



⇒ PRICE LIST ⇒

OF

Optical Instruments

MANUFACTURED BY

SPENCER LENS CO.,

BUFFALO, N. Y.,

U. S. A.

1896



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CATALOGUE AND PRICE LIST

—OF—

MICROSCOPES,

TELESCOPES

AND ACCESSORIES

—MADE BY—

SPENCER LENS CO.,

OFFICE & SALESROOM: 546 Main Street.

FACTORY: 367-373 Seventh Street.

BUFFALO, NEW YORK, U. S. A.

Preface.



*I*N PRESENTING this Catalogue to the public, we would state that this list has been hurriedly compiled, and while we have a most complete line of Objectives, our Stands are at present limited in number as to design, but in the near future we shall issue a complete illustrated catalogue of Microscope Stands and Accessories of our own manufacture.

In Comparing Our Prices

with those of other American makers, we would call attention to our Student and Educational Series, on pages 21 and 22, and for Oil Immersion Objectives to the Bacteriological Series, page 17.

Terms.

OUR TERMS are cash on delivery. Parties unknown to us must send money with order or goods will be sent C. O. D.

Goods ordered sent C. O. D. must be accompanied by one-fourth of the amount of order; expense of collection to be borne by purchaser.

All foreign orders should be accompanied by a remittance of the amount of the order.

We guarantee our goods to be strictly as represented or money refunded upon return of the goods.

Goods sent by mail are at the risk of purchaser.

All goods are carefully packed, and when shipped by express we guarantee their safe arrival. Shipments by freight at the risk of purchaser.

Give exact postoffice address and state by what express line goods are to be shipped.

Remit by express, postoffice order or New York draft, made payable to Spencer Lens Co.

No discounts from list prices will be allowed except to regular dealers in optical goods.

Announcement.

THE constantly increasing demand for our goods, growing out of the reputation which we have always maintained for uniformity and excellence of our work in every detail, has necessitated the employment of capital and increased facilities for the more extensive production of our goods.

Our business has been transferred to a Stock Company, incorporated under the laws of this State, known as the SPENCER LENS CO.

We are favorably located and provided with the latest and best machinery and appliances adapted to our work, where we shall continue the manufacture of our Microscope Objectives more extensively than ever before. We shall also manufacture Microscope Stands and Telescopes of every description, Eyepieces, Amplifiers and Lenses suited to every purpose. All the work, in every detail, will be under the constant care and supervision of Mr. H. R. Spencer, and none of the products of the company will be allowed to leave the works without his endorsement.

Thanking you for past favors, and soliciting a continuance of the same with the new company, we are,

Very respectfully yours,

SPENCER LENS CO.

Buffalo, Aug. 15, 1896.

Improvements.

SINCE the issue of our last price list nearly all our objectives have been reformulated, and we are now making use of a greater variety of flint and crown glass for the more perfect correction of the slight chromatic error existing in the older objectives. All the objectives enumerated in this catalogue will be found as near to absolute achromatism as is consistent with the formation of robust images and brilliancy of definition. In the selection of the various kinds of glass furnished by the different makers we have exercised the utmost care to avoid the use of such kinds in the manufacture of both our Microscope and Telescope Objectives as are subject to the deterioration from atmospheric changes known as the disease of the apochromatics.

All our immersion objectives have the fronts plated with pure gold to resist the action of corrosive fluids.

Spencer's New MicroscopeSTAND.....

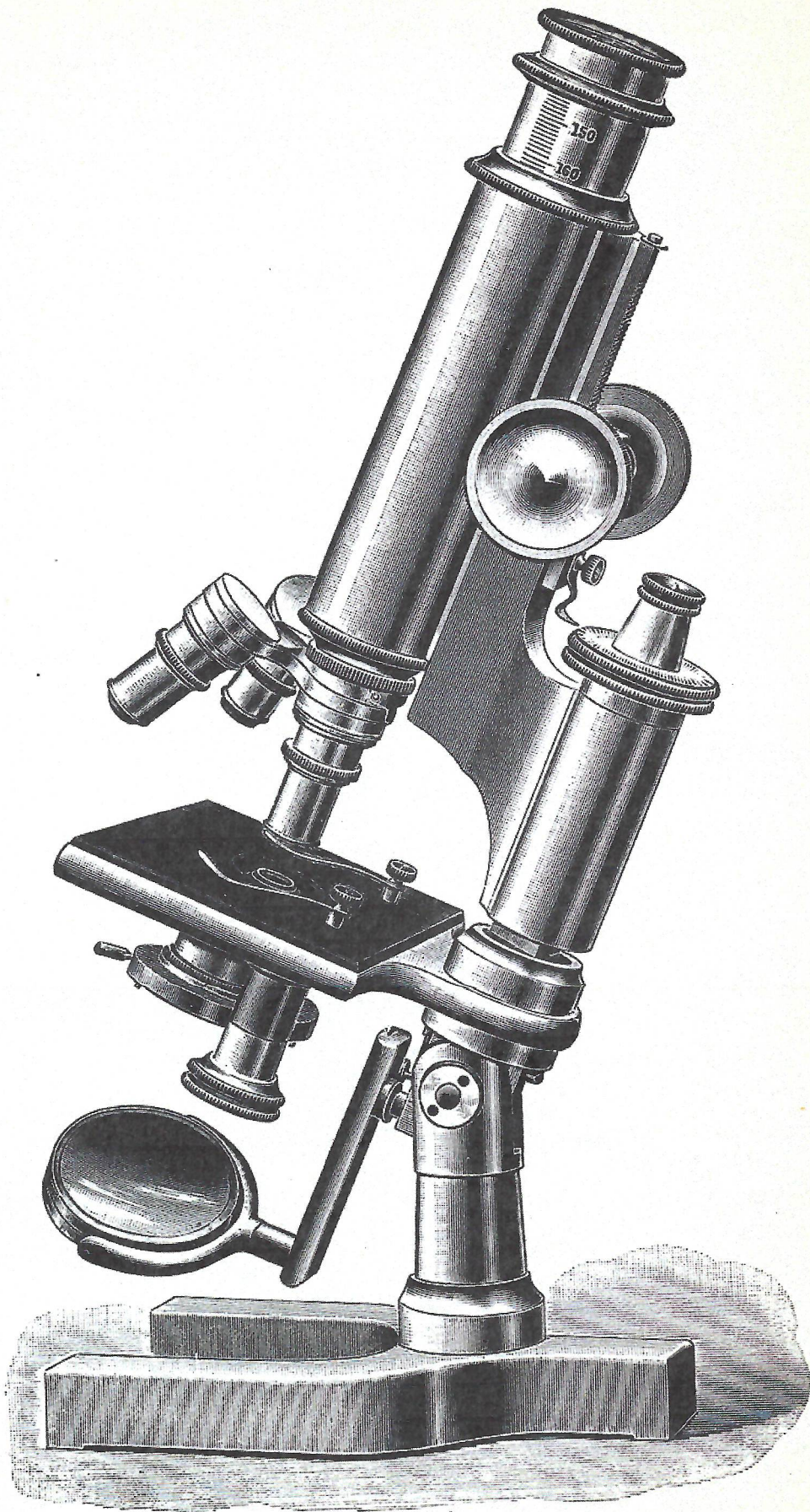
CONTINENTAL FORM NO. 1.

MANUFACTURED BY
SPENCER LENS COMPANY,

(Under the Personal Supervision of Mr. Herbert R. Spencer.)

Nos. 367-373 SEVENTH STREET,

BUFFALO, N. Y., U. S. A.



(CUT ONE-HALF ACTUAL SIZE.)
CONTINENTAL FORM No. 1.

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• Description of Stand No. 1. •

Brass, polished and lacquered. Height, 12 inches. Weight, 8¼ pounds. The base is filled with lead for extra weight, is in horse-shoe or Y form as preferred. Stout pillar with hinged joint for inclination. Stage, 4x3½ inches, faced with hard rubber, furnished with spring clips. The sub-stage is movable by quick sextuple screw, in protecting sleeve, at lower point of movement swinging outward to allow ready change of accessories. Diaphragm has three different sizes of aperture. The mirrors plane and concave with unusual range of motion, sliding and swinging upon arm. The focal length of the concave mirror accurately adapted. Fine adjustment by micrometer screw with graduated head. Coarse adjustment by diagonal rack and pinion. Body and draw tube of ample size, permitting the use of low power oculars of the largest field, advantageous in both visual and photographic work. Draw tube nickel plated and graduated in *mm.* Draw tube fitted with society screw. Oculars of any preferred power.

Also furnished with round, revolving centering stage, with plain metal or faced with hard rubber, at an additional cost of \$18.00 for the plain metal face, and \$20.00 for the hard rubber face.

Stand No. 1, with 1 eyepiece, ⅔-inch and ⅙-inch objectives, . . .	\$52.80
Same as above, with double nosepiece,	\$57.80
Stand No. 1, with 2 eyepieces, ⅔-inch and ⅙-inch objectives, . . .	\$55.00
Same as above, with double nosepiece,	\$60.00
Stand No. 1, with 2 eyepieces, 2-inch, ⅔-inch and ⅙-inch objectives, . . .	\$61.60
Same as above, with triple nosepiece,	\$69.10
Stand No. 1, with 2 eyepieces, ⅔-inch and ⅙-inch dry, and 1-12-	
inch oil immersion objectives, Abbe condenser and iris	
diaphragm,	\$96.25
Same as above, with triple nosepiece,	\$103.75

THE ABOVE PRICES INCLUDE POLISHED HARD WOOD CABINET, WITH LOCK AND KEY.

What Others Say of the Spencer Lenses.

NEW YORK CITY, January 5, 1897.

SPENCER LENS COMPANY, Buffalo, N. Y.

Dear Sirs—The lenses made by your firm and recently purchased by me are the most satisfactory for observation and photomicrography of any I have ever used. For resolution, definition and flatness of field, I have never seen their equal. The lenses in question are the $\frac{1}{4}$ inch, Homogeneous Immersion, 1.35 N. A., the $\frac{1}{2}$ -inch, 100 degrees and the 1-inch, 40 degrees.

Very truly yours,

J. A. FORDYCE, M. D.

Professor of Dermatology and Syphilology, Bellevue Hospital Medical College, New York City.

NEW YORK CITY, February 28, 1896.

SPENCER LENS COMPANY, Buffalo, N. Y.

My Dear Mr. Spencer—The other evening, with my 1-10-inch 1.54 N. A., I resolved *A. Pellucida* with absolutely central light. Bennett and Dr. Stearns were at my house, and saw and verified the condition of the light.

By-the-by, the lens corrects perfectly with water. Did you know it?

You ought to get out a circular about this lens. It is worth it. Yours truly,

HENRY G. PIFFARD, M. D.

Professor of Dermatology, Medical Department University of the City of New York.

NIAGARA UNIVERSITY.

BUFFALO, N. Y.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—The $\frac{1}{2}$ dozen 1-12-inch oil immersion objectives made for the Niagara University have been very carefully examined for definition, flatness of field, etc., and I wish to say that they are the best lenses for the money that I have ever seen. They are excellently corrected, and we are very well pleased with them, indeed.

Very respectfully,

JOHN A. MILLER, Ph. D., F. C. S.

BUFFALO, N. Y., December 29, 1897.

SPENCER LENS COMPANY, 367-373 Seventh St.,

Buffalo, N. Y.

Gentlemen—We have twelve of the new Spencer "Continental" stands, each with $\frac{2}{3}$ -inch and 1-5-inch dry, and 1-12-inch oil immersion objectives, Abbe condenser and iris diaphragm; they have been in use for some months. The stands have been very satisfactory, and so in fact have all the parts. The 1-12 oil immersions are particularly good.

Yours truly,

HERBERT U. WILLIAMS, M. D.

Professor of Bacteriology, University of Buffalo, Buffalo, N. Y.

DEPARTMENT OF HEALTH.

BUFFALO, N. Y., March 30, 1897.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—Having made a comparative examination of your objectives with those of other first-class makers, we find that in their defining power and other points of excellence, they are unsurpassed by those of any other maker.

Respectfully yours,

ERNEST WENDE, M. D.

Health Commissioner of Buffalo.

TRENTON, N. J., December 24, 1896.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—I take pleasure in expressing my opinion of the company's objectives, that opinion being vigorous and emphatic. The objectives are equal to any, and in many respects superior to any in the world. Their corrections are always as perfect as human skill can make them, while their defining and resolving powers are simply marvelous.

ALFRED C. STOKES, M. D.

KENT COLLEGE OF LAW.

CHICAGO, Ill., January 8, 1897.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—I have had an extended experience with the objectives made by Mr. Herbert R. Spencer, of your company, and have compared them with the objectives of other makers. Mr. Spencer is an artist and in my judgment makes the best objectives in the world.

Respectfully yours,

MARSHALL D. EWELL, LL. D., M. D.

Dean.

DEPARTMENT OF HEALTH.

BUFFALO, N. Y., March 2, 1897.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—Several months ago I had occasion to purchase three microscope objectives for use in the private laboratory of a prominent physician in this city.

I was instructed not to spare expense in making the purchase, but obtain the best lenses manufactured.

The objectives desired were a $\frac{1}{6}$ -inch dry, a $\frac{2}{3}$ -inch dry and a 1-12-inch oil immersion.

After careful comparison with objectives from two European makers and those from a prominent American manufacturer, I kept the lenses submitted by your firm.

The 1-12-inch oil immersion was particularly satisfactory, comparing most favorably with any that I have ever examined and was far superior to any of the others submitted at the time.

Respectfully,

WILLIAM G. BISSELL, M. D.

Bacteriologist, City of Buffalo, Professor of Bacteriology Niagara University, Buffalo, N. Y.

Spencer's New MicroscopeSTAND.....

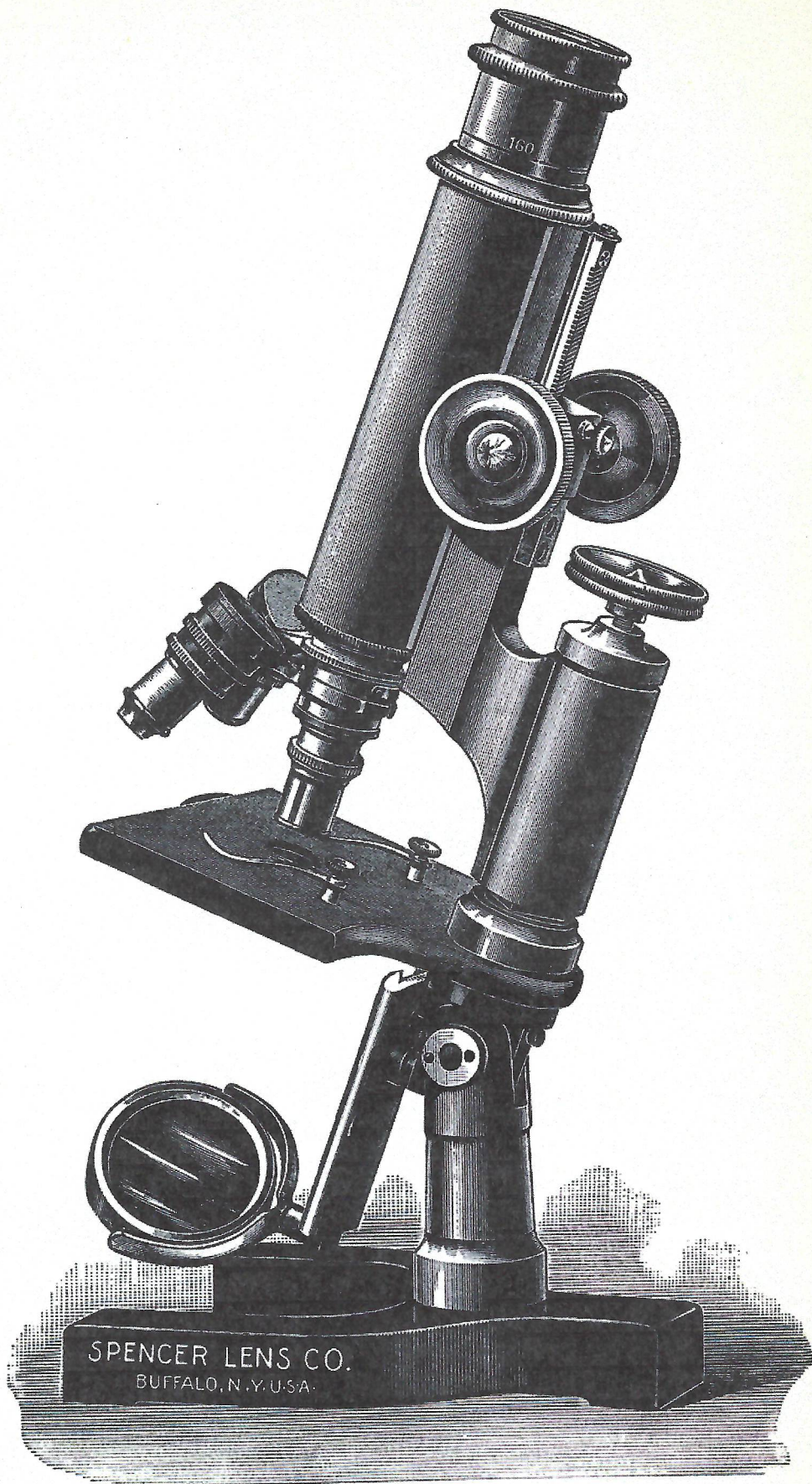
CONTINENTAL FORM NO. 2.

MANUFACTURED BY
SPENCER LENS COMPANY,

(Under the Personal Supervision of Mr. Herbert R. Spencer.)

Nos. 367-373 SEVENTH STREET,

BUFFALO, N. Y., U. S. A.



(CUT ONE-HALF ACTUAL SIZE.)
CONTINENTAL FORM No. 2.

• Description of Stand No. 2. •

Brass, polished and lacquered, except base, which is of japanned iron, and stage, which is brass with dull black finish. Height, 12 inches. Stout brass pillar, lacquered, with hinged joint for inclination. Stage, 4 x 3½ inches, furnished with spring clips and with revolving diaphragm, with four apertures of different sizes, fitted to its under surface. It is provided with plane and concave swinging mirrors, sliding upon arm with a range of motion which permits of use for top illumination. Tubes and adjustments are the same as in our No. 1 Stand. Fine adjustment by micrometer screw. Coarse adjustment by diagonal rack and pinion. Draw tube nickel-plated and fitted with society screw.

Oculars of any desired power.

Stand No. 2, with 1 eyepiece, 2/3-inch and 1/6-inch objectives, . . .	\$42.50
Same as above, with double nosepiece,	\$47.50
Stand No. 2, with 2 eyepieces, 2/3-inch and 1/6-inch objectives, . . .	\$44.50
Same as above, with double nosepiece,	\$49.50
Stand No. 2, with 2 eyepieces, 2-inch, 2/3-inch and 1/6-inch objectives, . . .	\$49.50
Same as above, with triple nosepiece,	\$57.00

We also furnish this stand with quick screw sub-stage in protecting sleeve, equipped when desired with Abbe condenser and iris diaphragm.

THE ABOVE PRICES INCLUDE POLISHED HARD WOOD CABINET, WITH LOCK AND KEY.

What Others Say of the Spencer Lenses.

MEDICAL DEPT., YALE UNIVERSITY.

NEW HAVEN, Conn., January 14, 1898.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—We have the following Spencer Lenses of the first quality, viz.: 1-inch, $\frac{3}{4}$ -inch and $\frac{1}{2}$ -inch dry lenses and $\frac{1}{4}$ -inch oil immersion 120° balsam angle, especially corrected for photography and unsurpassed by anything I have ever used; 1-6-inch oil immersion 120° balsam angle and 1-15-inch oil immersion 120° balsam angle, all of great excellence and entirely satisfactory; one $\frac{1}{4}$ -inch 120° dry, a splendid lens, long working distance, made to order; two $\frac{1}{8}$ -inch objectives 151° dry, excellent objectives.

I consider the Spencer lenses among the best made.

We have a Spencer Projection Eyepiece unsurpassed by any.

MOSES C. WHITE, M. D.,

Professor of Pathology in Medical Dept., Yale University.

BUFFALO, N. Y., March 5, 1898.

SPENCER LENS COMPANY, Buffalo, N. Y.

Dear Sirs—I have had several of your microscopes in constant use in my laboratory ever since you began making them, and am very glad to testify to the superiority of their design and the accuracy of their results. What I would especially commend in the Spencer instruments is the careful attention that is paid to the minutest details of construction. The result is an honest piece of workmanship, strong as well as beautiful, and precise enough for an exacting student to use with satisfaction. Yours sincerely,

FRANKLIN W. BARKOWS,

Professor Biology and Histology, Medical Department, University of Buffalo.

UNIVERSITY OF ILLINOIS.

URBANA, ILL., Feb. 26, 1898.

SPENCER LENS COMPANY, Buffalo, N. Y.

Dear Sirs—I have had in use microscope objectives made under the supervision of Herbert R. Spencer, or of his father, since 1880 and later. They have given excellent satisfaction and are as good to-day as they ever were. Their first-class, wide-angled objectives have no superiors in their class on earth.

Very truly yours,

T. J. BURRILL,

Dean of General Faculty and of Graduate School.

UNIVERSITY OF BUFFALO, MEDICAL DEPARTMENT.

BUFFALO, N. Y., March 12, 1898.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—The microscopes purchased from you for use in the Medical Department in the University of Buffalo have proved entirely satisfactory. The directors of the laboratories inform me that they are able to use them with excellent results. It gives me great pleasure to make this acknowledgement. Yours very truly,

M. D. MANN, Dean.

ALBION COLLEGE,

BIOLOGICAL LABORATORY.

ALBION, Mich., February 28, 1898.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—A first-class objective is a work of art and its maker an artist in as true a sense as he who wields a brush or chisel.

I have known, used and admired the work of Mr. Spencer for many years and I may say that I have never looked through an objective that gave clearer or more beautiful and truthful pictures than his. I have spent many hours in comparing his work with that of other makers and I have always been confirmed in the opinion that, as an artist in "brass and glass" he stands unsurpassed.

His objectives, to my mind, excel all others in the perfections of their corrections, giving such crisp and brilliant definition that it is a pleasure to work with them. They retain this crispness under high eyepieces to a marvellous degree.

I have never yet seen a poor objective that came from his hands. The uniformity of their quality is one of the strongest recommendations that I can give them. It is no lottery, purchasing a "Spencer" lens.

You may use this letter in whole or in part if you wish to make use of it.

Yours sincerely,

CHAS. E. BARR,
Prof. Biology, Albion College.

BUFFALO CENTRAL HIGH SCHOOL,

BUFFALO, N. Y., March 7th, 1898.

SPENCER LENS COMPANY, Buffalo, N. Y.

Dear Sirs—Our pupils have been using your microscopes for over a year, in the study of zoology and botany. The instruments are furnished with the $\frac{1}{4}$ -inch and 1-5-inch Spencer objectives, and are perfectly satisfactory for all the work of the school. I would cordially recommend these microscopes to any schools desiring a laboratory instrument that is strong and durable, as well as delicate in its adjustments.

Yours very truly,

FREDERICK A. VOGT, Principal.

COLLEGE OF MEDICINE—SYRACUSE UNIVERSITY.

SYRACUSE, N. Y., March 7, 1898.

SPENCER LENS COMPANY, Buffalo, N. Y.

Gentlemen—For thirty years I have been familiar with microscopic objectives made for others and myself by Charles A. Spencer and his son, Herbert R. Spencer. Without question, these lenses are among the very best produced in the world.

Yours sincerely,

A. CLIFFORD MERCER.

STATE OF NEW YORK—BUFFALO STATE HOSPITAL.

DR. ARTHUR W. HURD, Superintendent.

BUFFALO, N. Y., Feb. 26, 1898.

SPENCER LENS Co., 367 Seventh St.,
Buffalo, N. Y.

Gentlemen—We are pleased to be able to say that the microscope which was obtained from you, has been in constant use in this Hospital, and has proven to be a useful instrument for the work given it here. It has been used principally for diagnostic purposes in the laboratory, in the examination of blood, urine, and for tubercle bacilli, etc., and has met our wants.

Yours very truly,

ARTHUR W. HURD.

Spencer's New Microscope
....STAND....

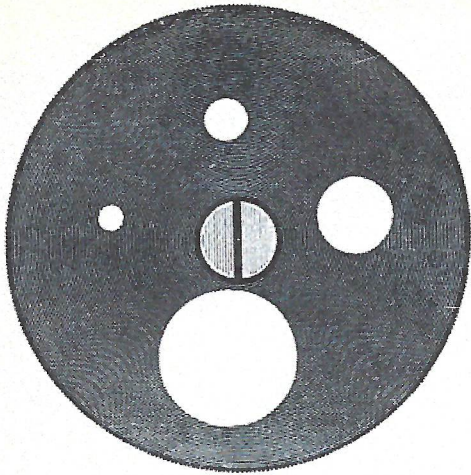
CONTINENTAL FORM NO. 3.

MANUFACTURED BY
SPENCER LENS COMPANY,

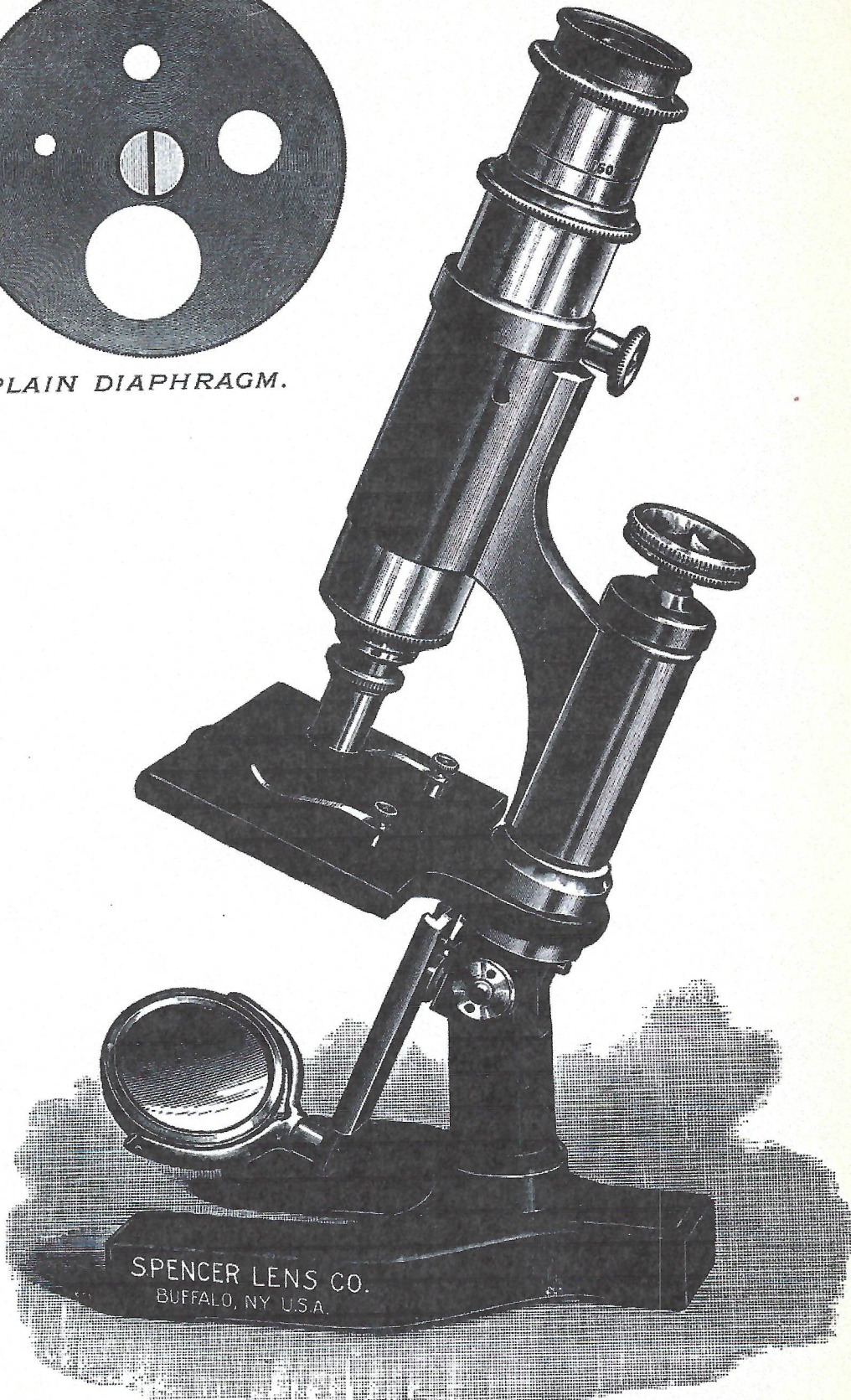
(Under the Personal Supervision of Mr. Herbert R. Spencer.)

Nos. 367-373 SEVENTH STREET,

BUFFALO, N. Y., U. S. A.



PLAIN DIAPHRAGM.



(CUT ONE-HALF ACTUAL SIZE.)
CONTINENTAL FORM No. 3.

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Description of Stand 3.

THIS very neat and tasteful instrument is especially commended to those who desire a superior microscope adapted for the best work, but at a very moderate cost. It is peculiarly suited for botanical and biological work, and for the general requirements of schools and academies. The same care is bestowed upon the construction and finish, as in the case of the more expensive stands.

The horseshoe base and pillar are japanned and very smoothly finished. The stout pillar and hinged joint for inclination, are the same as in the higher priced stands. Brass stage, dead black finish, fitted with revolving diaphragm, having four apertures of different sizes. Plane and concave mirrors with double motions, and sliding in a swinging arm of length to permit use for top illumination when desired. Fine adjustment by micrometer screw. Coarse adjustment by nickel plated sliding tube, carefully fitted in a cloth lined tube provided with clamp ring and set screw. Nickel plated draw tube. Other parts finely polished and lacquered.

Stand No. 3, with 1 eyepiece, $\frac{2}{3}$ -inch and $\frac{1}{6}$ -inch objectives,	\$37.50
Same as above, with double nosepiece, . . .	\$42.50
Stand No. 3, with 2 eyepieces, $\frac{2}{3}$ -inch and $\frac{1}{6}$ -inch objectives,	\$39.50
Same as above, with double nosepiece, . . .	\$44.50

We shall be glad to quote upon any other combination of objectives and oculars.

If required, our quick screw substage can be attached, thus providing for the use of condenser and iris diaphragm.

THE ABOVE PRICES INCLUDE POLISHED HARD WOOD CABINET, WITH LOCK AND KEY.

All of our instruments are equipped with the famous Spencer objectives, made under the personal supervision of Mr. Herbert R. Spencer, whose reputation as a lens maker is world wide.

BUFFALO, N. Y., January, 1897.

SPENCER LENS COMPANY, Buffalo, N. Y.:

Gentlemen:—At the Indianapolis Congress of Microscopists, August, 1879, the forerunner of the American Microscopical Society, *Frustralia Saxonica* of the Moller test plate was resolved by a "1/4-inch duplex homogeneous immersion lens" by Spencer. No. 20 of this plate, *Amphipleura Pellucida* was also resolved by this same lens. No better work has been accomplished by any lens prior to this, and those who have used the higher class of microscopical objectives since then are aware that the Spencer lenses have always held their own with the very finest lenses of either foreign or domestic production. Since the "Father of American Microscopy," Chas. A. Spencer, demonstrated in 1847 that American lenses could be made superior to the best that foreign experts had produced, there has been no retrogression in Spencer lenses. The microscopist who holds an objective made by Herbert R. Spencer, upon whom the mantle of his father has fallen, will never desire to part with it because he can obtain a better one. It is a great satisfaction to have the highest grade of microscopical work done by so thorough a workman in our own city. Yours very truly,

GEORGE E. FELL, M. D., F. R. M. S.
Past President American Microscopical Society.

BUFFALO, N. Y., January 15, 1897.

SPENCER LENS COMPANY, Buffalo, N. Y.:

Gentlemen:—For the past five years I have used your lenses almost daily, and for definition, penetration, resolution and flatness of field consider them superior to any in my possession.

WM. C. KRAUSS, M. D.,
Professor of Nervous Diseases, Niagara University,
Buffalo, N. Y., 371 Delaware Avenue.

INDIANAPOLIS, IND., February 26, 1896.

SPENCER LENS COMPANY, Buffalo, N. Y.:

Gentlemen:—For fifteen years I have used the lenses made under the supervision of Mr. H. R. Spencer, and have seen them in competition with those of nearly all other manufacture, foreign and domestic. I am glad to say that I have found none other so admirable in all respects. They embody all desirable qualities, and are as nearly perfect as the art of the lens maker can produce.

Very sincerely yours,
E. F. HODGES, A. M., M. D., F. R. N. S.

December 24, 1897.

SPENCER LENS COMPANY, Buffalo, N. Y.:

Gentlemen:—I have used the microscope lenses, objectives, and eye-pieces made by the late Charles A. Spencer, of Canastota, N. Y., or by his son, Mr. Herbert R. Spencer, of Buffalo, N. Y., since the year 1868, and consider them superior to those of any other maker. In fact the Spencer lenses in priority and superiority are the first in the world.

Sincerely,
H. R. HOPKINS,
Professor of Hygiene, University of Buffalo.

The Spencer Microscopes have received the especial approval of the Regents of the University of the State of New York.

Microscopes Complete.

ON MICROSCOPE stands with optical outfit complete, we make special prices. As our list of objectives embraces a greater number and variety than those of other makers, we would request intending purchasers to submit such combinations as are best suited for their work, upon which we will quote special prices to compare favorably with other makers.

STAND III.

THIS stand is entirely of brass, except the base, which is cast-iron, neatly japanned. The base is in one piece, similar to the preceding stand, and very rigid; the bell-metal bar is attached by a joint, allowing any angle of inclination, perpendicular and horizontal positions being indicated by stops. The body gives long and short standard lengths.

The coarse adjustment is accomplished by rack and pinion; the fine adjustment is of the same construction previously described.

The plane and concave mirrors are hung on an axis in the same plane with the object, and may be swung over the stage for illuminating opaque objects, the object being always in the center.

The stage is broad, firm and low, very convenient for dissecting or mounting, and is provided with delicate spring-clips, which may be removed.

The rotating diaphragm is circular in form, with a series of apertures differing in size.

The above stand with one ocular and cabinet \$24.00

For prices on stands and optical combinations, complete, see top of page.

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OBJECTIVES.

FIRST-CLASS HOMOGENEOUS IMMERSION SERIES.

Standard length of tube 1.5 inches from end of nosepiece
to eye surface of B, or 1-inchocular.

(ADJUSTABLE.)

Focal Length.	Numerical Aperture.	Balsam Angle.	Price.
$\frac{1}{4}$ inch.	1.32	120°	\$ 75 00
$\frac{1}{8}$ inch.	1.42	138°	80 00
$\frac{1}{10}$ inch.	1.42	138°	90 00
$\frac{1}{15}$ inch.	1.42	138°	125 00
$\frac{1}{25}$ inch.	1.42	138°	200 00

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

As the slightest variation in the refraction of the immersion fluid from that of the front lens or cover, change of tube length, change of eyepieces, and the air-refraction taking place under the cover of dry mounts, to a considerable extent introduces elements of uncertainty affecting the best possible performance of an objective without adjustment under all the conditions named, we furnish our homogeneous immersion series of largest aperture in adjustable mountings only.

A one-half ounce phial of immersion fluid (either cedar oil or glycerine compound, as may be desired), is furnished free of charge with every homogeneous objective.

In all cases we recommend sending to the maker of the objective for the immersion fluid for which it is corrected.

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OBJECTIVES.

FIRST-CLASS OIL IMMERSION SERIES.

Specially intended for Photo-Micrography.

(NON-ADJUSTING.)

Focal Length.	Numerical Aperture.	Balsam Angle.	Price.
$\frac{1}{4}$ inch.	1.35	125°	\$ 70 00
$\frac{1}{8}$ inch.	1.35	125°	70 00
$\frac{1}{10}$ inch.	1.35	125°	75 00
$\frac{1}{15}$ inch.	1.35	125°	110 00

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

It is well known that in photography the plates formerly used, and even to a great extent to-day, are chiefly sensitive to the blue and violet rays of the spectrum, while they are but feebly sensitive to the yellow and green rays. In photographing, therefore, it was necessary, in order to obtain the best results, that the lenses should be undercorrected, and often to a degree that seriously impaired their visual performance—that is to say, these lenses would enable an exceedingly sharp and well-defined photographic image to be obtained, but only at a certain sacrifice of their good qualities in other respects. Photographic plates can now be made that are exceedingly sensitive to yellow and yellowish-green light, the colors which most forcibly impress the eye. Professor H. G. Piffard, M. D., of New York, was the first, to our knowledge, to appreciate the practical importance of this fact in respect to photo-micrography, and early in 1892 requested us to construct a lens for him especially corrected for best visual definition, with a view to using it in connection with plates chiefly sensi-

tive to that portion of the spectrum producing the strongest visual impressions. This, of course, would practically avoid the inconveniences heretofore existing on account of the non-coincidence of the so-called optical and chemical foci. During the year 1893 we constructed several objectives in the manner proposed by Dr. Piffard, and the photographic results that have been obtained have fully justified the theoretical views on which they were based. It is, of course, understood that this series of lenses are not intended for and will not give the best results, photographically, if used with the old-style blue sensitive plates; but when used with yellow sensitives (so-called orthochromatic) plates, are capable of securing results which we believe are unattainable by objectives "specially corrected for photography" by the methods usually employed.

For purely visual work, irrespective of their application to photography, these lenses will be found, we believe, unequalled by those of any other maker in the essential features of resolving power and definition, together with flatness of field and long working distance.

With the one-quarter inch of this series the *Amphipleura Pellucida* has been resolved into lines, and with the one-sixth inch the *Navicula Rhomboides* has been resolved and photographed in beads.

A photograph of the test *Podura* made by Dr. Piffard with one of the new lenses is superb, and affords indisputable evidence of the excellence of his methods in photography, as well as of the unequalled performance of this new series of objectives.

OBJECTIVES.

BACTERIOLOGICAL SERIES.

(NON-ADJUSTING.)

Focal Length.	Numerical Aperture.	Balsam Angle.	Price.
$\frac{1}{8}$ inch.	1.22	106°	\$ 35 00
$\frac{1}{12}$ inch.	1.22	106°	35 00
$\frac{1}{12}$ inch.	1.35	125°	45 00
$\frac{1}{20}$ inch.	1.22	106°	75 00
$\frac{1}{30}$ inch.	1.22	106°	110 00
$\frac{1}{35}$ inch.	1.30	117°	130 00

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

This series has been specially designed to fulfill the requirements of workers in bacteria, physiological botany and general histology, work requiring perfect definition and flatness of field, combined with very long working focus. These objectives fulfill, in the highest degree, all these requirements, and possess the highest resolving power belonging to their aperture, all of the series resolving Balsam mounted A. Pellucida with lamp and mirror illumination.

OBJECTIVES.

WATER IMMERSION SERIES.

(ADJUSTABLE.)

Focal Length.	Numerical Aperture.	Water Angle.	Equivalent Balsam Angle.	Price.
$\frac{1}{8}$ inch	1.30	155°	117°	\$ 60 00
$\frac{1}{10}$ inch	1.30	155°	117°	75 00
$\frac{1}{15}$ inch	1.30	155°	117°	100 00

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

The objectives of this series have exceptionally great working focus for water immersion lenses of their large aperture, and are especially adapted to the study of the minute forms of life in water, and the highest class of histological work ; they are remarkable for flatness of field, freedom from color and beauty of definition. In all these points they are guaranteed to equal the highest type of homogeneous immersion objectives made. All of this series will resolve Balsam mounted A. Pellucida with simple mirror illumination.

OBJECTIVES.

FIRST-CLASS DRY SERIES.

(ADJUSTABLE.)

Focal Length.	Numerical Aperture.	Air Angle.	Price.
3 inch.	0.12	13°	\$20 00
2 inch.	0.18	20°	20 00
1 inch.	0.35	40°	35 00
$\frac{1}{2}$ inch.	0.77	100°	50 00
$\frac{4}{10}$ inch.	0.91	130°	60 00
$\frac{1}{4}$ inch.	0.93	136°	40 00
$\frac{1}{5}$ inch.	0.93	136°	40 00
$\frac{1}{5}$ inch.	0.99	163°	55 00
$\frac{1}{8}$ inch.	0.99	163°	60 00
$\frac{1}{10}$ inch.	.....	175°	60 00
$\frac{1}{12}$ inch.	.....	175°	75 00

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

The higher powers of this series more nearly approach in performance the best immersion objectives than any heretofore made. They are practically free from color, both by oblique and central illumination. The working distance is as great as is consistent with their wide angle of aperture. When in adjustment, the distance from front lens to cover remains the same whether the cover be thick or thin, and the angle of aperture remains constant throughout the entire range of adjustment. The claim of extreme aperture and great working distance made by some makers in favor of their high-power dry objectives is entirely at variance with the well-known laws of refraction. Any high-power dry objective of very large aperture must of necessity work close to the cover to transmit its full angular pencil of image-forming rays.

Owing to the large size of the back combinations of the $\frac{1}{2}$ and $\frac{4}{10}$ ths of this series, we have found it necessary to move the outer tube for cover correction, in order to avoid the excessive size and weight of mounting required for the movement of the inner tube.

OBJECTIVES.

PROFESSIONAL SERIES.

Focal Length.	Numerical Aperture.	Balsam Angle.	Air Angle.			Price.
2 inch.	0.14	.....	16°	Dry.	Non. Adj.	\$15 00
2 $\frac{3}{4}$ inch.	0.31	.....	36 35°	"	"	18 00
1 $\frac{1}{2}$ inch.	0.58	.....	70°	"	"	25 00
1 $\frac{1}{4}$ inch.	0.85	.....	116°	"	Adjustable.	24 00
$\frac{1}{6}$ inch.	0.94	.....	140°	"	"	40 00
$\frac{1}{8}$ inch.	0.97	.....	151°	"	"	45 00
$\frac{1}{10}$ inch.	1.32	120°	.....	Oil Im.	"	50 00
$\frac{1}{15}$ inch.	1.32	120°	.....	"	"	70 00

2, 3 and 4 inch combined. Price, \$20.

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

All the objectives of this series are strictly first class, and are in every way in proportion to their aperture as effective as the higher series, and are possessed of considerably greater working focus. We call attention to the $\frac{1}{10}$ and $\frac{1}{15}$ of this series, which are of great working focus, and of first-class performance, readily resolving A. Pellucida in Balsam with lamp and mirror illumination. The correction adjustment of the $\frac{1}{4}$ is by movement of the outer tube, its exceptionally long working focus preventing danger of injury to front or cover. All the higher powers are in first-class mountings, with rectilinear movement of inner tube.

OBJECTIVES.

STUDENT SERIES.

(NON-ADJUSTING.)

Focal Length.	Numerical Aperture.	Balsam Angle.	Air Angle.		Price.
3 inch.	0.10	.....	11°	Dry.	\$ 6 00
2 inch.	0.12	.....	13°	"	6 00
1 inch.	0.26	.....	30°	"	15 00
$\frac{2}{3}$ inch.	0.26	.....	30°	"	10 00
$\frac{1}{2}$ inch.	0.41	.....	50°	"	15 00
$\frac{1}{4}$ inch.	0.77	.....	100°	"	15 00
$\frac{1}{6}$ inch.	0.86	.....	118°	"	16 00
$\frac{1}{10}$ inch.	0.77	.....	100°	"	18 00

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

This is a thoroughly well corrected series of objectives of very moderate price. Their long working focus, flatness of field and excellence of definition render them a thoroughly efficient series for the every-day work of the physician and medical student. Of the lower powers we call particular attention to the 1 in. and 2-3 of 30° as lenses equal to the very best made.

The $\frac{1}{4}$ handsomely resolves P. Angulatum by central light. The $\frac{1}{6}$ and $\frac{1}{10}$ readily, with mirror illumination, resolve S. Gemma.

Owing to the impossibility of realizing the full value of large aperture of dry objectives without correction adjustment, to compensate for the aberrations introduced by varying thicknesses of cover glass, we have decided to limit the higher dry lenses of this series to 118° of aperture, which renders them more effective for general work than larger apertures, with greater sensibility to varying cover thicknesses with which they must of necessity be used. All are corrected for $\frac{1}{100}$ in. cover thickness, unless otherwise ordered.

OBJECTIVES.

EDUCATIONAL SERIES.

(NON-ADJUSTING.)

Focal Length.	Numerical Aperture.	Air Angle.		Price.
3 inch.	0.07	8°	• Dry.	\$5 00
2 inch.	0.07	8°	“	5 00
1 inch.	0.12	13°	“	5 00
1/2 inch.	0.35	45°	“	10 00
1/4 inch.	0.61	75°	“	12 00
1/5 inch.	0.42	90-50°	“	10 00 12 00
1/8 inch.	0.68	85°	“	14 00
1/10 inch.	0.78	102°	Water Im.	18 00

In ordering objectives please state whether for 160 mm. or 250 mm. tube length.

The lower powers of the Educational Series up to the $\frac{1}{2}$ in. are single systems of good correction and are well suited to botanical work, the examination of foraminifera and other opaque objects, work requiring defining power not strictly confined to one plane. All the higher powers are of great working focus. The $\frac{1}{4}$ resolves P. Angulatum with mirror but slightly removed from central.

The $\frac{1}{10}$ gives first-class resolution of P. Angulatum with central light, and with oblique light from mirror resolves No. 18 Moller's (Balsam) plate. This objective is less affected by slight changes of cover thickness than are the dry lenses of same aperture without correction adjustment.

LINEAR MAGNIFYING POWERS OF Objectives and Eyepieces.

Standard Tube Length.

OBJECTIVES.	3 in.	2 in.	1 in.	$\frac{2}{3}$ in.	$\frac{1}{2}$ in.	$\frac{1}{10}$ in.	$\frac{1}{4}$ in.	$\frac{1}{5}$ in.	$\frac{1}{6}$ in.																																																		
EYEPIECES.	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">$1\frac{1}{2}$ in.</td> <td style="padding: 5px;">20</td> <td style="padding: 5px;">30</td> <td style="padding: 5px;">60</td> <td style="padding: 5px;">80</td> <td style="padding: 5px;">150</td> <td style="padding: 5px;">166</td> <td style="padding: 5px;">300</td> <td style="padding: 5px;">334</td> <td style="padding: 5px;">400</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">1 in.</td> <td style="padding: 5px;">30</td> <td style="padding: 5px;">40</td> <td style="padding: 5px;">90</td> <td style="padding: 5px;">120</td> <td style="padding: 5px;">200</td> <td style="padding: 5px;">250</td> <td style="padding: 5px;">400</td> <td style="padding: 5px;">500</td> <td style="padding: 5px;">600</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$\frac{3}{4}$ in.</td> <td style="padding: 5px;">42</td> <td style="padding: 5px;">50</td> <td style="padding: 5px;">113</td> <td style="padding: 5px;">150</td> <td style="padding: 5px;">250</td> <td style="padding: 5px;">313</td> <td style="padding: 5px;">500</td> <td style="padding: 5px;">625</td> <td style="padding: 5px;">750</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$\frac{1}{2}$ in.</td> <td style="padding: 5px;">60</td> <td style="padding: 5px;">80</td> <td style="padding: 5px;">180</td> <td style="padding: 5px;">240</td> <td style="padding: 5px;">400</td> <td style="padding: 5px;">500</td> <td style="padding: 5px;">800</td> <td style="padding: 5px;">1,000</td> <td style="padding: 5px;">1,200</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$\frac{1}{4}$ in.</td> <td style="padding: 5px;">120</td> <td style="padding: 5px;">160</td> <td style="padding: 5px;">360</td> <td style="padding: 5px;">480</td> <td style="padding: 5px;">800</td> <td style="padding: 5px;">1,000</td> <td style="padding: 5px;">1,600</td> <td style="padding: 5px;">2,000</td> <td style="padding: 5px;">2,400</td> </tr> </table>									$1\frac{1}{2}$ in.	20	30	60	80	150	166	300	334	400	1 in.	30	40	90	120	200	250	400	500	600	$\frac{3}{4}$ in.	42	50	113	150	250	313	500	625	750	$\frac{1}{2}$ in.	60	80	180	240	400	500	800	1,000	1,200	$\frac{1}{4}$ in.	120	160	360	480	800	1,000	1,600	2,000	2,400
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OBJECTIVES.	$\frac{1}{8}$ in.	$\frac{1}{10}$ in.	$\frac{1}{2}$ in.	$\frac{1}{15}$ in.	$\frac{1}{8}$ in.	$\frac{1}{20}$ in.	$\frac{1}{25}$ in.	$\frac{1}{30}$ in.																																																			
EYEPIECES.	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">$1\frac{1}{2}$ in.</td> <td style="padding: 5px;">534</td> <td style="padding: 5px;">667</td> <td style="padding: 5px;">800</td> <td style="padding: 5px;">1,000</td> <td style="padding: 5px;">1,067</td> <td style="padding: 5px;">1,334</td> <td style="padding: 5px;">1,667</td> <td style="padding: 5px;">2,000</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">1 in.</td> <td style="padding: 5px;">800</td> <td style="padding: 5px;">1,000</td> <td style="padding: 5px;">1,200</td> <td style="padding: 5px;">1,500</td> <td style="padding: 5px;">1,600</td> <td style="padding: 5px;">2,000</td> <td style="padding: 5px;">2,500</td> <td style="padding: 5px;">3,000</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$\frac{3}{4}$ in.</td> <td style="padding: 5px;">1,000</td> <td style="padding: 5px;">1,250</td> <td style="padding: 5px;">1,500</td> <td style="padding: 5px;">1,875</td> <td style="padding: 5px;">2,000</td> <td style="padding: 5px;">2,500</td> <td style="padding: 5px;">2,125</td> <td style="padding: 5px;">3,750</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$\frac{1}{2}$ in.</td> <td style="padding: 5px;">1,600</td> <td style="padding: 5px;">2,000</td> <td style="padding: 5px;">2,400</td> <td style="padding: 5px;">3,000</td> <td style="padding: 5px;">3,200</td> <td style="padding: 5px;">4,000</td> <td style="padding: 5px;">5,000</td> <td style="padding: 5px;">6,000</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">$\frac{1}{4}$ in.</td> <td style="padding: 5px;">3,200</td> <td style="padding: 5px;">4,000</td> <td style="padding: 5px;">4,800</td> <td style="padding: 5px;">6,000</td> <td style="padding: 5px;">6,400</td> <td style="padding: 5px;">8,000</td> <td style="padding: 5px;">10,000</td> <td style="padding: 5px;">12,000</td> </tr> </table>								$1\frac{1}{2}$ in.	534	667	800	1,000	1,067	1,334	1,667	2,000	1 in.	800	1,000	1,200	1,500	1,600	2,000	2,500	3,000	$\frac{3}{4}$ in.	1,000	1,250	1,500	1,875	2,000	2,500	2,125	3,750	$\frac{1}{2}$ in.	1,600	2,000	2,400	3,000	3,200	4,000	5,000	6,000	$\frac{1}{4}$ in.	3,200	4,000	4,800	6,000	6,400	8,000	10,000	12,000						
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NUMERICAL APERTURE TABLE.

(Reprint from The Journal of the Royal Microscopical Society.)

NUMERICAL APERTURE. ($n \sin u = a.$)	Corresponding Angle ($2u$) for			Limit of Resolving Power, in Lines to an Inch.			Illuminating Power. (a^2)	Pene- trating Power. $(\frac{1}{a})$
	Air ($n = 1.00.$)	Water ($n = 1.33.$)	Homogeneous Immersion ($n = 1.52.$)	White Light, $(\lambda = 0.5289 \mu,$ Line E.)	Monochromatic (Blue) Light $(\lambda = 0.4881 \mu,$ Line F.)	Photography $(\lambda = 0.4660 \mu,$ Near Line $h.$)		
1.52			180° 0'	146,543	158,845	193,037	2.310	.658
1.51			166° 51'	145,579	157,800	191,767	2.280	.662
1.50			161° 23'	144,615	156,755	190,497	2.250	.667
1.49			157° 12'	143,651	155,710	189,227	2.220	.671
1.48			153° 39'	142,687	154,665	187,957	2.190	.676
1.47			150° 32'	141,723	153,620	186,687	2.161	.680
1.46			147° 42'	140,759	152,575	185,417	2.132	.685
1.45			145° 6'	139,795	151,530	184,147	2.103	.690
1.44			142° 39'	138,830	150,485	182,877	2.074	.694
1.43			140° 22'	137,866	149,440	181,607	2.045	.699
1.42			138° 12'	136,902	148,395	180,337	2.016	.704
1.41			136° 8'	135,938	147,350	179,067	1,988	.709
1.40			134° 10'	134,974	146,305	177,797	1,960	.714
1.39			132° 16'	134,010	145,260	176,527	1,932	.719
1.38			130° 26'	133,046	144,215	175,257	1,904	.725
1.37			128° 40'	132,082	143,170	173,987	1,877	.729
1.36			126° 58'	131,118	142,125	172,717	1,850	.735
1.35			125° 18'	130,154	141,080	171,447	1,823	.741
1.34			123° 40'	129,189	140,035	170,177	1,796	.746
1.33	180° 0'	122° 6'	122° 6'	128,225	138,989	168,907	1,769	.752
1.32	165° 56'	120° 33'	120° 33'	127,261	137,944	167,637	1,742	.758
1.30	155° 38'	117° 35'	117° 35'	125,333	135,854	165,097	1,690	.769
1.28	148° 42'	114° 44'	114° 44'	123,405	133,764	162,557	1,638	.781
1.26	142° 39'	111° 59'	111° 59'	121,477	131,674	160,017	1,588	.794
1.24	137° 36'	109° 20'	109° 20'	119,548	129,584	157,477	1,538	.806
1.22	133° 4'	106° 45'	106° 45'	117,620	127,494	154,937	1,488	.820
1.20	128° 55'	104° 15'	104° 15'	115,692	125,404	152,397	1,440	.833
1.18	125° 3'	101° 50'	101° 50'	113,764	123,314	149,857	1,392	.847
1.16	121° 26'	99° 29'	99° 29'	111,835	121,224	147,317	1,346	.862
1.14	118° 0'	97° 11'	97° 11'	109,907	119,134	144,777	1,300	.877
1.12	114° 44'	94° 55'	94° 55'	107,979	117,044	142,237	1,254	.893
1.10	111° 36'	92° 43'	92° 43'	106,051	114,954	139,698	1,210	.909
1.08	108° 36'	90° 34'	90° 34'	104,123	112,864	137,158	1,166	.926
1.06	105° 42'	88° 27'	88° 27'	102,195	110,774	134,618	1,124	.943
1.04	102° 53'	86° 21'	86° 21'	100,266	108,684	132,078	1,082	.962
1.02	100° 10'	84° 18'	84° 18'	98,338	106,593	129,538	1,040	.980
1.00	180° 0'	97° 31'	82° 17'	96,410	104,503	126,998	1,000	1,000
0.98	157° 2'	94° 56'	80° 17'	94,482	102,413	124,458	.960	1,020
0.96	147° 29'	92° 24'	78° 20'	92,554	100,323	121,918	.922	1,042
0.94	140° 6'	89° 56'	76° 24'	90,625	98,233	119,378	.884	1,064

NUMERICAL APERTURE TABLE—Continued.

NUMERICAL APERTURE. ($n \sin u = a$.)	Corresponding Angle ($2u$) for			Limit of Resolving Power, in Lines to an Inch.			Illuminating Power. (a^2 .)	Pene- trating Power. ($\frac{1}{a}$)
	Air ($n=1.00$.)	Water ($n=1.33$.)	Homogeneous Immersion ($n=1.52$.)	White Light, ($\lambda=0.5269 \mu$, Line E.)	Monochromatic (Blue) Light ($\lambda=0.4861 \mu$, Line F.)	Photography ($\lambda=0.4000 \mu$, Near Line h.)		
0.92	133° 51'	87° 32'	74° 30'	88,697	96,143	116,838	.846	1.087
0.90	128° 19'	85° 10'	72° 36'	86,769	94,053	114,298	.810	1.111
0.88	123° 17'	82° 51'	70° 44'	84,841	91,963	111,758	.774	1.136
0.86	118° 38'	80° 34'	68° 54'	82,913	89,873	109,218	.740	1.163
0.84	114° 17'	78° 20'	67° 6'	80,984	87,783	106,678	.706	1.190
0.82	110° 10'	76° 8'	65° 18'	79,056	85,693	104,138	.672	1.220
0.80	106° 16'	73° 58'	63° 31'	77,128	83,603	101,598	.640	1.250
0.78	102° 31'	71° 49'	61° 45'	75,200	81,513	99,058	.608	1.282
0.76	98° 56'	69° 42'	60° 0'	73,272	79,423	96,518	.578	1.316
0.74	95° 28'	67° 37'	58° 16'	71,343	77,333	93,979	.548	1.351
0.72	92° 06'	65° 32'	56° 32'	69,415	75,242	91,439	.518	1.389
0.70	88° 51'	63° 31'	54° 50'	67,487	73,152	88,899	.490	1.429
0.68	85° 41'	61° 30'	53° 9'	65,559	71,062	86,359	.462	1.471
0.66	82° 36'	59° 30'	51° 28'	63,631	68,972	83,819	.436	1.515
0.64	79° 36'	57° 31'	49° 48'	61,702	66,882	81,279	.410	1.562
0.62	76° 38'	55° 34'	48° 9'	59,774	64,792	78,739	.384	1.613
0.60	73° 44'	53° 38'	46° 30'	57,846	62,702	76,199	.360	1.667
0.58	70° 54'	51° 42'	44° 51'	55,918	60,612	73,659	.336	1.724
0.56	68° 6'	49° 48'	43° 14'	53,990	58,522	71,119	.314	1.786
0.54	65° 22'	47° 54'	41° 37'	52,061	56,432	68,579	.292	1.852
0.52	62° 40'	46° 2'	40° 0'	50,133	54,342	66,039	.270	1.923
0.50	60° 0'	44° 10'	38° 24'	48,205	52,252	63,499	.250	2.000
0.45	53° 30'	39° 33'	34° 27'	43,385	47,026	57,149	.203	2.222
0.40	47° 9'	35° 0'	30° 31'	38,564	41,801	50,799	.160	2.500
0.35	40° 58'	30° 30'	26° 38'	33,744	36,576	44,449	.123	2.857
0.30	34° 56'	26° 4'	22° 46'	28,923	31,351	38,099	.090	3.333
0.25	28° 58'	21° 40'	18° 56'	24,103	26,126	31,749	.063	4.000
0.20	23° 4'	17° 18'	15° 7'	19,282	20,901	25,400	.040	5.000
0.15	17° 14'	12° 58'	11° 19'	14,462	15,676	19,050	.023	6.667
0.10	11° 29'	8° 38'	7° 34'	9,641	10,450	12,700	.010	10.000
0.05	5° 44'	4° 18'	3° 46'	4,821	5,252	6,350	.003	20.000

Eyepieces.

THE numerous defects existing in the highest types of Huyghenian and solid eyepieces, among which may be mentioned want of achromatism and flatness of field; inequality of amplification throughout the whole extent of field and a consequent distortion of all objects viewed at or near the field-bar, have led us to the production of the new series of Aplanatic Positive Eyepieces, which, as their name implies, are free from all these aberrations, rendering them the most efficient made for exact micrometric measurements, for work in photo-micrography, and every-day work as well.

A comparative examination of a stage micrometer ruled into squares will at once show these eyepieces to be perfectly rectilinear and entirely free from the other defects inherent in the Huyghenian and solid types of best construction. We disclaim any design (or the necessity for it with our objectives) to correct outstanding aberrations of the objective by means of the eyepiece, but this form is corrected in and of itself for the use it is applied to. These eyepieces are entirely free from the disagreeable fringe of color seen at the field-bar in many of the compensating eyepieces, which is claimed to be a necessary accessory to the best performance of the apochromatics.

Our Huyghenian and solid eyepieces are made with great care, and are the best of their kinds.

EYEPIECES.

NEW APLANATIC—POSITIVE.

Focal Length.	Price.
1½ inch, - - - - -	\$12 00
1 inch, - - - - -	10 00
¾ inch, - - - - -	10 00
½ inch, - - - - -	10 00
¼ inch, - - - - -	12 00

SOLID EYEPIECES.

Focal Length.	Price.
½ inch, - - - - -	\$ 8 00
¼ inch, - - - - -	8 00

HUYGHENIAN EYEPIECES.

Focal Length.	Price.
2 inch, - - - - -	\$ 6 00
1 inch, - - - - -	6 00
½ inch, - - - - -	6 00
¼ inch, - - - - -	8 00

35

035

TELESCOPES.

IN THE manufacture of all our telescopes we use only the very best quality of optical glass obtainable, and besides employing the kinds possessing the physical properties of hardness, freedom from color and immunity from deterioration from exposure to damp atmosphere, combine such kinds of flint and crown as reduce the secondary colors to the smallest amount consistent with the fulfillment of all these conditions with the material to be had at the present time. Contrary to the generally accepted belief that short-focus telescopes give more outstanding color than those of long focus, we are prepared to demonstrate that our methods of correction and combination enable us to produce short-focus telescopes as free from outstanding color as are those of the highest type of old long-focus construction, and that their light collecting and defining power is much greater. Among the many advantages of the short-focus construction may be mentioned increased rigidity and freedom from vibration under all conditions, increased portability of the smaller instruments, and a very great reduction in the cost of mountings and domes for the larger ones.

We are prepared to execute orders for lenses of all kinds, eyepieces for telescopes, amplifiers, lenses for rifle telescopes, object glasses and eyepieces for levels and transits, and special lenses of every description.

TELESCOPE OBJECTIVES.

Aperture.	Focal Length.	Price.
2 inch.	9½ inch.	\$ 30 00
3 inch.	14 inch.	65 00
4 inch.	36 inch.	100 00
4½ inch.	36 inch.	145 00
5 inch.	36 inch.	200 00
5½ inch.	40 inch.	265 00
6 inch.	50 inch.	370 00
6½ inch.	55 inch.	480 00
7 inch.	63 inch.	660 00
8 inch.	72 inch.	900 00
8 inch.	96 inch.	800 00
9 inch.	81 inch.	1,250 00
10 inch.	90 inch.	1,600 00
12 inch.	120 inch.	2,000 00

The prices given in the above list are for objectives mounted in cells, and guaranteed to be perfect in their chromatic and spherical corrections.

Larger glasses will be furnished by special contract, on application, and those of longer focal length can be furnished if desired.

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NEW SHORT-FOCUS TELESCOPES.

THESE instruments in a compact form are designed to supplant the long-focus glasses of four or five times their bulk and weight. They are provided with our new aplanatic large field eyepieces, giving perfect flatness of field and freedom from color, under the most trying circumstances. The light-giving power of these glasses is nearly twice as great as that of the best spyglasses of twice their size; and their defining power is incomparably greater. We guarantee these glasses to be superior to all others.

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| Seven-tenth inch (vest-pocket) telescope, power 15; one draw; length, closed, four inches; drawn out, six inches; in leather case. Price | \$ 40 00 |
| One and one-half inch telescope, power 20; length, closed, seven and one-half inches; extended, thirteen inches; in leather sling case. Price | 40 00 |
| Two-inch telescope, variable eyepiece giving powers from 20 to 40; length when open, eighteen inches; closed, eleven inches; screw stand; in leather sling case. Price | 85 00 |
| Three-inch telescope, Alt-Azimuth mounting; three erecting eyepieces, giving powers of 40, 75 and 100; adapted to both terrestrial and astronomical work | 120 00 |
| Four-inch telescope, Alt-Azimuth mounting; one terrestrial eyepiece, giving a power of 40; three celestial eyepieces, giving powers of 48, 75 and 150. Price | 250 00 |
| Four inch and larger telescopes, mounted equatorially, by special contract. | |

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