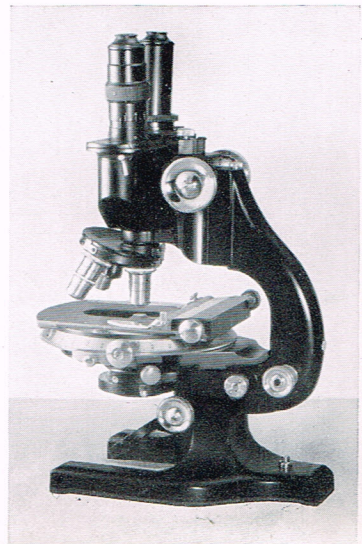
condenser is supplied. With it the centering device (No. 326) for centering the condenser should be selected even at the slight extra cost. The oblique light attachment (No. 327) may be added at a slight cost. It is useful where difficult resolution is involved. The addition of No. 326 and No. 327 constitutes a complete substage.

The instrument, as illustrated by the large cut, is No. 3LPH equipped with the double inclinocular L, combination mechanical stage P, with the operating buttons on both sides, and simple slide clips. It is also illustrated as No. 3BWH showing the circular revolving mechanical stage, having peripheral graduations, which makes an exceptionally fine research microscope. The centering condenser mounting is shown in both illustrations.

Any of the binocular bodies or mechanical stages previously described can be furnished on this stand. The microscope is regularly furnished with the single tube A, as well as the binocular body. It is regularly listed with the mechanical stage buttons on one side only, with the simple slide clips, and with noncenterable condenser mounting. See price list for cost of additional parts as illustrated. Furnished in polished hardwood case.

See price list for possible combinations. We suggest a choice from the following list:—

No. 3BWH	No. 3BRK APO.	No. 3LPJ
No. 3BPH	No. 3BWK APO.	No. 3LPG APO.
No. 3BPJ	No. 3LPH	No. 3LPK APO.





# SPENCER MICROSCOPE No. 5

This microscope was designed for the research worker. It embodies most of the new and original features instituted by the Spencer Lens Company. The fine adjustment is at the base of the arm, low enough to be operated by either hand resting on the table. A solid connector located within the hollow arm serves the double purpose of connecting the moving parts at the top of the arm with the micrometer below, and of lengthening the fine adjustment bearing to make the same more substantial and sensitive. The new circular mechanical stage X was designed especially for this microscope,—although it may be used on others. There is a small knurled button on the top of the arm for regulating the tension in the fine adjustment to add to its sensitivity in different positions. If the microscope is to be used in the vertical position this button is turned clockwise until it stops. If the body is horizontal for photomicrographic work, it is turned in the opposite direction.

This microscope is equipped with the complete research substage with fine adjustment and is listed and priced with the achromatic condenser for **all** optical equipments. A microscope of this grade should always be provided with the best substage parts.

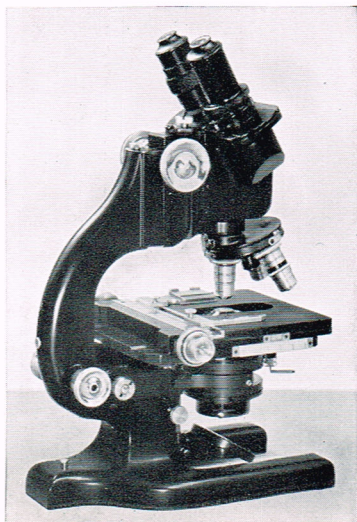
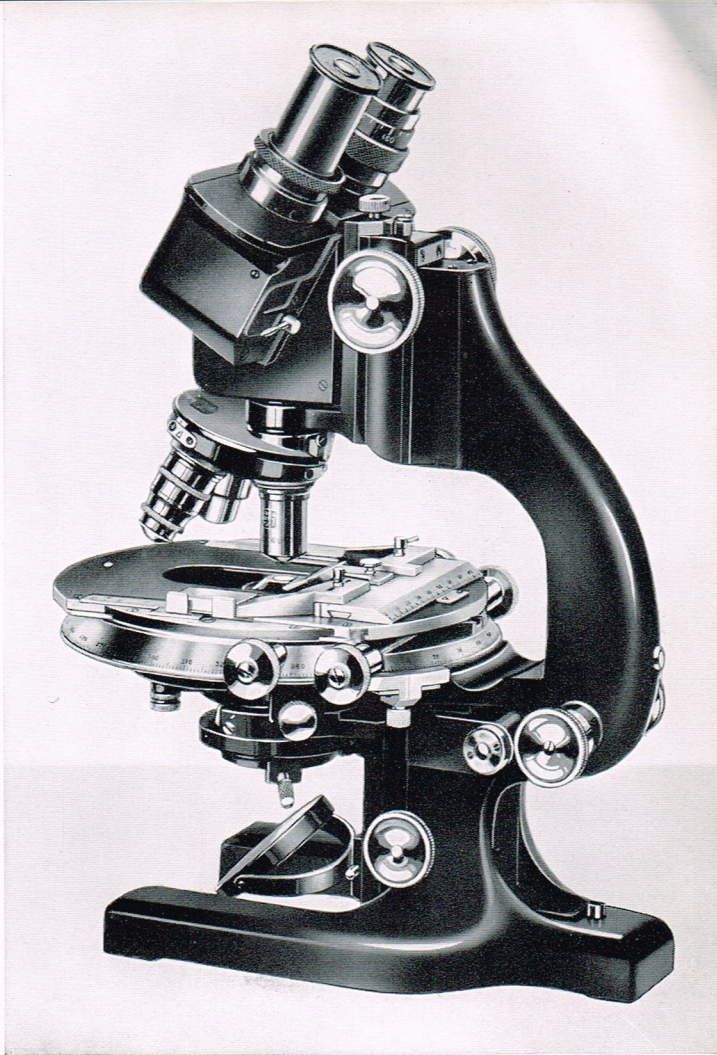
The large cut shows it illustrated as described above, with the combination inclinocular CL, which makes it No. 5CLXG APO.

Some research investigators prefer a rectangular stage. To them we recommend the instrument equipped with the combination mechanical stage R, with the special Spencer slide clips and with the concentric adjustment buttons on **both** sides of the stage. In the small cut this microscope is illustrated with the double inclinocular L. With this body and with the stage just described it becomes No. 5LRH. All prices include parts as described, and also the single body tube A. The body tubes B and CB may be substituted for those specified above. The stages may be replaced by any of the stages (S, M, P, T, V or W) at prices varying in accordance with the prices of these parts. Furnished in polished hardwood case.

See price list for possible combinations and prices.

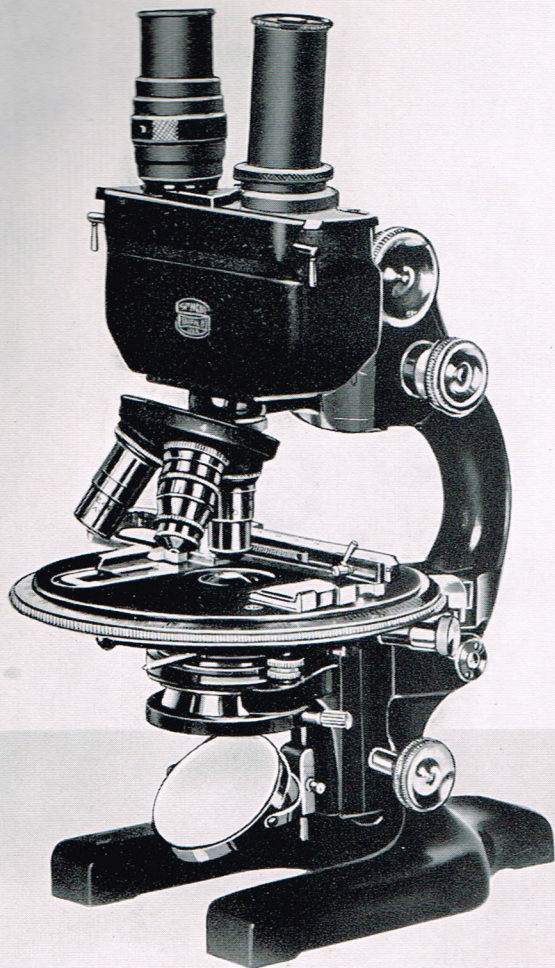
We recommend the following:—

No. 5CLXH	No. 5LRH
No. 5CLXJ	No. 5LWH
No. 5CLXG APO.	No. 5CLRJ
No. 5CXK APO.	No. 5LXK APO





# SPENCER MICROSCOPE No. 7



This microscope has been, and is, one of the most popular research microscopes produced. The curved arm makes a convenient means for handling the instrument and provides ample space for large objects on the stage. The distance from the center of the stage to the arm is 100 mm. The fine adjustment is in the conventional position on the arm and has all the advantages of the Spencer construction as previously set forth. The hand rest at the level of this stage is a real convenience when working the fine adjustment.

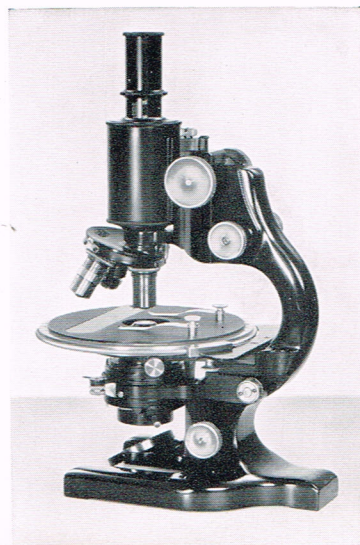
The microscope No. 7CBVH APO. is illustrated with the vertical combination body tube CB, with the circular mechanical stage V and the complete substage with

achromatic condenser. These combinations are suggestions only. The binocular bodies B, L and CL may be substituted. The stage is illustrated in the smaller cut with the movable parts removed and the bar filling the groove in the stage. This stage may be replaced by a plain stage or combination mechanical stages X, P, R, T, W. The single tube, illustrated in the smaller cut, is included in the prices given on this microscope. The fine adjustment on the substage for carefully focussing the condenser is a very important feature on this microscope. On account of the stability, the accuracy and precision of the fine adjustment, this microscope has been extensively used for photomicrographic work and in several instances, has been chosen above all others as the most desirable for the taking of micro-movies.

All told it is one of those substantial and satisfactory instruments which has lived through the time of different changes in design and is still one of the popular microscopes for all round careful research work.

Out of a multitude of possible combinations, all of which are good, we recommend the following:—

No. 7CBVH	No. 7CBVK APO.	No. 7LVH
No. 7CLVK APO.	No. 7BVI	No. 7BVI





# SPENCER MICROSCOPE No. 8

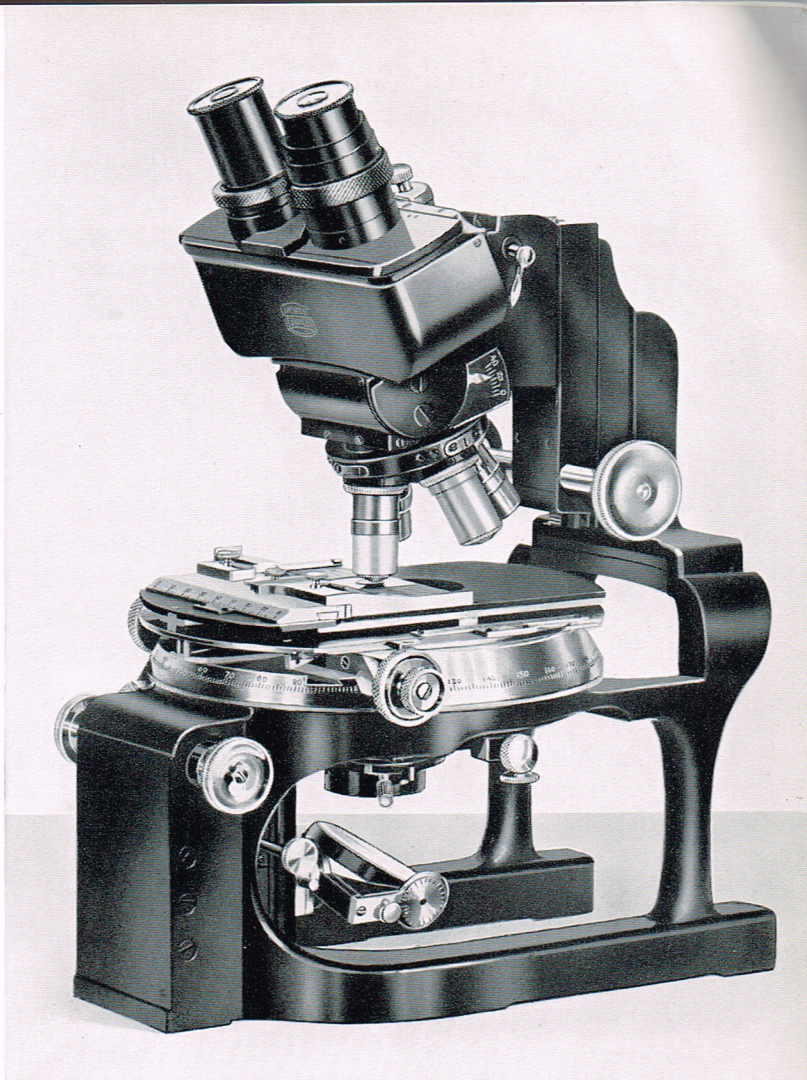
Microscope No. 8 is so different, so unique in its construction, that a description of the same hardly fits into the general description. It is our answer to the demand for an instrument with free access to the stage:—with the parts supporting the body placed out of the way on the side of the instrument away from the operator.

This accomplished, the serious and important problem was that of keeping the **fine adjustment on the operator's side where it should be**, and placed low so that either hand operating it may rest on the table. It was a real mechanical problem to meet a definite need, and it has

been successfully solved, using the same micrometer, bearings, etc., common to all Spencer microscopes. It affects a movement of the substage parts, together with a plate in the stage on which the slide is placed, to move it to and from the objective. The stage itself is not affected. It is sensitive, responsive and definite. Each division on the graduated fine adjustment button represents a movement of one micron. The coarse adjustment buttons are located low on the supporting arm.

The modern requirement for eyepieces inclined toward the user has been more than met by a variable angle of inclination by means of which the operator may select the most comfortable angle;—no matter what it may be between vertical and  $40^\circ$  from the vertical. When the angle is changed with the eyes at the eyepieces, no change in position or form of the object is noticed. This remarkable achievement has never before been accomplished in a microscope. It is done by a series of prisms, two of which revolve, so attuned, each to the other, that there is no distortion or change in the image. In operation nothing is necessary other than to loosen a clamp, select the desired angle and then tighten the clamp. Often after a long sitting at the microscope, one is rested by a slight change in position. Change the inclination accordingly.

The stage of this microscope is circular, six inches in diameter, with a graduated periphery and vernier readings to 3 minutes. This stage may be accurately centered to the optical axis of the body tube by screws which are, in turn, provided with locks so that they cannot be inadvertently turned.





Incorporated in this stage are mechanical stage parts, capable of receiving and moving 3" x 1" or 3" x 2" slides, as one may desire. The movements are actuated by concentric buttons on both sides of the stage. The close proximity of these buttons to the fine adjustment buttons adds to the ease by which the slide may be examined. Concentric buttons on both sides are new, and will be greatly appreciated. The to and fro movement of the mechanical stage is 40 mm. and the lateral movement 72 mm.

Graduation and verniers are provided for reading to 0.1 mm. For the to and fro movement there are two matched graduations and verniers,—one on either side, so that in case one may be covered by the slide the other is available.

The stage is provided with the special slide clips. These parts are removable so that a large plain stage, which is regular equipment, may be substituted when a very large slide or dish is to be used. This plain stage is actuated in both directions by the concentric buttons.

This microscope is equipped with the complete research substage. The mirror, as usual, is adjustable in two planes. It may be fixed in any position by clamps. Graduations are provided for each movement.

The microscope is illustrated and priced with the combination body tube CB. When desired, binocular body B is supplied. The single tube is always furnished, as is also a special bracket for holding the tube in the vertical position for photomicrographic work. When the bracket is used the prisms are dispensed with.

Realizing that there are some who do not care to incur the expense necessarily involved in the variable inclination, we offer a bracket which holds the eyepieces permanently inclined at the average comfortable angle of 30° from the vertical.

**To Recapitulate:**—the salient features of superiority in this microscope are:—

The variable inclination of the Binocular Body and its ease of manipulation.

The combination of single and double tube in one and the convenient shift from one to the other.

The eyepiece tubes converge at the proper angle.

The low fine adjustment on the side of the operator.

The concentric buttons on both sides of the stage are conveniently near the fine adjustment button.

A large plain stage for large objects, both movements of which are actuated by mechanical means.

Coarse adjustment conveniently located.

Out of a variety of optical equipments we make the following suggestions:—

No. 8H Microscope with variable inclination  
Same with fixed inclination

No. 8G APO. Microscope with variable inclination  
Same with fixed inclination

No. 8K APO. Microscope with variable inclination  
Same with fixed inclination

No. 8M APO. Microscope with variable inclination  
Same with fixed inclination



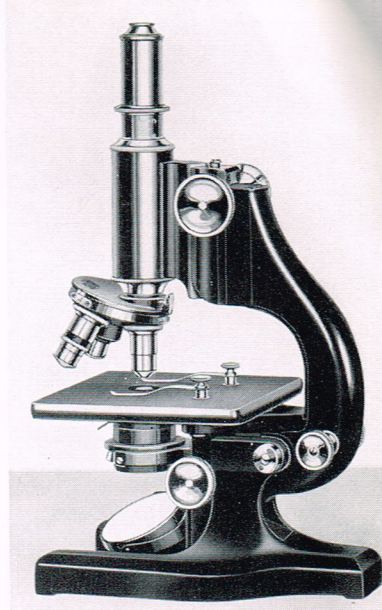
# SPENCER MICROSCOPE

## No. 30

Microscope No. 30 brings an instrument with the low fine adjustment within the range of the moderately priced microscope. It is beautiful in proportion and finish and a thoroughly practical instrument. The body tube is 36.5mm. in diameter, sufficiently large for good photomicrographic work.

It is illustrated with the large plain stage S, 125mm. x 125mm. This gives ample room on the stage for any purpose. The stages M, P, R, T, V and W may be substituted if desired. It is regularly supplied and priced below with the simple substage and Abbe Condenser N.A. 1.25.

We recommend the following combinations:—Nos. 30SH, 30SI, 30PJ, 30RG APO., 30WK APO., but the purchaser can find just the equipment he desires from the great variety of Spencer parts.



# SPENCER MICROSCOPE

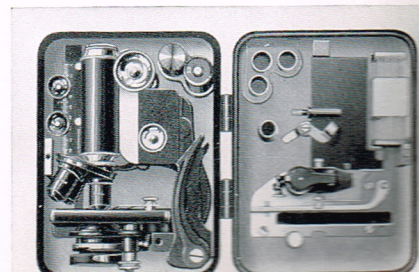
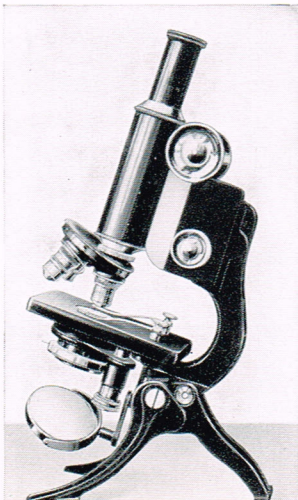
## No. 60

There are times when compactness and security in transporting are all essential in a microscope, yet when in use the instrument must be a real microscope capable of doing the most critical work. Both of these conditions are admirably met in No. 60. The case,  $8\frac{3}{4}'' \times 6\frac{1}{2}'' \times 3\frac{3}{4}''$ , is an alloy of aluminum which makes it small, light and at the same time strong enough to withstand the severest usage. The stand is so held in the case that there is no possibility of damaging it.

The illustration shows that when the instrument is set up for use it is capable of meeting any requirements of any ordinary microscope of similar pretensions. The optics and the vital parts of the stand are the same as in larger instruments. The stage is 85mm. x 105mm. and the free distance from the arm to the optical axis is 75mm.

Regardless of the unusual compactness of the case there is still room therein for a modified No. 485 mechanical stage and a modified No. 500 camera lucida. Both (with slides) are shown in the open case.

A Haemocytometer may be substituted for the camera. No. 60H is most generally called for. See price list.





## THE OPTICAL PARTS

Simple, unsupported statements of the excellence of a product, no matter how true, may not be convincing. Excellence must be obtained by definite effort directed along lines carefully chosen to attain the desired result. The result is assured when correct methods are used and properly coordinated. These methods must be used in producing a complex product of high merit.

This is particularly true of microscope optical systems which demand perfection of design and accuracy of workmanship close to the recognized limit of human attainment.

Spencer microscope objectives are designed by the latest and most approved mathematical methods. The problem of complicated optical design is so intricate that it is incapable of a rigid mathematical solution with any system of mathematics at present available.

It is possible to determine the exact path of certain chosen "rays" through the optical system. It is not possible, however, to determine entirely by mathematics a combination of lenses that will require these "rays" to travel any predetermined path. The mathematician must resort, to some extent, to trial and error methods to obtain the desired path. If entire reliance is placed on trial and error, the work involved is tremendous and the result uncertain. Mathematical aids are needed to control and guide the trial and error work in such a way as to assure the desired results in a reasonable length of time.

The research staff of Spencer Lens Company has devised a number of such aids which are used continuously in the routine of lens design.

The mathematics of lens design is based on the assumption that light consists of straight line "rays". Since light actually is a transverse wave motion, the performance of a microscope objective must be expressed in terms of the action of the objective on the light waves, in order to get a true and complete picture.

Lord Rayleigh has suggested a method of converting lens design data into these terms. All designs of Spencer objectives are analyzed by this method.

There are several advantages in following this method. The quality of the design can be evaluated in terms of what the eye sees when using the objective. The merit of the design can be given a numerical value.

Lord Rayleigh stated that errors of a quarter wave length or less were probably of no practical importance. At the time of this announcement, the perfection represented by this limit generally was considered to be unattainable in practice.

All Spencer designs are held to errors no greater than a fifth wave length and most of them reach a perfection of a tenth, and some are even better.

Another most important advantage derived from the use of this method lies in the fact that the design is evaluated in terms of the same quantity that is used to check the accuracy of manufacture. This allows a cross-check between design and manufacture that is an invaluable aid to the scientific control of quality of production.



It is possible to set permissible limits of error for each individual workman and to know continuously that these limits are not violated. In this manner, the manufacture of Spencer optical parts is specified and controlled.

Since the manufacturing specifications call for an accuracy of a tenth wave length on all Spencer objectives and a twentieth wave length in the case of the high power apochromatic objectives, it is obvious that the craftsmanship required is of a high order. Dr. A. A. Michelson has stated that a twentieth wave length represents about the limit of accuracy for human skill.

In the past, there has been an impression that such accuracy could be obtained only by hand work done by highly skilled artificers. After considerable research work and study of results, Spencer Lens Company has found that a better and more consistently good product can be obtained by the use of properly designed and adjusted machinery when operated by an artisan trained in its use.

Since there must be a large element of human skill in the production of Spencer quality of microscope optics, a definite and rigid inspection system is of paramount importance. The inspection department of Spencer Lens Company is operating under one general order: "An excellent lens is the **only** lens that can pass."

Whereas the chief function of our inspection department is to guarantee the delivery of high grade lenses, the question of what is done with rejected lenses is of almost equal importance. Every rejected lens is analyzed carefully to determine the exact cause of its defect. In the more obscure cases, this is done in the research department, where special instruments have been devised for this work.

As soon as the cause of trouble has been determined and defined in terms familiar to the manufacturing divisions, the facts are laid before them. Usually the means to be employed to prevent repetition of the trouble are obvious. When they are not, the problem is referred to the research staff and their solution is put into routine practice as soon as it is tested and found practicable.

This procedure of dealing with rejected lenses is an extremely valuable part of the whole process of turning out the highest possible quality. It constantly brings to light the weak links in the chain of production that otherwise might be overlooked. It initiates the work of strengthening these links. It keeps each individual on the alert and is a constant spur to better and better workmanship. Most important of all, it offers a point of contact between the research and manufacturing divisions, and creates a coordination that is extremely important when routine production methods must be practically laboratory operations.

Thus is the cycle of research, design, manufacture and inspection completed and re-created. It is a continuous operation that traverses the same field over and over again, but each time with added power. It demands rigid adherence to the present highest possible standards and constant progress toward higher standards. The methods used, and the coordination of these methods, embody the best principles of scientific endeavor and assure a product of scientific excellence. By these means is created a compact and closely coordinated organization dedicated to the purpose of building merit into the products of Spencer Lens Company.

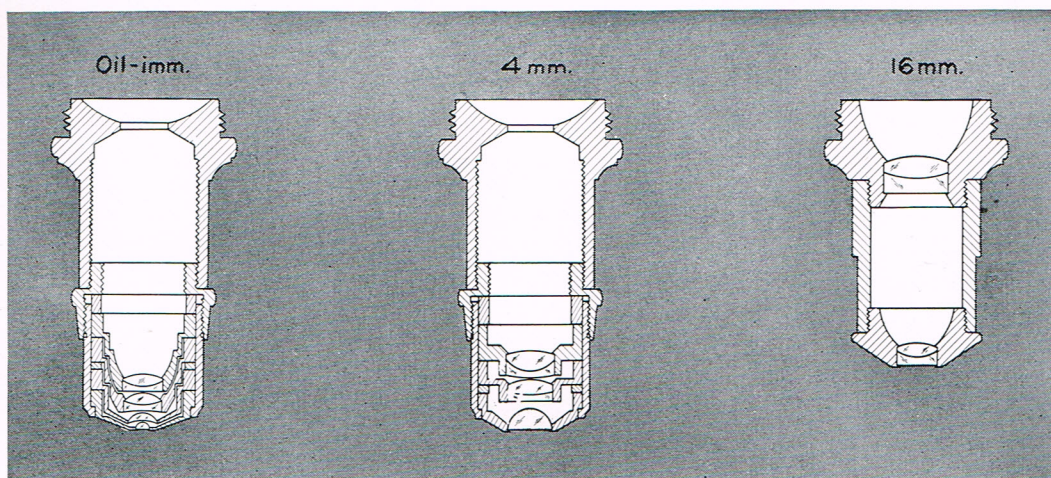


# THE OBJECTIVES

All Spencer objectives are plainly marked with the equivalent focus, the numerical aperture, and the initial magnification when the tube length is 160mm., for which length the objective is corrected. The magnification resulting from any combination of objective and eyepiece is always the product obtained by multiplying together the initial magnification of the objective and that of the eyepiece.

All Spencer objectives are also corrected for a cover glass thickness of 0.18mm., except when objectives are to be used without a cover glass over the object, when they are corrected accordingly.

The component optical parts of any objective are each carefully centered and mounted in its particular cell, and all of these cells are the same diameter. The objective is built up by placing these cells in their proper sequence each back of the other in a straight tube with the proper separations between them and with proper provisions for holding them in place, as shown in the illustrations.



In mounting the front lenses of all oil immersion objectives due consideration is given to the fact that the joint between the lens and its mounting must be, and remain, oil tight; that the very short working distance of these objectives means a greater likelihood of contact with the cover glass which might affect the security of the mounting. The front lenses of the objectives of lower aperture are secured between two shoulders of brass, while the lenses of the objectives of the higher apertures are secured in the best way possible commensurate with this aperture.

Years of experience in producing large numbers of objectives, and the same number of years spent in studying and perfecting the foundation of the plan of construction, have resulted in a line of these objectives which is unsurpassed. The selection of the glass, every curve and thickness, together with the mountings and separations are watched and checked with extreme care. After all this is done every objective is carefully adjusted and inspected. It is again rigidly inspected on the microscope to which it is attached just before shipping. We guarantee satisfaction in every objective we produce.

## SPENCER FLUORITE OR SEMI-APOCHROMATIC OBJECTIVES

The Spencer achromatic objectives are the best that can be produced using glass alone in the lenses involved. To meet the demand for more perfect chromatic correction, lenses made of fluorite crystals are introduced. Because of the difficulty of finding these crystals sufficiently clear for such lenses, coupled with the difficulty of working this material, the prices of these objectives are necessarily a bit higher. The results, however, are well worth the additional outlay where fine results are demanded.



Catalog No.	Equiv. focus mm.	Initial magnification	Type	Numerical Aperture	Working distance in mm.
120	4	44	dry	0.85	.57
129	3	60	oil imm.	1.30	.25
130	1.8	97	oil imm.	1.30	.14

### THE SPENCER ACHROMATIC OBJECTIVES

The achromatic objectives being in more general use naturally represent the bulk of production; which permits a systematization in production and inspection which insures a perfection in a series of achromatic objectives which could not be attained otherwise. They receive the same careful attention as do the higher priced objectives.

Catalog No.	Equiv. focus mm.	Initial magnification	Type	Numerical Aperture	Working distance in mm.
101	48	2.0	dry	0.08	52.5
102	40	2.6	dry	0.08	35.2
103	32-14 special	4-12	dry	.12—.24	31.5—6.0
104	32	4.0	dry	0.10	21.0
106	24	3.5	dry	0.08	2.4
107	25	5.3	dry	0.20	21.0
108*	16	10	dry	0.25	4.5
111**	16	10	dry	0.25	4.5
112	8	20	dry	0.50	1.44
113	5 special	36	dry	0.60	.8
115	4	44	dry	0.66	0.72
118	4	45	dry	0.85	0.3
122	3	60	dry	0.85	0.2
124	3	60	water imm.	1.00	0.24
125	3	60	oil imm.	1.25	0.25
127	1.8	95	oil imm.	1.25	0.13
128	1.5	115	oil imm.	1.25	0.10

\*This objective is separable. When the front system is removed the back system becomes a very good 32mm. objective.

\*\*This objective is so mounted that the front system swings out in a stirrup to remove it from the optical axis to make a 32mm. objective.

Iris diaphragms may be furnished with objectives Nos. 108-115-118-127 at an additional cost. See price list.

### APOCHROMATIC OBJECTIVES

The apochromatic objectives represent the climax in design of microscope optics thus far attained and probably represent a close approach to the limit of possibilities. These objectives are achromatically corrected for three colors of the spectrum and spherically corrected for two; whereas in the achromatic objectives these corrections are limited to two colors and one color respectively. This is done by the use of more lenses in general in the objective combination and the use of fluorite lenses in particular, together with a more accurate coordination and adjustment of the properties of the different elements entering into the objective.

The ability to bring so many colors of the spectrum to one focus, and the additional ability to bring the spherical correction in two instances to the same focus, means a sharper definition because of a minimum of haze and color fringe at the edges of an object. This, too, means greater resolution especially in that these conditions permit of the practical use of greater numerical apertures.

Catalog No.	Equiv. focus mm.	Initial magnification	Type	Numerical Aperture	Working distance in mm.
150	16	10	dry	.30	4.5
152	8	20	dry	.60	1.24
154*	4	44	dry	.95	.20
156*	3	60	dry	.95	.16
161	3	60	oil imm.	1.30	.20
162	3	60	oil imm.	1.40	.17
158	2	90	oil imm.	1.30	.14
159	2	90	oil imm.	1.40	.12
160	1.5	120	oil imm.	1.30	.10

\*Furnished in collar adjustment mounts.

Iris diaphragms may be furnished with objectives Nos. 162-158-159 at an additional cost. See price list.



# EYEPIECES

There are two types of color correction recognized as distinct entities in the field of lens design. One of these relates to the central part of the image and is called axial color correction. The other concerns the color correction of the outer portions of the image and is called oblique color.

Microscope objectives are corrected for axial color. The achromatic series is corrected for two colors for the axial point of the image, whereas the apochromatic series is corrected for three colors.

Oblique color correction cannot be attained in microscope objective design to as great a degree as is desirable. Therefore, the correction of the residual oblique color error is left to the eyepieces. In the achromatic series of objectives this residual error is not great and can be left uncorrected, as is done with the huyghenian series of eyepieces, without any great inconvenience to the user of the microscope.

Either huyghenian or planoscopic eyepieces should be used with achromatic objectives. Either planoscopic or compensating eyepieces should be used with apochromatic objectives.

Planoscopic eyepieces can be used interchangeably with achromatic and apochromatic objectives.

Huyghenian eyepieces never should be used with apochromatic objectives; nor compensating eyepieces with achromatic objectives.

## HUYGHENIAN EYEPIECES

The huyghenian eyepieces usually composed of two plano-convex lenses are so constructed that the image forming rays from the objective are brought to a focus at the diaphragm between the two lenses. This image is magnified by the eyelens. The magnifying power of the eyepieces is plainly marked thereon, which means the initial magnification of the objective is multiplied by the amount indicated as the magnifying power of the eyepieces. As these eyepieces are most generally used on the less expensive microscopes, where the tube is most generally vertical, the eyelenses of these eyepieces are mounted on a truncated cone so that people—especially those wearing glasses—place the pupil of the eye at the exit pupil of the eyepieces, and also avoid scratching the spectacle lenses, if any are worn. There are no knurled edges.

CATALOG NO.	POWER	CATALOG NO.	POWER
134	4X	142	10X
136	5X	143	16X
138	6X	144	12X
140	8X		

## PLANOSCOPIC EYEPIECES

Another series of eyepieces, the planoscopic, is offered by Spencer Lens Company. This series is designed to have a compensation for oblique color error intermediate between the huyghenian and compensating series. This series has sufficient compensation to correct the achromatic series very perfectly and also enough to be thoroughly usable with apochromatic objectives.

CATALOG NO.	POWER	CATALOG NO.	POWER
175	6X	179	15X
176	8X	180	20X
177	10X	181	5X
178	12X		

## SPENCER NEW WIDE FIELD EYEPIECES

These new wide field eyepieces are offered to meet conditions demanding a large field and as flat a field as possible. Such eyepieces are especially appreciated in clinical and pathological laboratories where examinations of blood and bacterial smears are routine. The corrections attained by the additional lenses in the eyepieces permit the use of a larger diaphragm in the eyepiece which means a larger, better corrected field; which is an advantage in much work aside from that mentioned above.

CATALOG NO.	POWER	EQUIVALENT FOCUS
135	10X	25mm.
137	15X	16mm.
139	20X	12mm.

## COMPENSATING EYEPIECES

Because of the greater perfection of axial color correction in apochromatic objectives, the oblique color error is of necessity somewhat worse. The compensating series of eyepieces has been designed to compensate for this residual oblique color error of apochromatic objectives.

CATALOG NO.	POWER	CATALOG NO.	POWER
164	1.5X	169	12X
165*	8X	170	15X
166	5X	172	20X
167*	10X	173	25X
168	10X	174	30X

\*High Eye Point



# CONDENSERS

In conformity with the policy of Spencer Lens Company of offering the best possible equipment for each individual problem, two achromatic condensers are offered. Each of these condensers is fully aplanatic as well as achromatic. They are designed and manufactured to the same standard as Spencer objectives.

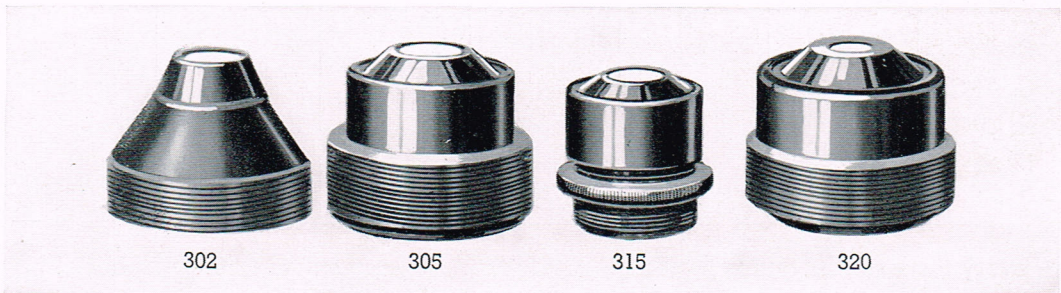
The N.A. 1.40 condenser is an excellent condenser and always should be used with an objective having a numerical aperture greater than 1.30. The N.A. 1.30 condenser is of the same general design as the N.A. 1.40, but has some features that make its use desirable whenever an objective of N.A. 1.30 or less is used. Because of its lower numerical aperture, it is possible to give this condenser a shorter focal length than the N.A. 1.40. This shorter focal length allows a better correction for aplanatism and spherical aberration. It will give better performance than the N.A. 1.40 wherever it can be used without sacrificing numerical aperture in the objective.

When achromatic condensers are specified on Spencer stands, the N.A. 1.30 condenser will be furnished regularly when the objective equipment specified does not call for an objective of higher numerical aperture than 1.30.

The Spencer wide angle condenser is a three lens system having aplanatic correction. It has a numerical aperture of 1.40 and is an efficient, inexpensive condenser for use with high aperture objectives.

The Spencer design of the Abbe type of condenser has the unique distinction of having a numerical aperture of 1.25. The usual numerical aperture for this type of condenser is 1.20. The increased numerical aperture of the Spencer condenser is obtained by a special design that does not in any way sacrifice other desirable qualities. This added numerical aperture is highly desirable to allow the use of the full resolving power of the oil immersion objective. It also increases the illumination on the object by nearly 10 per cent.

This condenser, as well as all other Spencer condensers, will illuminate the full field of a 16mm. objective without requiring special adjustment of any kind.



Catalog No.	Description
302	Abbe Condenser N.A. 1.25
305	Aplanatic Wide Angle Condenser N.A. 1.40
315	Achromatic and Aplanatic Condenser N.A. 1.30
320	Achromatic and Aplanatic Condenser N.A. 1.40

The above descriptions—and the prices therefor—call for the condensers only. The mounting for the condenser with accompanying iris diaphragm must be supplied in all cases except where the complete research substage is involved, in which case the iris is a part of the assemblage.

325	Non-centerable mounting and iris diaphragm
326*	Centerable mounting and iris diaphragm
327	Spencer oblique light attachment added to either of the above

\*This centering mount should always be used where an achromatic condenser is furnished.





No. 323 AUXILIARY CONDENSER AND MEANS FOR ATTACHMENT. This is an extra condensing lens which, placed below the regular condenser on either substage, raises the focal point of the condenser so that the apex of the cone of light is raised about 10mm. above the surface of the stage. This makes an intense illumination at this height for drop culture work and a larger area at the plane of the

stage for use with low power objectives. It is so mounted that it is easily attached or removed entirely out of the way when not in use. Provision for the same must be made at the factory.

## OPTICAL OUTFITS

OUTFITS	OBJECTIVES-focal length in mm.			OCULARS in X powers		CONDENSER AND IRIS DIAPHRAGM
	Achromatic	Fluorite	Apochromatic	Huyghenian	Compensating	
B	16.4			10		
D	16.4			6-10		
E	16.4			10		Abbe N. A. 1.25
F	16.4			6-10		" "
H	16.4-1.8			6-10		" "
I	16	4-1.8		6-10		" "
J	16.4	1.8		6-10		" "
G APO.			16.4-2		5-10	Achromatic
K APO.			16.8-4.2		5-10-15-20	" "
M APO.			16.8-4.2- 1.5		5-10-15-20- 25	" "

In every instance the outfits include a revolving nosepiece suited to the number of objectives specified, excepting on the M outfit where quick change nosepiece parts are supplied.

In all the outfits calling for the 4mm. achromatic objective the N.A. 0.66 objective will be furnished excepting with microscopes Nos. 5-7-8 where the N.A. 0.85 will be furnished. When especially requested the N.A. 0.85 will be furnished on any microscope at the same price. In outfits calling for the 2mm. apochromatic objective, the objective having a numerical aperture of 1.30 will be furnished. If objective N.A. 1.40 is desired, see price list.

The outfits listed above do not represent our complete line of objectives and oculars. We suggest such combinations because experience teaches us that they are most generally acceptable. Substitutions and additions may be made to suit the purchaser. By referring to the prices of objectives, oculars, condensers, etc., one may arrive at the cost of any optical combination desired.



# SPENCER LENS COMPANY

MAIN OFFICE AND PLANT

BUFFALO, N. Y.



## BRANCHES

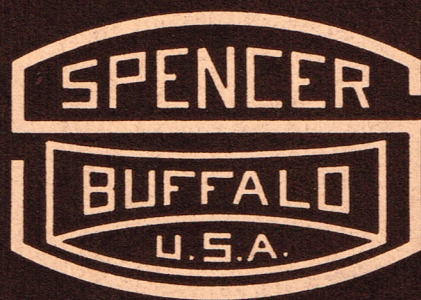
33 West 42nd St., New York City

Mallers Bldg., Chicago

582 Market St., San Francisco    165 Newbury St., Boston

Transportation Bldg., Washington







ERRATA

Spencer Research Microscope Catalog M-66

Page 10 - Description of "R" Stage -  
Sentence 4 - "At a slight advance etc., etc."  
should read "The stage is listed with operating  
buttons on both sides. Listing of details at  
same place indicates the price of buttons on  
both sides is only slightly in advance of  
buttons on one side."

Page 14 - Paragraph 4, Sentence 3 should read -  
"It is regularly listed with the mechanical stage  
buttons on one side only, with the simple slide  
clips, EXCEPT WITH STAGE "R" WHICH HAS MECHANICAL  
STAGE BUTTONS ON BOTH SIDES AND SPECIAL SLIDE CLIPS  
and with non-centerable condenser mounting."

Page 25 - Catalog No. 326\* should be described  
as follows:

Catalog No.326\* Centerable Mounting.