

Photographic Lenses

BAUSCH & LOMB OPTICAL CO.

PHOTOGRAPHIC LENSES
and
ACCESSORIES



Bausch & Lomb Optical Co.
ROCHESTER, N. Y.

New York: 100 E. 42nd St.
San Francisco: 28 Geary St.
Boston: 333 Washington St.

Chicago: 5 N. Wabash Ave.
Frankfurt a/M., 31 Schillerstrasse
London: 37 and 38, Hatton Garden, E. C

CONTENTS

Introductory		
Photographic Lenses - - - - -		3
Anastigmat Lenses- - - - -		4-5
Selecting a Lens - - - - -		6-14
Prices and Specifications		
Motion Picture Lenses - - - - -		15-17
Tessar—Series Ic - - - - -		18-19
Tessar—Series IIb- - - - -		20-21
Plastigmat Portrait - - - - -		22-23
Protar—Series VII and VIIa - - - - -		24-29
Protar—Series IV - - - - -		30
Protar—Series V - - - - -		31
Volute Shutter - - - - -		32-33
Compound Shutter - - - - -		34-35
Process Anastigmat - - - - -		36-37
Photo Engraving Prism - - - - -		37-38
Waterhouse Stops - - - - -		39
Focusing and Engraving Glasses - - - - -		40
Watchmakers' Glasses - - - - -		41
Retouching and Reducing Glasses - - - - -		42
Condensers, Lens Caps and Flanges - - - - -		43-44
To Our Patrons - - - - -		45-46

Photographic Lenses

This catalog is intended to furnish information which will assist the purchaser in the proper selection of a photographic lens. Look up your requirements in the pages which follow, and you will note what lens or lenses are best adapted for the specific purposes named, and in the latter part you will find those lenses described and listed.

While our anastigmats are truly universal, there are special applications which require special recommendations. We are always glad to take up in detail your various photographic needs and to guide you in selecting a lens.

As we are ready, also, to send lenses on approval through the local photographic dealer, the decision of the purchaser may be made without undue haste.

Pioneers in the development of optical glass manufacture in America, we now control our own supply of this basic raw material. It is possible, therefore, for us to work out our glass problems in our own plant, in advance of our lens and instrument problems and in co-ordination with them—a condition of no slight advantage in manufacture of this character.

The work of our Scientific Bureau is of particular significance in our photographic production. The formulae for our different lenses are computed by our own staff of scientists—the same scientists who compute the formulae for practically every type of lens, from that of pinhead size for use in our high power microscope objectives, to large searchlight mirrors five feet or more in diameter. Furthermore, they supervise both production and testing, to make sure that the finished product measures up to the standard set by their computations.

The camera is used for a multitude of purposes. If you have any photographic problems, do not hesitate to call on us for advice. We shall be glad to give you the benefit of our widely varied experience in photographic and other optical matters.

BAUSCH & LOMB OPTICAL COMPANY.
Rochester, N. Y.

Anastigmat Lenses

What They Have Meant to Photography

NO camera can give better results than its lens will permit; hence, the importance of lens manufacture to the enthusiastic photographer. In the early days of photography the lenses available were exceedingly slow and difficult to work with. Many experimenters, interested in the new science, tried to find a way to better them, but few met with any appreciable success. When faster lenses finally were invented, they had, from a modern viewpoint, a narrow field and other serious defects.

Numerous optical scientists undertook to produce a lens of greater versatility, which would overcome these defects, but it was more than twenty years before a lens was produced which represented a real forward step. This type, known as Rectilinear, was the first that proved its fitness to survive by combining spherical correction for a comparatively large aperture with freedom from distortion over a large field. Even this lens, which is still widely used in the simpler outfits, has one serious drawback, as it cannot be corrected for both astigmatism and curvature of field. If free from astigmatism, it has curved field; or, if made to give a flat field, the margins show the blur of the uncorrected astigmatism. This difficulty halted lens development for years. But, though mathematics was baffled, science finally found a remedy—a *new glass*.

For this new glass modern optical science is indebted to the collaboration of Professor Abbe and Dr. Schott, of Jena. In 1881, Dr. Schott, at the suggestion of Professor Abbe, began his experimental effort to produce a glass with new optical properties. Up to this time the optical qualities of ordinary glass had changed in proportion to its specific gravity. The heavier the glass, the higher the refractive power and the greater the dispersive power.

Abbe, the mathematician, had advanced the theory that it was possible to produce glasses which, though they had refrac-

tive indices as high as heavy flint glass, should show no more dispersion than ordinary crown glass. Dr. Schott worked to produce such a glass, and after three years was so successful that a plant making this new glass was put into regular operation. It was glass manufacture of this character which we successfully developed during the European War and which we are now carrying on in our own plant at Rochester, N. Y.

The first man to utilize the possibilities of the new glasses for the purpose of photography was Dr. P. Rudolph, of Jena, who in 1890, made the first anastigmat. This lens had astigmatic correction over a large flat field and at the same time spherical correction for a large opening, covering a large plate well and with a short exposure. The first lens of this type was a "universal," with a moderate speed and angle of view. There soon followed lenses of higher speed, as well as wide angle lenses, and in 1895 came the Convertible Protar Series VIIa, which has since become famed for its wide range of efficient usefulness.

Anastigmat lens superiority over Rectilinear was immediately recognized and gave a great stimulus to lens construction. Every manufacturer sought persistently to acquire greater speed without sacrificing the field of view. All other efforts in this direction were finally surpassed by Dr. Rudolph in 1903, when he invented the Tessar type, which is unequalled in its perfection by any other lens.

To summarize the progress in lens optics during the last half century can be most vividly shown, perhaps, by a comparison between the old Petzval type of Portrait Lens and the present Tessar Series Ic.

Both lenses have the same speed, if the Portrait lens is diaphragmed down to $f:4.5$, and their brilliant images indicate perfect spherical correction. But, while one of these early lenses, as ordinarily used in a studio, will just about cover field enough to image the head and bust sharply and will do no more, even if stopped down, the Tessar, with full aperture, will cover a field more than twice as great, and, when stopped down, will take a group.

Selecting a Lens

Aerial Photography

Recent experience has shown the usefulness of the Tessar Ic for both oblique and vertical photographs made from aircraft. Here speed is essential to overcome the motor vibration, and flatness of field is important, as the object in a vertical "shot" is practically a plane, and the photograph to be sharp to the edges must reproduce it as such. Covering power and even illumination should commend the Tessar Ic to Engineers and others concerned with the use of aerial photography in connection with surveying and general problems of topography and map making.

Architectural Subjects

Convertible Protar VIIa, because of its optical qualities and adaptability should be considered. As single Anastigmats, the Protar VII lenses, forming the Protar VIIa doublets, have a distinct field of their own. While not absolutely rectilinear, for no lens of this type can be, they may be used for purposes where a long focal length, medium speed and moderate angle is required.

Where only limited operating space is available and under conditions requiring a wide angle, the Protar V is a necessity.

Pictorial effects of architectural subjects are beautifully rendered with the Plastigmat.

Athletic Sports

The Tessar Ic, $f:4.5$ should be selected on account of its great speed. The motion of the object must be arrested by the shutter in order to obtain a sharp image, no matter what the light conditions may be at time of exposure. Greater depth of focus may be secured by working at a greater distance from the subject and subsequently enlarging the smaller image obtained.

The Tessar IIB $f:6.3$ and Compound Shutter will also do very satisfactory work along these lines, if the pictures are made at moderate distances. The Tessar Ic should always be selected in preference to the Tessar IIB for the reflecting type of camera, since the Tessar Ic when stopped down will duplicate the Tessar

I**ib**. The use of the Tessar Ic on compact hand cameras is limited to very few models, because in camera design, insufficient space has been provided for a lens faster than $f:6.3$.

Button and Stamp Pictures

For this work the required focal length is short so that the lens works practically at universal focus. A lens of short focal length will also probably be demanded on account of the restricted operating space. The Tessar Ic $f:4.5$ of $4\frac{1}{8}"$, $5\frac{1}{2}"$ or $6\frac{1}{2}"$ E.F. is the proper selection.

Children's Photographs

For this fascinating branch of photography, we need speed—therefore the Tessar Ic $f:4.5$ is the best lens. With the reflecting type camera and Tessar Ic, one may catch the fleeting expression of the child, make pictures of him at play or a snap-shot in the home. The Tessar Ic is of necessity larger than the I**ib**, which is generally fitted to the folding type of hand camera. There are some types of hand cameras with a ground glass for focusing which also have enough front board room to take the Tessar Ic, but hand cameras in general will not take a lens larger than the Tessar I**ib** $f:6.3$. The latter lens will do excellent work, for it has about twice the speed of the ordinary camera lens.

Cinematography

(See Motion Picture Photography)

Commercial Photography

This branch of photographic work presents a variety of problems which no single type of lens can possibly meet. On the other hand, it is not always possible for one to own a battery of lenses from which a selection may be made. However, the Tessar I**ib** and the Wide Angle Protar lenses form a pair which will meet practically all demands. If price is not paramount the Convertible Protar VIIa offers unusual convenience and a variety of focal lengths from which to make a selection.

Copying

All of our lenses may be successfully used for this work. The Tessar I**ib** is particularly satisfactory and is specially recom-

mended, but for an inexpensive copying lens the Protar V Extreme Wide Angle lens is suggested.

Enlarging

The Tessar I Ib $f:6.3$ should be selected on account of its excellent optical corrections. In enlarging, a flat object (the negative) is projected onto a flat surface (the bromide paper) and the necessity for a perfectly flat field lens is, of course, obvious. If the Tessar is to be used primarily for enlarging, we recommend a specially adjusted lens for the purpose. When such an adjustment is made, the lens may be used at larger openings, thus reducing the time of exposure.

Flashlight Photography

For flashlight work, banquets, interiors, etc., the most useful lens is one which permits focusing and exposing at large aperture. The Protar VIIa and Tessar I Ib meet the above condition with a saving of time and flashlight powder. Protar IV and Protar V are excellent lenses for group and banquet work if a greater angle is required.

Flower Photography

In this work there is no great necessity for speed, so that a Convertible Protar VIIa with its several focal lengths may be favorably considered since the advantage of better proportion of parts, in other words perspective, results from the use of the longer focal length combinations.

Groups

In no branch of photography is the Anastigmat more essential for good results. The best investment is in a Tessar I c lens. The reserve covering power of this type makes it possible to use a shorter focal length lens and still retain satisfactory definition from corner to corner—an obvious advantage where work must be done in a limited space.

Tessar I Ib may also be employed or the Protar VIIa. These lenses may be used at moderate aperture for groups and when used at full opening are, on account of their speed, useful lenses for the studio or for the making of home portraits.

The longer focal length lenses are preferable because they give better perspective, but the focal length of a lens, for a group, is governed by restrictions of operating space—an important factor.

Home Portraiture

Both the Tessar Ic and the Plastigmat may be used for this type of work. It is imperative that the lens have speed, be compactly mounted and of such focal length as to operate within the limits of space available in the average home and yet not give poor perspective usually characteristic of a lens of short focal length. When used for portraiture the No. 18 Tessar Ic, 8 x 10, 11 $\frac{3}{4}$ " E.F. meets these conditions very satisfactorily and consequently is especially recommended for this class of work. The Plastigmat also is offered in focal lengths of 12", 15" and 18".

Interiors

Generally it is desired to include as much of the interior as possible, which would require a wide angle lens. The Protar IV fills such a need since it has an aperture sufficiently large ($f:12.5$) for focusing. The Protar VIIa has more speed (larger aperture), and will cover a medium wide angle when stopped down; furthermore, its single combinations are invaluable to emphasize or produce an enlarged image of some particular section of the interior or some object in it. The Protar V is recommended for extreme wide angle work.

Landscapes

For this, the Convertible Protar VIIa or the Plastigmat should be chosen.

The speed of the Protar VIIa is ample. The convertible feature of the lens, with the possibility of using any one of two, three or more focal lengths in one barrel or shutter according to the lens selected, makes it an ideal one. If the Protar VII lenses which make up the Protar VIIa lens are equal in focal length, a speed of $f:6.3$ is obtained; if the combinations are unequal, an extra focal length is gained, with a slight loss of speed. By adding one or more Protar VII combinations, a Set of Protars is built up. For full details see page No. 26.

Convertibility is of great convenience in photography. If the image produced by the Protar VIIa is too small, one of the single combinations may be used from the same position and a larger image secured. You simply find the desired view point and select the proper combination from the Set to give the required scale and perspective.

The slightly diffused-focus effect possible with the Plastigmat lens, which may be used on several sizes of reflecting cameras, is appreciated by many. It gives beautiful pictorial results of pleasing softness, but with detail preserved even in the shadows to a remarkable degree. For the various cameras with which this lens may be used see page No. 23.

Lantern-Slide Making

The Tessar IIb is recommended. When the lens is used for enlarging or reducing, be sure that the front of the lens as ordinarily used faces the easel in enlarging, and the original negative or print when reducing.

Motion Picture Photography

The Tessar Ic, $f:3.5$ which has been especially designed for this work, may be fitted to practically every make of motion picture camera. Where greater speed is required, especially for poorly lighted subjects, motion analysis, and color motion pictures, the Ultra Rapid Anastigmat $f:2.7$ should be considered. Its speed is about twice as great as $f:3.5$ with no sacrifice of critical definition and covering power.

Naturalist Photography

Inability to approach the subject closely and a desire for large image size, necessitates the use of a lens of long focal length. Speed is likewise essential. Both requisites are found in Tessar Ic and IIb lenses. Likewise, the Convertible Protar VIIa, and its single combinations will be found useful when used under favorable light conditions.

Newspaper Photography

The Tessar Ic appeals to newspaper photographers on account of its speed of $f:4.5$, which satisfies requirements for exposures

under difficult lighting conditions, and also meets the severe tests called for in recording "action" or "speed" photographs. Every newspaper man likewise has use for Protar V Extreme Wide Angle lens when forced to work in restricted spaces.

Photomicrography

The Micro Tessars are useful for direct enlarged photographs of small objects such as insects, minerals or plant life where the magnification does not exceed 25 times. (Literature concerning Photomicrographic Apparatus and Microscopes sent on request)

Portraiture

(See "Home Portraiture" and "Studio")

Projection

The Tessar IIb on account of its flat field, is the finest projection lens made, and the Micro Tessar has special properties which fit it for the projection of Microscope slides. Tessar IIb lenses for projection are furnished in special rack and pinion mounts with steel iris diaphragm leaves.

(Projection Apparatus catalog sent on request.)

Reflecting Cameras

The Tessar Ic is supreme. Its speed of $f:4.5$ is retained in all sizes at no sacrifice of any optical quality. Brilliancy, superior sharpness of definition, flatness and freedom from distortion over the entire field characterize the Tessar Ic as the leading type of anastigmat.

For a given plate size and focal length, the Tessar Ic possesses a larger circle of sharp definition than is found in any competing lens. Since the plane of sharp definition does not shift when the lens is stopped down, the ability to focus at large apertures is highly advantageous.

To the long bellows model cameras, the Convertible Protar VIIa lens with its single Anastigmat combinations of longer focal length may be fitted, offering unusual possibilities where great shutter speed is not required.

The smaller sizes of the Plastigmat may also be used on reflecting cameras, giving beautiful pictorial results. These

lenses of 9" and 12" E.F. in compact barrels with iris diaphragm are made specially for this purpose. For the cameras with which these lenses may be used, see page No. 23.

Science and Research

Photography is being used very generally in laboratory procedure for the making of records, but since each problem usually requires special consideration we recommend that you allow us to cover this subject by letter or permit us to make arrangements to have a representative call upon you.

Speed Photography

(See "Reflecting Cameras")

Standing Figures

The standing position is the most difficult to maintain hence the need for reducing the period of exposure to arrest movement. Obviously a lens having a flat field and great speed should be considered. Tessar Ic $f:4.5$ meets these requirements.

Tessar Iib $f:6.3$ may be used successfully up to the limit of its speed.

Plastigmat $f:5.6$ produces negatives of pleasing softness.

Stereoscopic Photography

A pair of lenses accurately matched in focal length is required. The Tessar Iib or the Convertible Protar VIIa is usually selected. Lenses of higher relative aperture are not often used as the lens diameters are such as to require lens mounts and barrels too large to permit fitting to Stereo shutters. However, in special cases it is possible to fit lenses of higher speed, such as the Tessar Ic $f:4.5$, and we shall be glad to advise respecting the fitting of such lenses to your Stereo camera.

Studio (Professional)

Both the new Plastigmat and the larger sizes of the Tessar Ic are well adapted to this class of work.

During recent years the so-called "soft focus" portraits have met with much favor. The Plastigmat, which enables one to obtain beautiful soft focus effects has proven superior to other

lenses designed for this purpose and eliminates the objections that have prejudiced many photographers against entering this popular field of endeavor.

The larger sizes of the Tessar Ic have long been popular for portraiture because of their great speed. This lens has a flat field which makes it adaptable for standing figures, while its marked covering power is of great value for groups.

No. 18a is the standard lens for the ordinary studio, while No. 19 is intended for large heads and 11 x 14 work. The professional who wishes one truly universal lens should choose the Tessar Ic.

Numbers 18, 18a, 19 and 20 are supplied with lens hoods which are detachable in case the lenses are to be used on compact home portrait cameras.

Telephotography

Your particular problem will be made the subject of special correspondence.

For motion picture telephotography, any of the Tessar Ic lenses from 4 $\frac{7}{8}$ " E.F. and longer may be used.

Water Pictures

The light reflected from water and sky is so intense that lenses must almost always be stopped down.

For yachting pictures, large image sizes are obtainable with the long focal length single combinations of the Convertible Protar VIIa lens.

For motor boat racing, diving and other water sports, a Tessar Ic is indispensable since extremely fast exposures must be made to arrest the rapid movement of the object.

Wide Angle Photography

Protar IV $f:12.5$ is a rapid wide angle lens for architectural work, flashlights, interiors and groups. Its large relative aperture admits ample light for focusing and is also sufficient for instantaneous exposures out of doors under favorable light conditions.

Protar V $f:18$ meets the demand for making extreme wide angle photographs of architectural subjects, interiors and flash-

lights. The correction for flatness of field and astigmatism has been carried to a greater degree than in other lenses designed for this kind of work. It should be noted that Protar IV and Protar V lenses cannot be fitted to shutters like the Compound and Automatic, but require a shutter such as the Volute in which the diaphragm and shutter blades are one and the same. This is due to the extremely limited separation between the front and rear combinations.

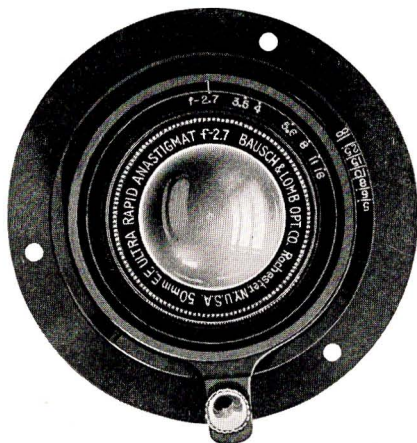
Convertible Protar VIIa lenses may also be used on larger plates than those for which they are listed since they possess an unusual reserve covering power which becomes available when the lens is stopped down.

PRICES AND SPECIFICATIONS

All of the lenses mentioned in the preceding pages of this catalog are listed, illustrated and described in detail in the following pages. The motion picture lenses are shown first, after which come the Tessars, the Plastigmat and the Protars. Shutters, the Process Anastigmat, Engraving Prisms and Glasses and other accessories follow in the order named.

**BAUSCH & LOMB LENSES FOR MOTION PICTURE
CAMERAS OF ALL KINDS**

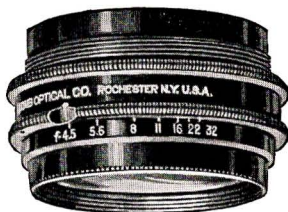
The rise of the motion picture industry brought new lens problems, including a demand for lenses of enormous speed, since the motion picture operator cannot control weather conditions and must usually take his pictures just as he finds them. The following types of mountings are reproduced in actual size.



*Spiral focusing mount with Iris Diaphragm
(See catalog numbers "F" and "UF")*



*Micro Barrel with Iris
Diaphragm (Supplied
with No. 32B only)*



*Standard Barrel with Iris
Diaphragm (See catalog
numbers "B" and "UB")*

Tessar Ic f:3.5

(For Motion Picture Cameras)

Remarkable covering power and a speed sufficient for practically all conditions are the principal characteristics of the Tessar Ic f:3.5, which has long been one of the most favored motion picture camera lenses. The speed of f:3.5 means that the light admitted to the film is almost double that of the Tessar Ic f:4.5, and five times that of ordinary camera lenses.

Owing to the short focal length of the lenses, their depth of focus is enormous even at full aperture, while they cover the regular size motion picture negative to the very corners.

This series of lenses is furnished in barrel with iris diaphragm or in spiral focusing mount, as illustrated on preceding page.

In Barrel with Iris Diaphragm

Code Word	Catalog No.	Speed	Covers at Full Opening	Equivalent Focus		Diameter	Price
				In.	mm.		
<i>Haarm</i>	50B	f:3.5	¾ x 1	2	50	1½"	\$33.00
<i>Haasn</i>	75B	f:3.5	1¼ x 1¼	3	75	1¾"	40.00
<i>Haatp</i>	32B	f:4.5	¾ x 1	1¼	32	1⅝"	30.50

In Spiral Focusing Mount

Code Word	Catalog No.	Speed	Covers at Full Opening	Equivalent Focus		Diameter	Price
				In.	mm.		
<i>Haavr</i>	50F	f:3.5	¾ x 1	2	50	1½"	\$44.00
<i>Haax</i>	75F	f:3.5	1¼ x 1¼	3	75	1¾"	51.00
<i>Haazw</i>	32F	f:4.5	¾ x 1	1¼	32	1⅝"	41.50
<i>Haagd</i>	5LF		Lens Hood for no. 50F				1.50
<i>Haehf</i>	7LF		Lens Hood for no. 75F				1.50

Tessar Ic f:4.5

For Telephoto Effects—In Barrel with Iris Diaphragm

Code Word	Catalog No.	Speed	Covers at Full Opening	Equivalent Focus Inches	Diameter	Price
<i>Haagc</i>	15	f:4.5	4 x 5	6 1½"	1½"	\$45.50
<i>Haahd</i>	15a	f:4.5	5 x 7	7 ⅞"	1 11⁄16"	60.00

Ultra Rapid Anastigmat $f:2.7$
(For Motion Picture Cameras)

To meet the need for an unusually fast lens, which covers perfectly the standard size motion picture negative, the new Ultra Rapid Anastigmat lens has been designed. This lens is the only one thus far found acceptable for color motion picture work; it is also useful in taking dark interiors.

The Ultra Rapid Anastigmat has very good definition, a remarkably flat field, and covers the negative to the corners. It has an equivalent focal length of 50 mm. while its speed is $f:2.7$, about twice as fast as $f:3.5$, and three times as fast as $f:4.5$. The simple form of construction, with only six reflecting surfaces, assures a minimum loss of light by reflection.

The lens is furnished in barrel with iris diaphragm or in spiral focusing mount.

Ultra Rapid Anastigmat $f:2.7$
In Barrel with Iris Diaphragm

Code Word	Catalog No.	Speed	Covers at Full Opening	Equivalent Focus		Diameter	Price
				In.	mm.		
<i>Hevov</i>	50UB	$f:2.7$	$\frac{3}{4} \times 1$	2	50	$\frac{3}{8}$ "	\$45.00
<i>Hewaw</i>	50UBD		Above lens in barrel with Completely Closing Iris Diaphragm				50.00

In Spiral Focusing Mount

Code Word	Catalog No.	Speed	Covers at Full Opening	Equivalent Focus		Diameter	Price
				In.	mm.		
<i>Hevuz</i>	50UF	$f:2.7$	$\frac{3}{4} \times 1$	2	50	$\frac{3}{8}$ "	\$56.00
<i>Hewex</i>	50UFD		Above lens in Spiral Focusing Mount with Completely Closing Iris Diaphragm				67.00

Other focal lengths are contemplated. If interested, write for specifications and prices.

Bausch & Lomb Tessar Series Ic $f:4.5$

*Master of
Speed and
Light*



*America's first
and leading
Anastigmat*

Its remarkably wide range of application makes the Tessar unequalled among lenses of the unsymmetrical type. Being constructed of thin glass elements the light absorption is reduced to a minimum. Neither front nor rear combination may be used alone. The leading characteristic of this lens is its speed, $f:4.5$ which is maintained in all sizes at no sacrifice in other important optical qualities. For comparison, $f:4.5$ is twice as fast as $f:6.3$ and more than 3 times the speed of lenses having a speed value of $f:8$. When stopped down to the corresponding stop, Tessar Ic possesses the same depth of focus and definition as Tessar Iib.

Its flatness of field, superior sharpness of definition, brilliancy and freedom from distortion extend evenly over the entire field, or area of plate for which the lens is listed. The chromatic corrections are of such high order that the lens readily lends itself to color photography.

Compactness of mounting is an important factor, thus making possible the adaptation with greatest ease to the various cameras on the market. The beveled or inclined diaphragm ring allows easy reading of the scale from front of camera while its double knurl assures positive grip and smooth operation.

In ordering a Tessar for a Graflex Camera specify whether the camera is a new or old model since different mountings are required for different models.

BAUSCH & LOMB OPTICAL CO.

The following tables show the catalog numbers of the Tessar Ic lenses applicable to all Graflex cameras.

Size	New Model	Tessar Ic	Old Model	Tessar Ic
2¼ x 3¼	Graflex, Series B	No. 13	Auto Graflex Jr.	No. 13
2¼ x 3¼	R.B. Graflex, Ser. B	No. 14	R. B. Graflex Jr.	No. 15
3¼ x 4¼	Graflex, Series B	No. 14	Auto Graflex	No. 14
3¼ x 4¼	R.B. Graflex, Ser. B	No. 15	R. B. Teles. Graflex	No. 15
4 x 5	Graflex, Series B	No. 15	Auto Graflex	No. 15
4 x 5	R.B. Graflex, Ser. B	No. 15a	R. B. Teles. Graflex	No. 16
5 x 7	Graflex, Series B	No. 16	Auto Graflex	No. 16

Other Models

Size	Model	Tessar Ic
2½ x 4¼	1A Graflex	No. 14
3¼ x 5½	3A Graflex	No. 15a
3¼ x 4¼	R. B. Auto Graflex	No. 15a
4 x 5	R. B. Auto Graflex	No. 17
3¼ x 5½	Compact Graflex	No. 15a
5 x 7	Compact Graflex	No. 16
5 x 7	Home Portrait Graflex	No. 18
5 x 7	Press Graflex	No. 16
3¼ x 4¼	Speed Graphic	No. 14
3¼ x 5½	Speed Graphic	No. 15a
5 x 7	Speed Graphic	No. 16

PRICE LIST Tessar Ic f:4.5

Code Word	No.	Size of Plate Covered with Stop f:4.5 Inches	Size of Plate Covered with Small Stops Inches	Equivalent Focus Inches	Diameter of Lens Inches	Lens and Barrel with Iris Diaphragm	In Volute Shutter Without Barrel		In Compound Shutter Without Barrel	
							No.	Price	No.	Price
<i>Haacy</i>	12	2¼x 3¼	3½x 3½	3¾	¾	\$32.50	1	\$55.50	1	\$51.50
<i>Haadz</i>	13	2½x 3½	3¼x 3¼	4 ⅞	1 ⅓	36.00	1	59.00	1	55.00
<i>Haafb</i>	14	3¼x 4¼	4 x 5	5 ⅓	1¼	40.00	1	63.00	2	61.00
<i>Haafc</i>	15	4 x 5	4¼x 6½	6 ⅓	1½	45.50	2	70.50	2	66.50
<i>Haafd</i>	15a	5 x 7	5 x 8	7 ⅞	1 ⅓	60.00	2	85.00	3	85.00
<i>Haafj</i>	16	5 x 8	6½x 8½	8 ⅓	1 ⅓	82.00	3	109.00	3	107.00
<i>Haafg</i>	17	6½x 8½	8 x 10	9¾	2 ⅓	115.00	3	142.00	4	150.00
<i>Haafh</i>	18	8 x 10	10 x 12	11¼	2 ⅓	165.00			5	205.00
<i>Haamj</i>	18a	10 x 12	11 x 14	14¾	3¾	215.00				
<i>Haank</i>	19	11 x 14	12 x 16	15 ⅓	3 ⅞	267.50				
<i>Haapl</i>	20	14 x 17	16 x 18	19 ⅞	4 ⅞	410.00				

Bausch & Lomb Tessar Series IIb $f:6.3$

Recommended for use on folding hand cameras, also on cameras for Commercial,



Flashlight, Group and Landscape photography, Enlarging, Copying, etc.

Tessar IIb is very similar to Tessar Ic. Its construction, being of the unsymmetrical type, requires that both front and rear combinations be used together.

It is characterized by a uniform precision and sharpness of definition of image on the plate from center to margin and unusually brilliant and evenly distributed illumination. Its covering power, or the size of the image of critical sharpness is increased by stopping down the diaphragm. Its speed, $f:6.3$ is about 61% faster than the lenses rated at $f:8$ (U.S. 4), and 49% faster than those marked $f:7.7$.

It may, therefore, be used for all instantaneous work on all cameras, including the reflecting type. The shorter focal lengths are generally fitted to folding hand cameras and are likewise used for enlarging, copying and lantern slide making. The longer focal lengths 12" and upwards lend themselves to portraiture and groups.

Being smaller than the Tessar Ic because of its lesser speed, compactness of mounting and light weight are outstanding features.

The double knurled diaphragm ring is beveled to facilitate reading of the scale.

BAUSCH & LOMB OPTICAL CO.

PRICE LIST
Tessar Iib f:6.3

Code Word	No.	Size of Plate Covered with Stop f:6.3 Inches	Size of Plate Covered with Small Stops Inches	Equivalent Focus Inches	Diameter of Lens Inches	Lens and Barrel with Iris Diaphragm	In Volute Shutter Without Barrel		In Compound Shutter Without Barrel	
							No.	Price	No.	Price
<i>Haenl</i>	2a	2¼ x 3¼	3½ x 3½	3½	1⅞	\$25.00*			0	\$43.00
<i>Haepm</i>	3	2½ x 3½	3½ x 4¼	4⅝	1⅞	28.50	1	\$51.50	1	47.50
<i>Haern</i>	4	3¼ x 4¼	4 x 5	5¼	1⅞	31.00	1	54.00	1	50.00
<i>Haesp</i>	5	4 x 5	5 x 7	6¼	1⅞	32.50	1	55.50	1	51.50
<i>Haetr</i>	5k	3¼ x 5½	5 x 7	7⅞	1⅞	36.00	1	59.00	1	55.00
<i>Haevs</i>	5a	5 x 7	5 x 8	7⅞	1⅞	42.00	2	67.00	2	63.00
<i>Haevv</i>	6	5 x 8	6½ x 8½	8⅝	1⅞	53.50	2	78.50	3	78.50
<i>Haibz</i>	7	6½ x 8½	8 x 10	10	1⅞	74.00	2	99.00	3	99.00
<i>Haicb</i>	8	8 x 10	10 x 12	12	2	125.00	3	152.00	4	160.00
<i>Haidc</i>	9	10 x 12	12 x 15	14¼	2⅝	165.00	3	192.00	4	200.00
<i>Haidd</i>	9a	11 x 14	14 x 17	16½	2¾	206.00			5	246.00
<i>Haidf</i>	10	14 x 17	15 x 20	19⅞	3⅞	267.00				
<i>Haidg</i>	11	16 x 20	20 x 24	23¼	3⅞	370.00				

For matching lenses for stereoscopic work, add **\$4.00** to the price of the lenses.

When ordering lenses fitted with shutter, by telegraph, specify *Volut* or *Compd* in addition to the code word for the size of lens.

Each lens in barrel is furnished in a case which protects it from injury. Lens cap and flange are included. When lens is ordered in shutter, case is not furnished.

*Supplied in cells only. Speed f:6.9.

Bausch & Lomb Plastigmat $f:5.6$



During recent years photographs made with the so-called “diffused” or “soft-focus” lenses have gained considerable popularity. For both portraiture and landscape work, such lenses, producing pictures with a softness of detail and blending of high lights and shadows, are especially attractive.

Much trouble has been experienced with most lenses of this type heretofore available, due to their several optical imperfections. Photographs made with them at full aperture have often been unsatisfactory because of lack of detail in the high lights, clogging of the shadows and the extremely fuzzy indistinctness of the finished picture. To obtain satisfactory detail and sharpness it has usually been necessary to stop the lens down, greatly prolonging the exposure, often at the risk of a possible movement of the subject.

The Bausch & Lomb Plastigmat, $f:5.6$, eliminates all these faults. In computing it, a slight confusion of the image-forming

BAUSCH & LOMB OPTICAL CO.

rays over the entire field has been introduced, thus avoiding the needle sharpness of the anastigmat and producing negatives of such softness as to eliminate nearly all retouching. With this lens it is possible to obtain satisfactory results wide open. At the same time it avoids the disagreeable diffusion disliked by many; halation is reduced to a minimum; and there are no chalky whites. Detail is preserved in the deepest shadows to a remarkable degree, with almost a total absence of the so-called double lines. Furthermore, the image that appears on the ground glass is exactly the same as the negative will show.

While designed particularly for the studio camera, the Plastigmat in the smaller sizes, may be readily fitted to several models of the Graflex camera as follows:

4 x 5	R.B. Telescopic.....	}	No. 0, 9" E.F.
3¼ x 4¼	R.B. Auto.....		
4 x 5	R.B. Auto.....		

3¼ x 5½	Compact.....	}	No. 0a, 9" E.F.
3A.	Graflex.....		

3¼ x 4¼	R.B. Auto.....	}	No. 1a, 12" E.F.
4 x 5	R.B. Auto.....		

Numbers 1, 2 and 3 are furnished with a hood and intended for use on Studio Cameras.

PRICE LIST

Plastigmat Portrait f:5.6

Code Word	No.	Size of Plate Covered, Inches	Equivalent Focus, Inches	Diameter of Lens, Inches	Lens and Barrel with Iris Diaphragm
<i>Haik</i>	0	4 x 5	9	1 11⁄16	\$51.50
<i>Haiml</i>	0a				
<i>Haism</i>	1	5 x 7	12	2 1⁄16	65.50
<i>Haipn</i>	1a				
<i>Haivp</i>	2	6½ x 8½	15	2¾	84.50
<i>Haivr</i>	3	8 x 10	18	3 1⁄16	108.00

Each lens in barrel is furnished in a case, which protects it from injury. Lens cap and flange are included. Lens hood is furnished with numbers 1, 2 and 3 only.

Bausch & Lomb Protar Series VII and VIIa

Single combinations (VII) f:12.5. Doublets (VIIa) f:6.3-f:7-f:7.7

*Recommended for
Landscapes, Com-
mercial, Architec-
tural and*



*Flash-light
photography. Por-
traits, Groups and
Copying.*

Unlike the preceding lenses described, this Series represents a type of construction which is not only symmetrical but convertible as well. And to avoid confusion, we will refer to the Series VII, as single Protars; the Series VIIa, as doublets, comprising two Series VII used in combination; and to the Protar Sets, as consisting of three or more Series VII interchangeable in the same barrel or shutter.

Protar Series VII

Protar VII is a single Anastigmat, composed of thin glass elements cemented together and carefully mounted in a metal cell of standard size, which fits either end of lens barrel or shutter. The correct position for this lens in either style of mounting, is behind the diaphragm. It will then perform according to its listed specifications. In some cameras, however, the bellows is too short to allow the use of a single Protar in this position. In such cases it is permissible to place the lens in front of the diaphragm, but this procedure limits the covering power and is not recommended.

While not absolutely rectilinear, for no lens of this type can be, the results obtained are entirely satisfactory, and so perfect are the spherical and anastigmatic corrections as to make the single lens almost equal to the doublet, and actually superior to

many doublets of other makes, for which strong claims of perfection are made.

A lens of this type lends itself to a variety of purposes requiring long equivalent focal length, medium speed and narrow angle, as for instance, commercial and architectural photography, large portraits and groups. For photographing landscapes at a considerable distance, Protar VII may be looked upon as a telephoto, because it produces a larger size image than lenses of such focal length as are ordinarily recommended for the size of plate in question. Although incapable of magnifications equal to those obtainable with a telephoto attachment and photographic lens, nevertheless its greater speed and anastigmatic corrections more than compensate for this limitation.

Protar Series VIIa

Protar VIIa, a doublet, consists of two Protar VII of like or unlike foci, fitted in barrel or shutter. If unlike, the lens of longer focal length should be placed in front of the diaphragm, in order that the greatest volume of light may be collected.

If, in forming a Protar VIIa doublet, we select two Protar VII of equal foci, the complete lens has a speed of $f:6.3$, if, however, we combine two of unequal foci, the doublet will have a speed of $f:7$ or $f:7.7$, according to the relative foci selected. Thus, we have in one and the same lens, one or two long focal length single lenses suitable for a variety of work, and also a rapid doublet adapted for most kinds of instantaneous work. Although a doublet composed of two lenses of equal foci possesses a larger relative aperture and hence greater speed, one composed of two of unequal foci, has the advantage of being convertible into three lenses of different foci, whereas the former is convertible only into two.

The advantages of variety and convenience without the burden of multiplicity of frontboards, flanges, adapters, shutters, cases and caps, are possible by the acquisition of a Convertible Protar VIIa lens, which stands at the head of the list, both in

optical quality and its adaptability to the generally limited lens space allowed on cameras. A Protar VIIa is especially desirable, if the camera has sufficient bellows draw to permit the use of the single combinations of long focal length. In selecting a lens it would be unwise therefore, to choose one, the largest front combination of which had a back focus exceeding the maximum bellows draw, for when using it alone, back of the diaphragm, objects at infinity could not be brought into sharp focus.

Convertible Protar Sets

To illustrate the facility with which Sets of Convertible Protar lenses may be made up, and the uses to which they may be put, let us consider the No. 8 Protar VIIa doublet. This lens is listed to cover a 5" x 7" plate, having an equivalent focal length of 7" and a speed of $f:7$, which is considerably faster than the ordinary camera lens. It is composed of two Protar VII lenses, the front combination being a No. 4 of $13\frac{3}{4}$ " E.F., listed for 8" x 10", the rear combination being a No. 3 of $11\frac{3}{16}$ " E.F., listed for $6\frac{1}{2}$ " x $8\frac{1}{2}$ ". Each lens has a speed of $f:12.5$, which is sufficient for instantaneous work under favorable light conditions. We have, in other words, three anastigmat lenses in one—two single anastigmats and a doublet. Now let us add to this, a No. 2 Protar VII of $8\frac{3}{4}$ " E.F., listed for 5" x 7", and thus form a "C" set of Protars, consisting of three single Protar VII and three doublet Protar VIIa lenses, offering six different focal length lenses as follows:

Front Protar VII	Rear Protar VII	Doublet Protar VIIa	Speed	Size of Plate Cover
	No. 2— $8\frac{3}{4}$ " E.F.		$f:12.5$	5" x 7"
	No. 3— $11\frac{3}{16}$ " E.F.		$f:12.5$	$6\frac{1}{2}$ " x $8\frac{1}{2}$ "
	No. 4— $13\frac{3}{4}$ " E.F.		$f:12.5$	8" x 10"
No. 3— $11\frac{3}{16}$ " E.F.	No. 2— $8\frac{3}{4}$ " E.F.	No. 5 $5\frac{5}{8}$ " E.F.	$f:7.0$	$4\frac{1}{4}$ " x $6\frac{1}{2}$ "
No. 4— $13\frac{3}{4}$ " E.F.	No. 2— $8\frac{3}{4}$ " E.F.	No. 6 $6\frac{1}{8}$ " E.F.	$f:7.7$	$4\frac{1}{4}$ " x $6\frac{1}{2}$ "
No. 4— $13\frac{3}{4}$ " E.F.	No. 3— $11\frac{3}{16}$ " E.F.	No. 8 7" E.F.	$f:7.0$	5" x 7"

The cost of this set of lenses is \$110, or an average of \$18.33 per focal length. Obviously, this is an exceptionally low price for an anastigmat lens of high quality. If we desire a faster lens, we need only to add another single Protar VII of like focal length,

BAUSCH & LOMB OPTICAL CO.

which will then form a symmetrical doublet having a speed of $f:6.3$. This illustration demonstrates the enormous advantage of the Convertible Protars and proves their claim to convertibility, variety and usefulness.

Protar VII lenses used in combination to form Protar VIIa doublets and Sets follow. To meet special conditions we will gladly suggest other possible Sets.

PRICE LIST

Protar VII $f:12.5$

Code Word	No.	Size of Plate Covered with Stop $f:12.5$ Inches	Size of Plate Covered with Small Stops Inches	Equivalent Focus Inches	Back Focus Inches	Diameter of Lens. Iris Diaphragm	Lens and Barrel with Iris Diaphragm	In Volute Shutter Without Barrel	In Compound Shutter Without Barrel		
		No.	Price	No.	Price	No.	Price	No.	Price		
<i>Haobb</i>	1	$4\frac{3}{4} \times 6\frac{1}{2}$	5×7	$7\frac{1}{16}$	$7\frac{3}{4}$	$\frac{3}{4}$	\$33.00	1	\$56.00	1	\$52.00
<i>Haocc</i>	2	5×7	$6\frac{1}{2} \times 8\frac{1}{2}$	$8\frac{3}{4}$	$9\frac{3}{4}$	$\frac{7}{8}$	35.00	1	58.00	1	54.00
* <i>Haodd</i>	3	$6\frac{1}{2} \times 8\frac{1}{2}$	10×12	$11\frac{1}{16}$	$12\frac{1}{4}$	$1\frac{1}{8}$	42.00	1	65.00	2	63.00
<i>Haoff</i>	4	8×10	11×14	$13\frac{3}{4}$	15	$1\frac{3}{8}$	50.00	2	75.00	2	71.00
<i>Haogg</i>	5	10×12	12×16	$16\frac{3}{8}$	$17\frac{1}{2}$	$1\frac{3}{4}$	68.00	2	93.00	3	93.00
<i>Haokk</i>	6	11×14	16×18	$18\frac{1}{8}$	$20\frac{1}{2}$	$1\frac{7}{8}$	84.00	3	111.00	3	109.00
<i>Haool</i>	7	12×16	18×22	$23\frac{1}{4}$	$25\frac{1}{4}$	2	117.00	3	144.00	4	152.00
<i>Haomm</i>	8	13×16	22×27	$27\frac{1}{8}$	$29\frac{1}{8}$	$2\frac{1}{16}$	148.00	3	175.00	4	183.00
<i>Haonn</i>	9	16×18	24×30	$30\frac{3}{4}$	34	$2\frac{3}{16}$	210.00				
<i>Haopp</i>	10	16×20	27×35	$33\frac{1}{8}$	$37\frac{1}{2}$	$3\frac{1}{4}$	270.00				
<i>Haorr</i>	11	18×22	30×40	$39\frac{1}{4}$	$43\frac{1}{2}$	$3\frac{3}{4}$	360.00				

When ordering lenses fitted with shutter, by telegraph, specify *Volut* or *Compd* in addition to the code word for the size of the lens.

Each lens in barrel is furnished in a case which protects it from injury. Lens cap, flange and screen ring or ray filter are included. When lens is ordered in shutter, case is not furnished.

*No. 2 Compound is here regularly supplied. If it is desired to use the lens in a hand camera and the No. 2 is too large, we can adapt the Compound No. 1 by reducing the diameter of the lens. This in no way affects the speed of the combination. In ordering, please specify whether No. 1 or No. 2 is to be furnished.

Bausch & Lomb Convertible Protar Set

We offer two Sets complete with lenses mounted interchangeably. Each Set may be ordered in one of three ways, namely:

Fitted in barrel with iris diaphragm;

Fitted in shutter, Compound or Volute;

Fitted in both, barrel and shutter, interchangeably.

With each Set we furnish a lens cap, screen ring, and flange.

BAUSCH & LOMB OPTICAL CO.

with screws for attaching to frontboard. (When using a Protar VII alone in rear of lens barrel or shutter, the front combination is replaced by the screen ring.) A compact leatherette-covered case may be had at additional cost.

Sets may be built up gradually if the entire investment cannot be made at one time, but in this case we recommend the selection of the longest focal length, Protar VII, as a part of the original purchase, since to its barrel or shutter may be fitted the shorter focal length lenses.

PRICE LIST
Convertible Protar VIIa *f*:6.3—*f*: 7.0—*f*:7.7

Code Word	No.	Size of Plate Covered with Full Aperture Inches	Size of Plate Covered with Small Stops Inches	Combinations of Single Protars Focus Inches		Combined Equivalent Focus Inches	Speed <i>f</i>	Lens and Barrel with Iris Diaphragm	In Volute Shutter Without Barrel		In Compound Shutter Without Barrel	
				Front Lens	Back Lens				No.	Price	No.	Price
<i>Haubc</i>	1	3¼x 3¼	3¼x 4¼	7 ¹ / ₁₆	7 ¹ / ₁₆	4½	6.3	\$57.50	1	\$80.50	1	\$76.50
<i>Haudf</i>	2	3¼x 4¼	4 x 5	8 ¹ / ₁₆	7 ¹ / ₁₆	4½	7.0	60.00	1	83.00	1	79.00
* <i>Haufg</i>	3	4 x 5	4¾x 6½	11 ¹ / ₁₆	7 ¹ / ₁₆	5	7.7	66.00	2	91.00	2	87.00
<i>Hauhg</i>	4	4 x 5	4¾x 6½	8 ¹ / ₁₆	8 ¹ / ₁₆	5 ¹ / ₁₆	6.3	62.00	1	85.00	1	81.00
* <i>Hauhj</i>	5	4¾x 6½	5 x 7	11 ¹ / ₁₆	8 ¹ / ₁₆	5 ¹ / ₁₆	7.0	68.00	2	93.00	2	89.00
<i>Hauwk</i>	6	4¾x 6½	5 x 7	13 ¹ / ₁₆	8 ¹ / ₁₆	6½	7.7	78.00	2	103.00	2	99.00
* <i>Haukl</i>	7	4½x 7¼	5 x 8	11 ¹ / ₁₆	11 ¹ / ₁₆	6½	6.3	74.00	2	99.00	2	96.00
<i>Haulm</i>	8	5 x 7	6½x 8½	13 ¹ / ₁₆	11 ¹ / ₁₆	7	7.0	82.00	2	107.00	2	103.00
<i>Hauln</i>	9	5 x 8	6½x 8½	16 ¹ / ₁₆	11 ¹ / ₁₆	7½	7.7	100.00	2	125.00	3	125.00
<i>Haulp</i>	10	5 x 8	7 x 9	13 ¹ / ₁₆	13 ¹ / ₁₆	7½	6.3	91.50	2	116.50	2	112.50
<i>Hauqr</i>	11	6½x 8½	8 x 10	16 ¹ / ₁₆	13 ¹ / ₁₆	8½	7.0	108.50	2	133.50	3	133.50
<i>Hauvs</i>	12	6½x 8½	8 x 10	18 ¹ / ₁₆	13 ¹ / ₁₆	9½	7.7	125.00	3	152.00	3	150.00
<i>Hauwt</i>	13	6½x 8½	8 x 10	16 ¹ / ₁₆	16 ¹ / ₁₆	9¼	6.3	123.00	2	148.00	3	148.00
<i>Hautv</i>	14	7 x 9	10 x 12	18 ¹ / ₁₆	16 ¹ / ₁₆	10	7.0	140.00	3	167.00	3	165.00
<i>Haurv</i>	15	7 x 9	10 x 12	23¼	16 ¹ / ₁₆	10½	7.7	172.50	3	199.50	4	207.50
<i>Haurz</i>	16	7 x 9	10 x 12	18 ¹ / ₁₆	18 ¹ / ₁₆	10½	6.3	156.00	3	183.00	3	181.00
<i>Hauzb</i>	17	8 x 10	11 x 14	23¼	18 ¹ / ₁₆	11½	7.0	188.50	3	215.50	4	223.50
<i>Hebab</i>	18	8 x 10	11 x 14	27½	18 ¹ / ₁₆	12¾	7.7	220.00	3	247.00	4	255.00
<i>Hebec</i>	19	8 x 10	12 x 16	23¼	23¼	13¼	6.3	220.00	3	247.00	4	255.00
<i>Hebid</i>	20	10 x 12	14 x 17	27½	23¼	14½	7.0	250.00	3	277.00	4	285.00
<i>Hebof</i>	22	10 x 12	16 x 18	27½	27½	15½	6.3	278.00	3	305.00	4	313.00
<i>Hebug</i>	25	10 x 12	17 x 20	30¾	30¾	18¼	6.3	385.00				
<i>Hecac</i>	28	11 x 14	18 x 22	33 ¹ / ₈	33 ¹ / ₈	20¼	6.3	495.00				
<i>Heccd</i>	30	12 x 16	22 x 27	39¼	39¼	23¾	6.3	670.00				

For matching lenses for stereoscopic work, add \$4.00 to the price of the lenses.

When ordering lenses fitted with shutter, by telegraph, specify *Volut* or *Compd* in addition to the code word for the size of lens.

Each lens in barrel is furnished in a case, which protects it from injury. Lens cap, flange and screen ring for ray filter are included. When lens is ordered in shutter, case is not furnished.

The diaphragm scale is graduated for each focal length.

*No. 2 Shutters are here regularly supplied. If it is desired to use the lens on a hand camera and the No. 2 Shutter is too large, we can adapt the No. 1 by reducing the diameter of the lens. This in no way affects the speed of the combination. In ordering, please specify whether the No. 1 or No. 2 Shutter is to be furnished.

BAUSCH & LOMB OPTICAL CO.

PRICE LIST

C Set—Bausch & Lomb Convertible Protar VIIa

(Code Word—Haott)

In Barrel without case.....	\$110.00	Case extra \$5.00
In No. 2 Volute Shutter without barrel and case....	135.00	Case extra 8.00
In No. 3 Compound Shutter without barrel and case.	131.00	Case extra 8.00

Series	No.	Size of Plate Covered with Largest Stops* Inches	Equivalent Focus of Lens in Inches			Speed
			Front Lens	Back Lens	Comb. Focus	
VII	2	5 x 7	.....	8 $\frac{3}{4}$	....	<i>f</i> :12.5
	3	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	.....	11 $\frac{1}{16}$	....	<i>f</i> :12.5
	4	8 x 10	.....	13 $\frac{3}{4}$	....	<i>f</i> :12.5
VIIa	5	4 $\frac{1}{4}$ x 6 $\frac{1}{2}$	11 $\frac{3}{16}$	8 $\frac{3}{4}$	5 $\frac{5}{8}$	<i>f</i> :7.0
	6	4 $\frac{1}{4}$ x 6 $\frac{1}{2}$	13 $\frac{3}{4}$	8 $\frac{3}{4}$	6 $\frac{1}{8}$	<i>f</i> :7.7
	8	5 x 7	13 $\frac{3}{4}$	11 $\frac{3}{16}$	7	<i>f</i> :7.0

*Larger plates covered with smaller stops.

D Set—Bausch & Lomb Convertible Protar VIIa

(Code Word—Haovv)

In Barrel without case.....	\$215.00	Case extra \$6.00
In No. 3 Volute Shutter without barrel and case.....	242.00	Case extra 9.00
In No. 3 Compound Shutter without barrel and case.....	240.00	Case extra 9.00

Series	No.	Size of Plate Covered with Largest Stops* Inches	Equivalent Focus of Lenses in Inches			Speed
			Front Lens	Back Lens	Comb. Focus	
VII	3	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	....	11 $\frac{1}{16}$	...	<i>f</i> :12.5
	4	8 x 10	....	13 $\frac{3}{4}$	...	<i>f</i> :12.5
	5	10 x 12	....	16 $\frac{1}{16}$	...	<i>f</i> :12.5
	6	11 x 14	....	18 $\frac{7}{8}$	...	<i>f</i> :12.5
VIIa	8	5 x 7	13 $\frac{3}{4}$	11 $\frac{1}{16}$	7	<i>f</i> :7.0
	9	5 x 8	16 $\frac{1}{16}$	11 $\frac{1}{16}$	7 $\frac{1}{2}$	<i>f</i> :7.7
	9a	5 x 8	18 $\frac{7}{8}$	11 $\frac{1}{16}$	8	<i>f</i> :7.7
	11	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	16 $\frac{1}{16}$	13 $\frac{3}{4}$	8 $\frac{1}{2}$	<i>f</i> :7.0
	12	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	18 $\frac{7}{8}$	13 $\frac{3}{4}$	9 $\frac{1}{8}$	<i>f</i> :7.7
	14	7 x 9	18 $\frac{7}{8}$	16 $\frac{1}{16}$	10	<i>f</i> :7.0

*Larger plates covered with smaller stops. When ordering set fitted with shutter, by telegraph, specify *volut* or *compd* in addition to the code word for the set.

**Bausch & Lomb Medium Wide Angle Protar
SERIES IV *f*: 12.5**

*A Rapid Lens
for Architectural
and Flashlight*



*Photography,
Interiors
and Groups.*

The Protar, IV an unsymmetrical doublet, the combinations of which consist of two cemented elements, is an anastigmat lens of moderately short focal length, speed and covering power for a comparatively large plate. Its speed is sufficient for instantaneous exposures out-of-doors under favorable light conditions, while its large relative aperture adapts it for flash lights of interiors and groups, admitting ample light for focusing, and enabling one to obtain sufficient illumination with less flash powder than is possible with lenses of smaller aperture.

If a shutter is required, the Volute is recommended, because of its adaptability to lenses of extremely limited separation.

Nos. 6 and 7 are suggested for the 7" x 17" and 12" x 20" Banquet cameras, respectively.

PRICE LIST

Code Word	No.	Size of Plate Covered with Stop <i>f</i> :12.5 Inches	Size of Plate Covered with Small Stops Inches	Equivalent Focus Inches	Diameter of Lens Inches	Lens and barrel with Iris Diaphragm	No.	In Volute Shutter Without Barrel Price
<i>Hecog</i>	1	2½ x 3¼	3½ x 3½	2 ⅞	¼	Discontinued		Discontinued
<i>Hecuh</i>	2	3¼ x 4¼	4 x 5	3 ⅞	⅜	\$25.75	1	\$48.75
<i>Hedad</i>	3	4¼ x 6½	5 x 7	4 ⅞	½	28.00	1	51.00
<i>Hedef</i>	4	5 x 8	6½ x 8½	6 ⅞	⅝	35.00	1	58.00
<i>Hedig</i>	5	6½ x 8½	8 x 10	7 ⅞	⅞	44.50	1	67.50
<i>Hedoh</i>	6	10 x 12	12 x 15	10 ¼	1 ⅝	61.00	1	84.00
<i>Heduj</i>	7	12 x 15	16 x 20	15 ⅞	1 ⅞	89.00	2	114.00
<i>Hefaf</i>	8	16 x 20	18 x 22	23 ⅞	2 ⅞	150.00	3	177.00
<i>Hefeg</i>	9	20 x 24	24 x 30	35 ⅞	2 ⅞	Discontinued		Discontinued
<i>Hefih</i>	10	24 x 30	28 x 36	48 ⅞	3 ⅞			

See foot notes on page 31.

**Bausch & Lomb Extreme Wide Angle Protar
SERIES V f:18**

*For Architectural
and Flash-light*



*Photography,
Interiors and
Copying.*

This lens should be chosen for the most exacting wide angle photography, because the corrections for flatness of field and astigmatism have been carried to a high degree of perfection. Its effective angle and covering capacity, especially recommend the Protar V for architectural and interior photography.

The speed is sufficient for out-of-door instantaneous photography under favorable light conditions. In order to utilize the widest angle, one should select the next smaller size lens than listed for the plate to be covered. Stopping down the iris diaphragm gives the extreme covering power desired.

Being of the unsymmetrical type the lens must be used in its entirety. We recommend the Volute, if a shutter is desired.

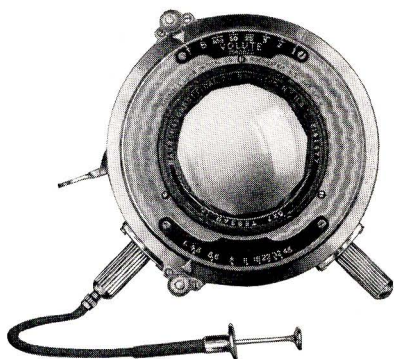
PRICE LIST

Code Word	No.	Size of Plate Covered with Stop f:18 Inches	Size of Plate Covered with Small Stops Inches	Equivalent Focus Inches	Diameter of Lens Inches	Lens and barrel with Iris Diaphragm	No.	In Volute Shutter Without Barrel Price
<i>Hegag</i>	1	4 x 5	4¼ x 6½	3 ⅞	1 ½	\$27.00	1	\$50.00
<i>Hegeh</i>	2	5 x 7	6½ x 8½	4 ⅞	1 ⅞	27.00	1	50.00
<i>Hegij</i>	3	6½ x 8½	8 x 10	5 ⅞	1 ⅞	31.00	1	54.00
<i>Hegok</i>	4	8 x 10	11 x 14	7 ⅞	2 ⅞	40.00	1	63.00
<i>Hegul</i>	5	10 x 12	14 x 17	8 ½	2 ⅞	47.50	1	70.50
<i>Hehah</i>	6	11 x 14	18 x 22	10 ⅞	1 ⅞	61.50	1	84.50
<i>Hehik</i>	7	12 x 15	20 x 24	12 ⅞	1 ¾	76.00	1	99.00
<i>Hehol</i>	7a	16 x 18	22 x 27	15 ⅞	1 ⅞	96.50	1	119.00
<i>Hehum</i>	8	14 x 17	17 x 20	18 ⅞	1 ⅞	114.00	1	137.00
<i>Hejom</i>	9	16 x 18	22 x 27	24 ⅞	1 ½	175.00	2	200.00
<i>Hejun</i>	10	20 x 25	24 x 30	37 ¼	2 ⅞	288.00	3	313.00

For matching lenses for stereoscopic work, add \$4.00 to the price of the lenses.
When ordering lenses fitted with shutter, by telegraph, specify *Volut* in addition to code word for the size of lens. Each lens in barrel is furnished in a case which protects it from injury. Lens cap and flange are included. When lens is ordered in shutter, case is not furnished.

Bausch & Lomb Volute Shutter

Theoretically and practically, the proper place for interception of light rays is at the diaphragm point of the lens. An iris diaphragm opening and closing at that point gives maximum illumination with minimum motion, uniform exposure, an increase in the depth of focus, covering power, and an improvement in definition. In the Volute, the



diaphragm and shutter blades are identical, that is, one and the same, which construction permits fitting lenses such as the Wide Angle Protars, IV and V, which have limited separation.

All working parts are inclosed within a dust-proof aluminum case, of such strength and durability as to insure perfect centering of the combinations, so essential to the proper performance of a high grade anastigmat lens. The workmanship throughout, the finish and operation, show the extreme care exercised in the manufacture of the individual parts and assembly of an instrument of precision.

The speeds are controlled by a patented pneumatic retarding device and vary from one second to 1/150 second. "Time" and "Bulb" exposures are included.

To operate, set indicator, at top of shutter, opposite the particular speed desired. The lever on side is then raised to limit of motion. A downward pressure on lever releases the mechanism, causing the blades to open and close automatically.

For "Time" exposures, set indicator at "T" on upper scale. Raise lever on side to limit of motion. Open shutter by pressing lever down. A second pressure on lever closes shutter.

BAUSCH & LOMB OPTICAL CO.

For "Bulb" exposures, set indicator at "B," on upper scale. Raise lever on side to limit of motion. Open shutter by pressing down and **hold** same until it is desired to close shutter.

The shutter blades will not open or expose the plate while being set, nor is there recoil of any appreciable amount, even at the highest speed.

The indicator at bottom of shutter registers against the diaphragm values engraved on scale plate. Since more than one lens may be fitted to this shutter, several sets of diaphragm graduations may be engraved on this plate. The setting of the diaphragm opening may be made before or after raising the lever on side of shutter.

The Volute is offered in three sizes as per the following specifications. With each shutter there is regularly furnished a wire cable release. If the older form of release, rubber bulb and hose, are preferred, please so specify on the order. A shutter fitted for one form of release will not accommodate the other.

PRICE LIST

Code Word	No.	Range of Exposure	Case Opening Inches	Iris Diaphragm Opening Inches	Flange Diameter		Volute Shutter Only	Fitted to our Lens Add	Fitted to lens of other manuf.
					Inside Inches	Outside Inches			
<i>Hepuv</i>	1	1 sec. to 1/150 sec.	1 $\frac{1}{16}$	1	1 $\frac{1}{16}$	2	\$23.00	\$4.50	\$6.00
<i>Herar</i>	2	1 sec. to 1/100 sec.	1 $\frac{1}{8}$	1 $\frac{1}{16}$	2 $\frac{1}{16}$	3	25.00	5.50	7.00
<i>Heres</i>	3	1 sec. to 1/75 sec.	2 $\frac{1}{16}$	2	3	3 $\frac{1}{16}$	27.00	6.00	8.50

Fitting charges include diaphragm graduations for one focal length only. Graduations for additional focal length, \$1.00 each.

When fitting our lenses to a new Volute, a flange affording the most compact fitting is furnished without extra charge.

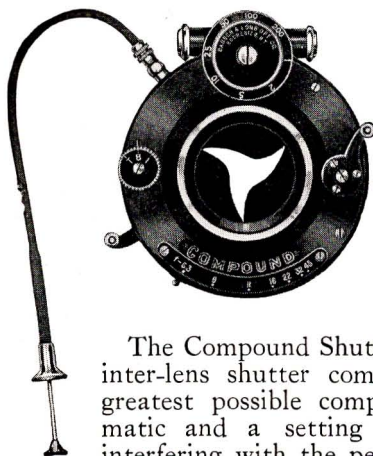
When fitting lenses of other manufacture, we will furnish in place of flange, an adapter on back of shutter so that same will interchange in barrel flange, but we require the lens in its barrel or other fitting.

When any lens is to be fitted to customer's Volute, it is absolutely necessary that shutter be returned to us.

Extra cable releases, 6" or 12", 50c each.

Extra rubber bulb with 18" hose, 25c.

Bausch & Lomb Compound Shutter



A shutter with an ample variety of speeds, uniform exposure and mechanical accuracy is an absolute necessity in successful photography. Regardless of the perfection of the lens, satisfactory results can be obtained only when that lens is equipped with a shutter which functions properly.

The Compound Shutter is an exceptionally efficient, inter-lens shutter combining high speed with the greatest possible compactness. It is both an automatic and a setting shutter, neither adjustment interfering with the perfect action of the other.

“Bulb” and “Time” exposures are made without setting the shutter. When an instantaneous exposure is to be made, however, the setting lever must be depressed before the shutter will operate. The larger sizes have a pin just above the diaphragm scale instead of the disc, as illustrated, for designating the kind of exposure to be given.

The various speeds including 1, $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{25}$, $\frac{1}{50}$, $\frac{1}{75}$ and up to $\frac{1}{100}$, $\frac{1}{150}$, $\frac{1}{200}$ and $\frac{1}{250}$ second in the smaller sizes are secured by setting the milled speed dial at top of shutter. As the figures are engraved on a bevel, they may be read either from the front or from above. The actual length of the exposure is as near to the speed indicated on the dial as can possibly be secured, while the greatest speed is fast enough to arrest movement of rapidly moving objects. If desired, the shutter may be opened for focusing, the same as when taking a “Time” exposure; then, after focusing, closed and set for the instantaneous exposure. The iris diaphragm opening is regulated by shifting the knob below the diaphragm scale.

In the smaller sizes there are three shutter segments or blades, and in the larger, proportionately more. As these segments open

BAUSCH & LOMB OPTICAL CO.

star-shape, even illumination over the entire plate is assured. Exposure may be made by either the finger release or with the wire cable release which is supplied with each shutter. For the No. 4 and No. 5 sizes the pneumatic form of release or bulb attachment is sometimes preferred. This consists of a small, cylindrical metal pump and plunger, which screws directly into the shutter case in place of the wire cable release. It is operated by means of a rubber bulb and hose. Prices will be found below.

The mechanism throughout is of the greatest accuracy, and is not easily put out of order. All of the moving parts are protected from dust by an aluminum case machined from a casting. The case opening threads are cut accurately and run true, which insures correct optical performance of the lens. A locking device, actuated by the disc, prevents accidental exposures and makes it impossible to operate the setting lever when "Time" or "Bulb" exposures are to be made, or to open the shutter without setting the lever when an instantaneous exposure is to be made.

The finish is of black enamel, with some parts nickel-plated, giving the shutter a durable and handsome appearance. Because of its sturdy construction, the Compound shutter seldom needs repairs, but should an accident put it out of operation, it should be returned to us for correction.

PRICE LIST

Code Word	No.	Maximum Speed Seconds	Case Opening Inches	Iris Diaphragm Opening Inches	Flange Diameter		Compound Shutter Only	Fitted to B&L Lens add	Fitted to Other Lens add
					Inside Inches	Outside Inches			
<i>Herov</i>	0	1/250	1 $\frac{1}{8}$	$\frac{7}{8}$	*1 $\frac{1}{8}$	1 $\frac{1}{2}$	\$18.00	\$4.50	\$6.00
<i>Heruw</i>	1	1/200	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	19.00	5.50	7.00
<i>Hesas</i>	2	1/150	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	2 $\frac{1}{8}$	21.00	6.50	8.50
<i>Heset</i>	3	1/100	2 $\frac{1}{8}$	1 $\frac{3}{8}$	2 $\frac{1}{8}$	3 $\frac{1}{8}$	25.00	8.00	10.00
<i>Hesiv</i>	4	1/75	2 $\frac{5}{8}$	2 $\frac{1}{4}$	3	4	35.00	10.00	12.00
<i>Hesow</i>	5	1/50	3 $\frac{1}{4}$	2 $\frac{1}{4}$	3 $\frac{1}{2}$	4 $\frac{1}{4}$	40.00	13.00	15.00

Fitting charges include diaphragm graduations for one focal length only. Graduations for additional focal length \$1.00 each.

When fitting our lens to a new Compound, a flange affording the most compact fitting is furnished without extra charge.

When fitting lenses of other manufacture, we will furnish in place of flange, an adapter on back of shutter so that same will interchange in barrel flange, but we require the lens in its barrel or other fitting.

When any lens is to be fitted to customer's Compound, it is necessary that shutter be returned to us, or if customer's Bausch & Lomb lens is to be fitted to a new Compound, simply notify us of serial number of lens, and how lens is now mounted and the shutter with proper adapters will be sent.

No. 5, Bulb Attachment for No. 4 or 5 Shutter, with large rubber bulb and 36" of rubber tubing.....	\$2.00
No. 5 large rubber bulb and 36" of rubber tubing.....	.50
No. 5 Bulb Attachment for No. 4 or 5 Shutter, with small rubber bulb and 18" of rubber tubing..	1.75
Small rubber bulb and 18" of rubber tubing.....	.25

Bausch & Lomb Process Anastigmat $f:10$

An American-made

Process Lens



Photo-engraving is both an art and a science. As such it is dependent for quality results upon the technical exactness of the operation, no less than upon the artistic instincts of the operator—and quality results from photo-engraving were never more in demand than at the present time.

From this it follows that the importance of the optical equipment employed can scarcely be over-emphasized. Upon the quality of the lens and its accessories depends very largely the quality of the reproductions which will be obtained on the copper plate.

Such was our aim in designing the Process Anastigmat, probably the first lens for color work to be made in America. While designed primarily for black and white work, its perfect registration makes it an admirable lens, at the smaller apertures, for three and even four colors.

A distinctive and important feature is found in the fact that because of its exceptional spherical correction, its unusual freedom from so-called spherical zones, there is none of the "stop difference" in focusing, so often found in photo-engraving lenses.

This means that it is possible to open the lens wide and focus on the object, then stop down as desired for the exposure without

refocusing. The advantage of this is quite obvious to the operator, for, if obliged to focus at a small stop, it is very difficult, because of the depth, to locate the correct position of the plate, at which the sharpest image is actually obtained.

Since the Process Anastigmat is made according to our own formula and entirely of our own optical glass, we are in a position to guarantee its uniform quality and performance. The focal lengths offered and other specifications are given below.

PRICE LIST

Bausch & Lomb Process Anastigmat $f:10$

Code Word	No.	Covers for Same Size Reproduction Inches	Covers for Reduction Inches	Equivalent Focus Inches	Diameter of Lens Inches	Lens and Barrel with Iris Diaphragm and Set of Five Waterhouse Stops
<i>Hekon</i>	0	11 x 14	8 x 10	13	1 $\frac{3}{8}$	\$131.25
<i>Hekup</i>	0a	12 x 15	10 x 12	16	1 $\frac{3}{4}$	155.25
<i>Helal</i>	1	14 x 17	12 x 15	18	2	175.00
<i>Helem</i>	2	20 x 24	16 x 20	25	2 $\frac{5}{8}$	280.00

The set of five Waterhouse stops with square openings, is regularly furnished in leather case.

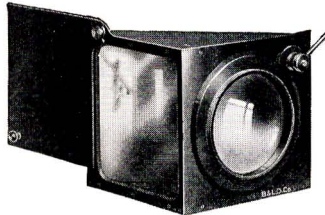
Bausch & Lomb Photo-Engraving Prism

New Model

These prisms are used to reverse the image formed by the lens from left to right, thus making it unnecessary to strip and turn the film in process work. Not only do these prisms obviate the danger of stretching or damaging the film during manipulation, but they effect a great saving of time and labor as well. Being made of high grade glass and having highly polished surfaces and accurate angles, the prism does not influence the sharpness of the image to any degree.

BAUSCH & LOMB OPTICAL CO.

The optical glass used is homogenous, well annealed and free from color, striae, and other defects. The three surfaces are optically plane and the angles are of the utmost precision; the silvering of the hypotenuse reflecting surface is of great whiteness and will not deteriorate.



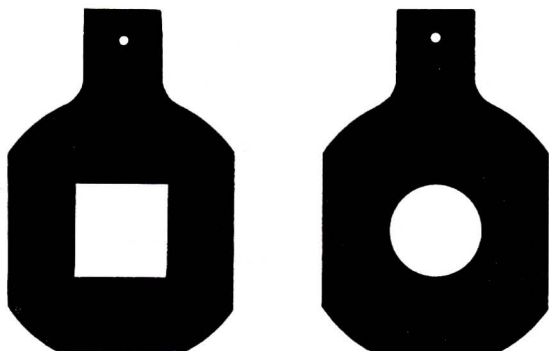
An improved type of mount permits the utilization of a wider angle, since the light rays enter a square instead of round opening prism face. To this face there is fastened a velvet-lined metal cover which serves to protect the glass surface when the prism is not in use, and may also be used as a shutter. The prism and lens are fitted close together by means of an adapter, thus retaining the greatest effective angle, maximum illumination and speed of the objective. This adapter has a revolving collar and clamp which makes it possible to revolve the prism about the axis of the objective and then make it secure in any desired position.

To insure accurate fitting of prisms to lenses of other manufacture, the lenses should be sent to us.

PRICE LIST

Code Word	Aperture of Prism, Inches	For Bausch & Lomb Process Anastigmat	For Bausch & Lomb Tessar IIb	Fitted to B. & L. Lenses	Fitted to Lenses of Other Make
<i>Hemam</i>	2½	No. 0	No. 8	\$74.00	\$79.00
<i>Hemen</i>	3	No. 0a	No. 9	112.00	117.00
<i>Hemip</i>	3½	No. 1	No. 9a	136.00	141.00
<i>Hemor</i>	4	No. 2	No. 10	190.00	196.00
<i>Hemus</i>	4½		No. 11	300.00	310.00
<i>Henan</i>	5			420.00	430.00

**Waterhouse Stops
For Process Anastigmat**



These stops are very accurately made of brass, with either square or round openings, marked and blackened so as to prevent reflections. The stops with square openings are furnished in sets of five; those with round openings, in sets of seven. Each set of stops is supplied in a leather case.

Prices for special designs will be sent on application.

PRICE LIST

Code Word	Cat. No.	Fit Lens No.	Square Opening Set of Five	Round Opening Set of Seven
<i>Heyay</i>	1	0	\$7.50	\$6.25
<i>Heyez</i>	2	0a	7.50	6.25
<i>Heyib</i>	3	1	7.50	6.25
<i>Heyoc</i>	4	2	9.25	7.50

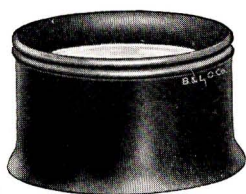
Focusing Glass

When focusing upon images of very fine structures, the eye requires some assistance in order to determine the sharpest point. For this purpose a focusing glass should be used.

This glass is a doublet lens, consisting of two plano convex lenses which give a well corrected image at $3.5\times$ magnification. They are substantially mounted in a dull black metal tube.

Code Word	Cat. No.	Specifications	Price
<i>Caris</i>	4619	Doublet Focusing Glass , as described	\$5.00

Engravers' Glasses



While this glass is designed particularly for engravers, it can be used for retouching and by carvers and dye cutters. It is made with two plano convex lenses, which give a large, clear, flat field, much superior to that given with a single lens glass. Furnished in vulcanite mounting.

Code Word	Cat. No.	Lens Diameter in Inches	E. F. in Inches	Magnification	Price
<i>Laalg</i>	146	$1\frac{1}{8}$	3	$3.5\times$	\$3.60

Watchmakers' Glasses



No. 144-LP



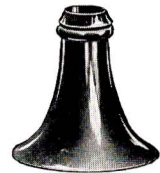
No. 144



No. 144-C



No. 144 -A



No. 144 1/2

These glasses are particularly adapted for the use of engravers and others engaged in fine mechanical work. While all are easily held in the orbit of the eye, one style, No. 144LP, is made with a detachable spring to pass around the head and hold the glass in position for more extended observation. No. 144A is fitted with two lenses, one removable, to give two different magnifying powers. All styles are mounted in black vulcanite.

The Achromatic Watchmakers' Glass (144C) is a chromatically corrected combination, giving a flat, sharp field of view to the margin. Yielding sharper images and greater contrasts than the ordinary glass, it is much more restful in continuous use and particularly appreciated by users whose efficiency depends upon their continued accuracy and clearness of vision under exacting conditions.

Code Word	Cat. No.	Lens Diameter in Inches	E. F. in Inches	Magnification	Price
<i>Laanh</i>	144	1	1 to 5	3 to 5×	\$1.20
<i>Laanj</i>	144 1/2	1/2	1	10×	.90
<i>Laarl</i>	144LP	1	2 to 3	3 to 5×	1.40
<i>Laapk</i>	144A	1/2, 1	1 1/2 to 2 1/2	4 and 7×	1.40
<i>Laasm</i>	144C	1	2	5×	2.40
<i>Laatn</i>	144C	1	3	3 1/2×	2.40

BAUSCH & LOMB OPTICAL CO.

Retouching Glasses



The large field of view and slight magnifying power of these glasses make them especially fitted for this class of work. They are of the best quality of material and workmanship. The lenses are double convex, accurately ground from clear white glass and highly polished. Their magnifications are calculated to give the clearest possible field of view for their respective diameters. The rim is of nickel, and the handle of ebonized wood.

Code Word	Cat. No.	Lens Diameter In Inches	E.F. In Inches	Price
<i>Laimk</i>	202	2½	6	\$2.00
<i>Lainl</i>	204	3	7	2.25
<i>Laipm</i>	206	3½	8	2.50
<i>Lairn</i>	208	4	10	3.00
<i>Laisp</i>	209	4½	12	3.75
<i>Laitr</i>	210	5	13	4.50

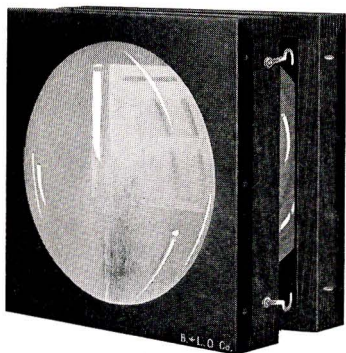
Reducing Glass



The Reducing Glass consists of a double concave lens, mounted in a nickel rim with ebonized wood handle. The workmanship and quality of glass are the same as in the preceding glasses.

Code Word	Cat. No.	Lens Diameter In Inches	E.F. In Inches	Price
<i>Lairv</i>	204CC	3	7	\$3.00

Bausch & Lomb Condensing Lenses



Our condensers for enlarging are well annealed, carefully ground and polished and have long been considered standard. We now furnish an improved mount, opening up like a book. The outer surface of the mount is protected by metal and the condensers may be placed safely on edge. There is no danger of the condensers rolling off on the floor as in the case of the round mounts and there is no

temptation, therefore, to lay the condensers down horizontally on the flat surface where they are, of course, subject to danger of scratching.

In all condensers of the larger sizes there are inevitable striations which the glass makers cannot eliminate. We have conducted an extended series of experiments and find that a piece of finely ground or opalescent glass will completely eliminate the effects of the striae when placed about 2 or 3 inches in front of the light (according to the intensity of same) between the light and the condensers. The ground glass may also be placed between the two condensers if desired, but the loss of light at this point is much greater than when the diffusing glass is placed where we suggest.

Those who prefer to put a piece of ground glass between the condensers can easily do so, a rabbet being provided to hold the glass.

(Prices on ground glass sent on application.)

BAUSCH & LOMB OPTICAL CO.

Condenser Specifications

Cat. No.	E. F. of Pair., In.	For Negatives, Inches	Area, Sq. In.	Outside Dimensions of Condenser Mounts
6½D	6	3¼ x 5½ 4 x 5	17⅞ 20	7⅞ x 7⅞ x 2⅜
8D	7	4¾ x 6½	30⅞	9⅝ x 9⅝ x 3⅞
9D	8	5 x 7	35	10⅞ x 10⅞ x 3⅞
10D	9	5 x 8	40	11⅞ x 11⅞ x 4⅞
12D	10	6½ x 8½	55¼	13⅞ x 13⅞ x 5⅞
14D	11	8 x 10	80	15⅞ x 15⅞ x 5⅞

Ask for special folder, "Enlarging with Condensers."

PRICE LIST

Code Word	Cat. No.	Diameter In Inches	Focus In Inches	One Condenser Unmounted	Pair of Condensers Mounted
<i>Hetat</i>	6½D	6½	10	\$6.00	\$19.00
<i>Hetev</i>	8D	8	12	9.00	26.00
<i>Hetox</i>	9D	9	14	12.00	33.00
<i>Hetuy</i>	10D	10	15	15.00	40.00
<i>Hetav</i>	12D	12	18	30.00	72.00
<i>Hewev</i>	14D	14	21	45.00	103.00

In telegraph orders add the word "Mount" to code word when pairs of condensers in mount are desired. (Be sure to state diameter of condenser when ordering.)

Bausch & Lomb Lens Caps

Diameter, Inches.	1⅞	1⅞	1⅞	2	2⅞	2⅞	2⅞	2⅞
Price, each.	\$0.60	\$0.65	\$0.70	\$0.70	\$0.75	\$0.80	\$0.85	\$0.90
Diameter, Inches.	3¼	3⅞	4⅞	4⅞	4⅞	4⅞	6⅞	
Price, each.	\$1.00	\$1.40	\$1.50	\$1.60	\$1.75	\$2.00	\$2.90	

Bausch & Lomb Flanges

Diameter, Inches.	1⅞	1½	1¼	2	2¼	2½	2¾
Price, each.	\$0.85	\$1.00	\$1.15	\$1.45	\$1.55	\$1.75	\$1.85
Diameter, Inches.	3	*3½	4	4½	5	5½	6
Price, each.	\$2.00	\$3.00	\$3.75	\$4.60	\$5.50	\$6.35	\$7.50

*Specify whether for lens barrel or No. 5 Compound Shutter.

Flanges for Compound Shutters

Diameter, Inches.	1⅞	1⅞	2⅞	3	3½		
Price, each.	\$0.85	\$1.15	\$1.55	\$2.00	\$3.00		

TO OUR PATRONS

THE goods listed herein can be obtained from dealers in photographic goods in the United States and Canada and our agents in foreign countries. We prefer that they be ordered through dealers. If, however, there is any difficulty in procuring them through this channel, we shall be pleased to supply them direct, as per prices and information conveyed in this catalog.

When ordering from this catalog, please give catalog number, name of article and size. Use code words in telegraphing.

Lenses on Approval

Lenses will be sent on twenty day approval basis to responsible parties who send satisfactory references, or they will be forwarded for examination and trial in care of the express companies, provided a deposit is made covering transportation charges one way. The purchaser may, if he wishes, forward the price of the desired goods with his order. They will then be sent on twenty days' trial, and if not wanted, the amount in full will be returned on the payment of charges and the receipt of the goods, uninjured, within that period.

Terms

Credit and Financial Standing. To avoid delay, purchasers with whom we have no account and who have no mercantile rating, should accompany their first order with commercial references or remittance in cash, money orders, New York or Chicago current funds.

Under an arrangement made by the Western Union Telegraph Co. orders may now be sent by telegraph between points in the United States, in the same message with remittance. Code words or catalog numbers may be used. Information may be secured on application to nearest Western Union manager.

Special Goods. Remittance in full should accompany orders for goods to be made on special order.

C. O. D. Shipments. No C. O. D. shipments will be made unless sufficient funds to cover delivery charges both ways accompany the orders. Goods made on special order, or to be sent on memorandum account, will not be forwarded C. O. D.

Quotations. Our prices are f. o. b. Rochester, N. Y. Transportation for goods sent on approval, trial or for examination is at the expense of the customer.

Liability. In packing we double check all goods, and obtain proper receipts from the transportation companies. Unless otherwise specified, we shall use our best judgment in mode of shipping, prepaying transportation if requested and adding amount to invoice. Our responsibility ceases when we have delivered a shipment to the carriers. All claims for breakage should be reported to the transportation companies at once, as we cannot be held responsible for losses or damage to goods in transit. Please examine all packing minutely for small items.

We make no charge for boxing or packing and no allowance for freight, express or parcel post charges.

Guarantee. We exercise the utmost care in manufacturing and packing. In case of faulty goods inadvertently reaching our customers, we shall feel under obligation if our attention is called thereto.

Returning of Goods. Goods being returned for any reason should be plainly tagged with the sender's name and address. Special identification tags are furnished on request. Wherever possible, please give date of invoice and invoice number on which the goods were originally billed.

Notice. Prices in this catalog are subject to change without notice.

Branch Offices and completely equipped display rooms are maintained in the following cities:

New York: Pershing Sq. Bldg., 100 East 42nd Street.

Chicago: 5 No. Wabash Avenue.

Boston: 333 Washington Street.

San Francisco: 28 Geary Street.

**BAUSCH & LOMB OPTICAL COMPANY,
Executive Office and Manufactory
ROCHESTER, N. Y.**

Other Products

In addition to the products listed in this publication, the Bausch & Lomb Line includes the following products:

Binoculars	Optical Glass
Blood Counting Apparatus	Optical Machinery
Centrifuges	Optical Measuring Instruments
Colorimeters	Periscopes
Diamond Tools	Photomicrographic Apparatus
Gun Sights for the Army and Navy	Projection Lanterns (BALOPTICONS)
Industrial Optical Instruments	Range Finders
Magnifiers	Reading Glasses
Metallographic Apparatus	Refractometers
Microprojectors	Saccharimeters
Microscopes	Searchlight Reflectors
Microtomes	Spectacle Frames and Cases
Ophthalmic Instruments	Telescopes
Ophthalmic Lenses	

We will be glad to send upon request, descriptive information or literature on any of the above.

BAUSCH & LOMB OPTICAL COMPANY