

Bausch & Lomb Optical Co.

Photographic Lenses & Shutters.

Semi
Centennial
Catalog.



Rochester, N.Y.
New York - Chicago -
Boston - Frankfurt, a.m.
Germany.

Semi-Centennial Catalog

Photographic Lenses

Shutters
and
Apparatus



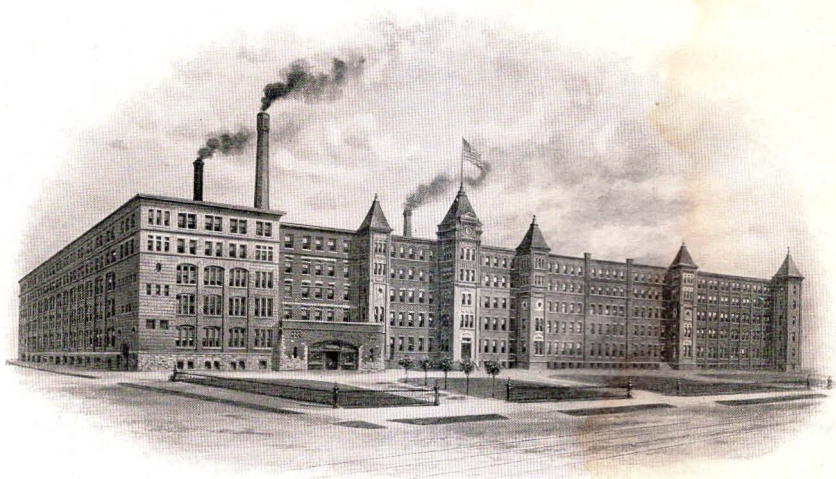
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Bausch & Lomb Optical Co.

Rochester, N. Y.

New York Boston Chicago, U. S. A.

Frankfurt ^{a/m} Germany



Factory of the
Bausch & Lomb Optical Co.
Rochester, N. Y.
1904

Preface to Semi-Centennial Catalog



THIS issue of our General Photographic Catalog marks the completion of our fiftieth year of lens making and concludes the first half century of the growth of the optical industry in America. From a most humble beginning our business has developed until to-day we occupy the largest and best equipped lens factory in the world, employing more than 1,200 workmen in the production of optical instruments.

Our photographic lenses and shutters are now known and used in every country on the globe where photography is practiced. Our series offer to the amateur and professional a selection unequalled in variety and excellence, it being possible to choose from among our products a lens suitable for any kind of work, from one adapted to use with the smallest hand camera to the largest equipment for photo-engraving or the three color process.

We produce many lenses after our own formulæ but we are also the sole American manufacturers of the world-famous

Carl Zeiss Lenses

including Planar, Unar, Tessar and Protars. We produce these under contract as the sole American licensees under identically the same formulæ, methods of production and critical tests in process and after completion. All changes and improvements are immediately imported and carried out by us.

Our aim is the production of perfect lenses. To this end we are constantly introducing new and improved machinery and methods. Each element that enters into the manufacture of any of our products, as well as the completed article, is subjected to the most accurate and exhaustive tests to demonstrate its optical and mechanical perfection before it is allowed to leave the factory. When our name is finally engraved on a finished instrument, it stands as an assurance of standard excellence and a guarantee of the best quality in every respect.

Zeiss Quality

The Zeiss series of Anastigmat lenses are characterized by perfect elimination of the defects inherent in older types. Images are sharply defined over the entire plate, and have no curvature, straight lines being reproduced as such at all angles. No bright spots due to faulty deviation of a portion of the rays of light mar the brilliancy. The Zeiss lenses are worthy of the phrase used of them for so many years: "*The best photographic lenses in existence.*" Marking the beginning of the modern epoch of lens manufacture, they today are generally accepted as the standard.

Jena Glass

The best of the numerous varieties of Jena glass are employed in the construction of the lenses here listed. The use of these special glasses is an absolute necessity in securing the high degree of correction attained. We are glad to realize that it is unnecessary to make apology for the isolated air bubbles which appear in almost all varieties. Though they appear to the eye as defects they do not lessen in any way the optical properties of a lens and the manufacturers can not supply optical glass without them.

New Apparatus

Tessar—We here list this newest Zeiss objective for the first time. It is the latest product of the genius of Dr. P. Rudolph and we recommend it as a rapid, high class objective suitable for all classes of photography. It is especially remarkable for the extreme sharpness and preciseness of its definition and for the uniform brilliancy of its pictures. The smaller sizes we highly recommend for hand cameras, the larger sizes for the highest photographic attainments and particularly for reproduction, half-tone and line work. The Apochromatic Tessar is superior to any lens on the market for the three color process.

Unar—Zeiss Series Ib, although now very popular, is a product made public since the previous issue of this catalog. Its high optical qualities and excellent mechanical construction particularly adapt it for very rapid work, and we strongly recommend it for its great speed and remarkable optical properties.

Plastigmat $f-6.8$ —This is our own invention and the result of popular demand for an American lens. Our long experience in the production

of lenses enables us, we believe, to provide what is desirable in a photographic lens of universal application. Plastigmat $f-6.8$ is constructed to meet these requirements. It is the peer, optically, of any symmetrical Anastigmat ever produced, with the single exception of the Zeiss series of Anastigmat lenses. The mounting is of a light and compact type, while the lens systems are far enough apart to permit the application of any of our shutters. Plastigmat is especially convenient for use on the hand camera and is an ideal lens for general photography and portraiture.

Volute—This is the highest type of iris diaphragm shutter, forming an ideal combination with Plastigmat and our other Anastigmat lenses. Among the large manufacturers who use our Volute and other shutters we may mention the Eastman Kodak Company, Rochester Optical Company, Blair Camera Company and the Century Camera Company. Indeed, for many years our shutters have been used by all the prominent camera manufacturers of the world, all types of lenses, wherever made, being equipped with them.

Sample Photographic Prints

The various half-tone illustrations appearing in these pages suggest the quality of the work done by our various lenses. It is necessary to state, however, that the photographs have lost in reproduction much of their value as samples of the results actually to be obtained. Upon receipt of ten cents in stamps we will mail to those interested a characteristic photographic print, made by any one of our lenses. Our specimen prints demonstrate the perfect adaptability of the members of our series to all classes of photography.

Our Other Publications

Microscopes and Accessories.
Laboratory Supplies for Chemical and Biological Laboratories.
Bacteriological Apparatus.
Projection Apparatus.
Chemicals.
Eyeglasses and Lenses.
Bausch & Lomb-Zeiss Stereo Field Glasses.

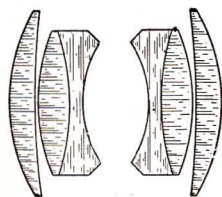
Bausch & Lomb-Zeiss Planar $f-3.6$

Series Ia



Actual Size

Planar is the most rapid Anastigmat lens on the market. The speed varies from $f-3.6$ in the smaller and medium sizes to $f-5$ in the larger. This is equal to the speed of the ordinary portrait lens, and hence is sufficient for photographing the fastest moving objects.



Planar is all the more adapted to every kind of instantaneous work by reason of its covering power and definition, details in the shadows being rendered visible by the shortest exposures.

The speed particularly adapts Planar to use in making kinemetograph and other negatives for the projection of moving pictures.

The field is flat and free from astigmatism.

The angle of view is 72° , of which 50° are actually utilized on the small plates for which the different numbers are listed.

Neither the front nor rear system gives sufficiently sharp views to allow of their separate use.

Planar's great rapidity requires lenses of special size, and consequently the objective is bulkier and heavier than any other which we manufacture. Because of this fact we do not recommend this lens for ordinary use with the hand camera.



PINK CHRYSANTHEMUMS



CALLA LILIES

Bausch & Lomb-Zeiss Planar—Series Ia

Telegraphic Code.	No.	Size of Plate Covered with Largest Stop.* Inches.	Equivalent Focus. Inches.	Diameter of Lens. Inches.	Speed.	Angle. Degrees	Price.	
							Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Plagium</i>	9	2½ x 3¼	4½	1¼	f-3.6	70	\$ 53 00	\$ 70 00
<i>Plakoid</i>	10	3¼ x 3¼	5	1½	f-3.8	70	63 00	81 50
<i>Planeta</i>	11	3¼ x 4¼	6¼	1¾	f-3.8	70	77 00	95 50
<i>Planum</i>	12	4¼ x 6½	8	2	f-4.	65	109 00	129 00
<i>Plasma</i>	13	5 x 8	10	2½	f-4.	65	150 00	170 00
<i>Plastik</i>	14	6½ x 8½	12	2¾	f-4.2	62	192 00	.....
<i>Plastron</i>	15	7 x 9	14½	3¼	f-4.5	72	241 00	.....
<i>Plata</i>	16	8 x 10	16¾	3¾	f-4.5	72	300 00	.....
<i>Platanno</i>	17	10 x 12	18½	3¾	f-5.	68	349 00	.....
<i>Platinid</i>	18	12 x 16	24	4¾	f-5.	68	698 00	.....

* The next larger plate is well covered with intermediate stop.

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

NEW YORK, BOSTON, CHICAGO, U.S.A., FRANKFURT a/m GERMANY

Bausch & Lomb-Zeiss

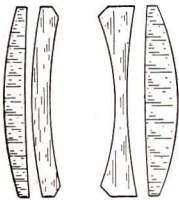
Unar $f-4.5$

Series 1b



Actual Size

Unar is an unsymmetrical doublet. Next to Planar it is the fastest lens in the Zeiss series, the speed varying from $f-4.5$ in the smaller to $f-5.6$ in the larger sizes. About 48° of the field of view are utilized on the particular plate for which each number is listed. The next larger plate is well covered with intermediate stop.



Unar is much lighter and more compact than Planar, and hence is specially recommended for hand cameras, being suited for the most rapid snapshots and all instantaneous work. With unfavorable conditions of light where very rapid work is required, it is not surpassed save by Planar.

Speed and depth of focus adapt Unar to the requirements for portraiture and group work. For the professional photographer we manufacture a special "Portrait Unar," with a speed of $f-4.5$. (See Catalog of Portrait Lenses.)

Because of its excellent optical qualities and its strong and even illumination, Unar is unusually well adapted for projection.

It is entirely satisfactory for landscape and all-around work because of its excellent optical qualities, speed and portability.

It is simple in construction, and consequently the price is relatively low.

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.



Made with Bausch & Lomb-Zeiss Unar *f*-4.5

Bausch & Lomb-Zeiss Unar—Series I b

Telegraphic Code.	No.	Size of Plate Covered with Largest Stop.* Inches.	Equivalent Focus. Inches.	Diameter of Lens. Inches.	Speed.	Angle. Degrees.	Price.	
							Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Undine</i>	3	2½ x 3½	4½	1	<i>f</i> -4.5	65	\$ 31 50	\$ 48 50
<i>Ungko</i>	4	3¼ x 4¼	5½	1¼	<i>f</i> -4.5	65	38 50	57 00
<i>Ungvar</i>	5	4 x 5	6¼	1½	<i>f</i> -5	65	42 00	60 50
<i>Unimak</i>	6	5 x 7	8¾	1¾	<i>f</i> -5	65	63 00	83 00
<i>Unit</i>	7	5 x 8	10¼	2	<i>f</i> -5.5	65	91 00	111 00
<i>Univers</i>	8	6½ x 8½	12¼	2½	<i>f</i> -5.5	65	125 50	.....
<i>Unpro</i>	9	8 x 10	14¾	2¾	<i>f</i> -5.3	65	164 50	.....
<i>Unze</i>	10	10 x 12	18	3½	<i>f</i> -5.6	65	210 00	.....

* The next larger plate is well covered with intermediate stop.

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

Bausch & Lomb-Zeiss

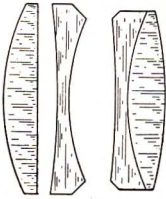
Tessar $f-6.3$

Series II b



Actual Size

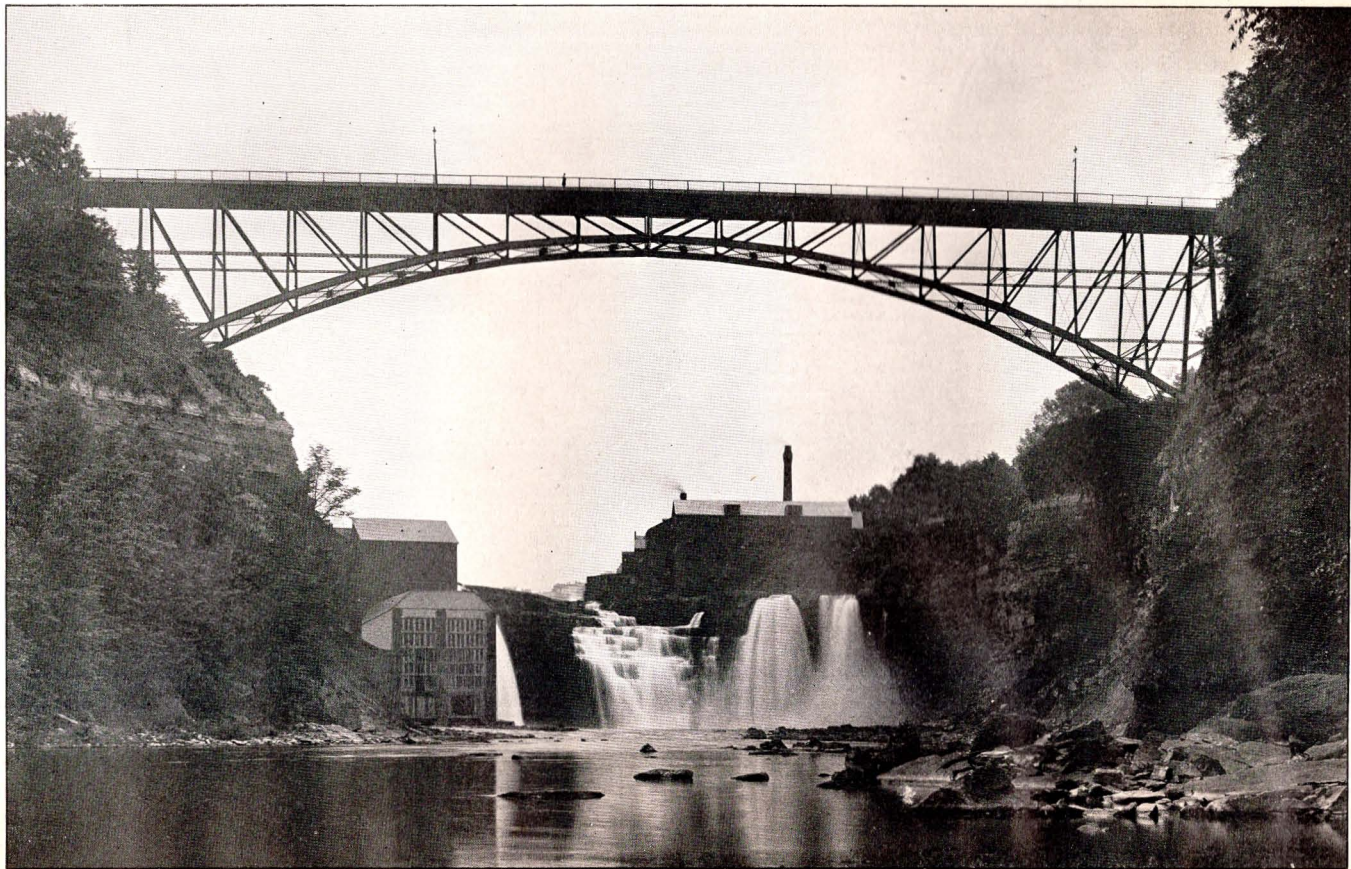
Tessar, like all the other Zeiss series, possesses characteristics which guarantee it a unique position among photographic lenses of the highest quality and perfection. Like all the others, also, its claims upon the attention and admiration of the photographic public, both amateur and professional, are based upon merits which years of experiment have now fully demonstrated. It is with the knowledge that Tessar is possessed of qualities which make it, in some respects, superior to all other lenses, that we now announce our readiness to supply this latest product of optical computations.



Construction

Simplicity—Tessar is an unsymmetrical doublet of four very thin lenses made of a new type of Jena glass manufactured especially for this purpose. The front lens is uncemented, the two elements being divided by a very appreciable air space. The rear lens is cemented. The front and rear combinations are separated sufficiently to allow the Volute or Iris Diaphragm shutters to be properly fitted. Tessar construction is essentially characterized by simplicity.

Compactness—Tessar is light and compact, and hence particularly suitable for use with the hand camera. The actual size of the 4 x 5 Tessar is shown in the illustration.



Taken with a BAUSCH & LOMB-ZEISS TESSAR No. 8, at 2 o'clock in the afternoon of a cloudy day, no sun. Much of the detail is lost in reproduction, but a sample print made from this negative may be obtained. (See preface.)

Optical Qualities

Definition—Here Tessar stands supreme. The image possesses a sharpness and crispness not previously thought of in connection with such great aperture and rapidity. The corrections are perfect, the accuracy and precision of the image extending over a field of great angular area.

Illumination—Because of the small number of lenses, Tessar gathers a marvelously strong beam of light and transmits it with undiminished intensity. The illumination is characterized by unusual uniformity from center to margin of plate.

Rapidity—Because of this unusual light-gathering power a rapidity indicated by $f-6.3$ is attained. This is sufficient for all kinds of instantaneous photography.

A lens combining such simplicity of construction and such speed with equally uniform illumination and precise definition has never before been placed on the market.

Application

Hand Camera—Tessar is light and compact and may be fitted to any hand camera. In the shorter foci it is particularly adapted to use with cameras of fixed extension employed for instantaneous work.

Portraiture and Groups—Here Tessar's speed, accuracy of definition, depth of focus and flat field give it an important place.

Landscapes—Tessars of long focus produce excellent results in landscape work. Objects in the distance and in the foreground are depicted with equally marvelous accuracy.

General Work—None of the Zeiss series is so universally adapted to all the requirements of photography as is Tessar, save only the Convertible Protars with their universality of focus. Superior optical qualities, choice of long or short focus, compactness of the new mounting and the applicability of the Volute or Iris Diaphragm shutters, make Tessar the most satisfactory of the entire Zeiss series when one lens alone must serve for all kinds of work. Tessar may be relied upon absolutely in those instances where the conditions of artistic and pictorial photography are peculiar and unusual.

Process Work—The uniform brilliancy and definition characteristic of Tessar make it particularly applicable to industrial and reproductive photography where these two qualities are of such importance. For projection, copying and enlarging Tessar will give satisfactory returns. For process work there is no better lens to be had on the market. It is capable of giving the most precise delineation of objects in half-tone and line engraving. Indeed, its microscopic definition, while working at the large relative aperture of $f-6.3$, makes it the objective *par excellence* for half-tone work. We cannot impress the merits of Tessar too highly upon all who are thinking of purchasing new or added equipment for this class of photography.

Three-Color Work—We are manufacturing a special lens known as the Apochromatic Tessar, with a rapidity varying in the members of the series from *f-10* to *f-15*. This lens stands alone in its applicability to three-color printing as it is corrected perfectly for three regions of the spectrum, and thus the photographer is enabled to proceed with his work, substituting one after the other the three ray filters employed in this branch of the art, without varying the size or focus of the image and consequently without the inconvenience of additional focusing and manipulation incidental to the use of lenses not corrected apochromatically. In this field the merits of the Apochromatic Tessar guarantee it a deserved popularity.

An Incidental Advantage

Attention is called to the fact that another desirable feature is the moderate price for which we are able to place Tessar on the market. This is due to the simplicity of construction, which requires less actual material and less labor than does the complicated manufacture of the average high grade lens.

Bausch & Lomb-Zeiss Tessar—Series II b

Telegraphic Code.	No.	Size of Plate Covered with Stop <i>f-6.3</i> . Inches.	Equivalent Focus. Inches.	Diameter of Lens. Inches.	Price.	
					Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Tesab</i>	4	3 $\frac{1}{4}$ x 4 $\frac{1}{4}$	5 $\frac{3}{8}$	1 $\frac{5}{16}$	\$ 33 50	\$ 50 50
<i>Tesec</i>	5	4 x 5	6 $\frac{1}{8}$	1 $\frac{1}{16}$	40 00	57 00
<i>Tesid</i>	5a	4 $\frac{1}{4}$ x 6 $\frac{1}{2}$	7	1 $\frac{1}{4}$	49 00	67 50
<i>Tesog</i>	6	5 x 7	8 $\frac{1}{4}$	1 $\frac{7}{16}$	59 50	78 00
<i>Tesux</i>	7	5 x 8	10	1 $\frac{3}{4}$	80 50	99 00
<i>Tesade</i>	8	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	12	2 $\frac{1}{8}$	118 50	138 50
<i>Tesent</i>	9	8 x 10	14 $\frac{3}{8}$	2 $\frac{7}{16}$	154 00	174 00
<i>Tesopo</i>	10	10 x 12	19 $\frac{1}{4}$	3 $\frac{5}{16}$	244 00	.....
<i>Tesura</i>	11	12 x 15	23 $\frac{3}{16}$	3 $\frac{11}{16}$	314 00	.....

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

Bausch & Lomb-Zeiss Apochromatic Tessar* Series VIII

Telegraphic Code.	No.	Extreme size of Plate covered in $\frac{1}{4}$ Reproduction. Inches.	Speed.	Equivalent Focus. Inches.	Diameter of lens. Inches.	Price.
<i>Apotes</i>	1	14 x 17	<i>f-10</i>	18 $\frac{3}{32}$	2 $\frac{1}{8}$	\$ 139 50
<i>Apotor</i>	2	20 x 24	<i>f-10</i>	25 $\frac{3}{16}$	2 $\frac{7}{8}$	227 00
<i>Apotux</i>	3	28 x 32	<i>f-10.3</i>	33 $\frac{1}{16}$	3 $\frac{5}{16}$	331 50
<i>Apotic</i>	4	32 x 36	<i>f-12.5</i>	46 $\frac{1}{16}$	3 $\frac{3}{4}$	523 00
<i>Apotath</i>	5	48 x 60	<i>f-15</i>	70 $\frac{7}{8}$	4 $\frac{3}{4}$	1220 00

* Nos. 1, 2 and 3, working at stop 12.5, and Nos. 4 and 5 working at stop 15, give sufficient precision for half-tone reproduction. Nos. 1, 2 and 3, working at stop 18, and Nos. 4 and 5 working at stop 30, give sufficient precision for engravings.

Bausch & Lomb-Zeiss

Protar *f*-8

Series II a.

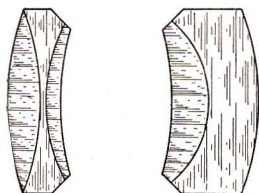


Actual Size

Here the chief aim is to construct a lens combining rapidity and great extent of field.

The speed is $f-8$ which is fast enough for ordinary instantaneous work. The angle of view is 75° of which 60° are utilized on the various plates.

Protar IIa is an unsymmetrical doublet, neither system of which can be used singly, while the separation between the two is sufficient for the application to the smaller sizes of any of our diaphragm shutters.



The definition is excellent, the lens reproducing detail with faultless exactness.

The illumination is ample even under unfavorable conditions and is uniform from center to margin of plate because of the perfect spherical and Anastigmatic corrections.

Series IIa was intended primarily for the hand camera and is suitable for this work because of its neat and compact mounting, short focus, applicability of shutters and excellent optical qualities. It should always be selected for hand cameras when the symmetrical construction is not desired and when a medium wide angle lens is considered necessary. Its focus is shorter than that of other lenses while at the same time its covering capacity is quite equal to that of the rest.

In a studio where space is limited and where good lighting conditions exist, the remarkable depth of focus renders this lens suitable for groups.

It is used by many leading photo-engravers because of faultless detail, flat field and ability to copy straight lines at all angles.

All numbers prove satisfactory for general work, whether for landscape views or instantaneous photography.



LOOPING THE LOOP.

Made with Bausch & Lomb-Zeiss Protar—Series IIa.

Bausch & Lomb-Zeiss Protar—Series IIa

Telegraphic Code.	No.	Size of Plate Covered with Stop $f=3$.* Inches.	Equivalent Focus. Inches.	Diameter of Largest Lens. Inches.	Price.	
					Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Zaba</i>	1	4 x 5	4 $\frac{3}{8}$	$\frac{5}{8}$	\$ 30 00	\$ 47 00
<i>Zaccho</i>	2	4 $\frac{1}{4}$ x 6 $\frac{1}{2}$	5 $\frac{3}{8}$	$\frac{3}{4}$	33 50	50 50
<i>Zapha</i>	3	5 x 8	6 $\frac{1}{2}$	1	44 00	61 00
<i>Zamia</i>	4	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	8	1 $\frac{3}{16}$	54 50	71 50
<i>Zapote</i>	5	8 x 10	9 $\frac{3}{8}$	1 $\frac{7}{16}$	64 50	83 00
<i>Zarmich</i>	6	10 x 12	11 $\frac{3}{8}$	1 $\frac{5}{8}$	85 50	104 00
<i>Zax</i>	7	11 x 14	13 $\frac{3}{4}$	2	125 50	145 50
<i>Zayah</i>	8	14 x 17	17	2 $\frac{3}{8}$	160 50	180 50

* The next larger plate is well covered with small stop.

See page 45 for sizes of flanges.

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

NEW YORK, BOSTON, CHICAGO, U.S.A., FRANKFURT a/m GERMANY

Bausch & Lomb-Zeiss

Protar *f*-12.5

Series IV.

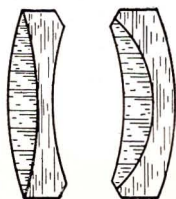


Actual Size

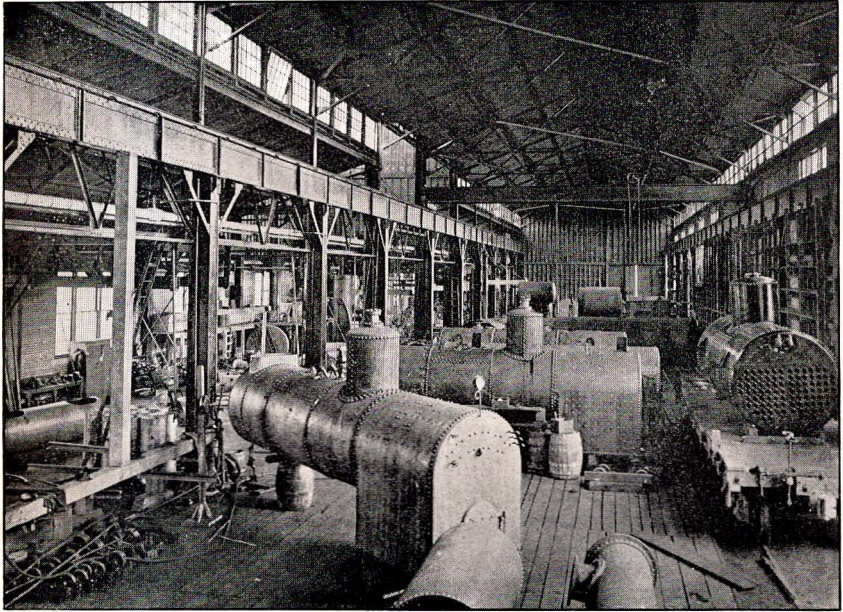
This is the only lens in existence which combines the two important qualifications of wide angular aperture and speed to an unusual extent. It may be classed as a medium wide angle and is listed as such, giving sharp, well covered pictures, free from the ordinary distorted edges, a very important feature in a lens of this character, especially for outdoor architectural photography. Its use as an extreme wide angle, however, is not precluded if the

next smaller lens to the one listed is selected or a given lens is used on the next size plate. Its speed is such that it will give instantaneous exposure, and it is particularly valuable in flash light exposures of large gatherings.

The objective is a doublet, each system of which is composed of two lenses. Being an unsymmetrical lens the two systems can not be used separately.



The angle of view is more than 100° in the first six numbers and 85° in the larger. Of these, 68° and 44° respectively are utilized on the plates for which the various members of the series are listed. The next larger plates are well covered with smaller stops.



Photographed on a November morning with 5 x 8 Bausch & Lomb-Zeiss Protar—Series IV.
Exposure 5½ seconds.

Bausch & Lomb-Zeiss Protar—Series IV

Telegraphic Code.	No.	Size of Plate Covered with Stop <i>f-12.5</i> * Inches.	Equivalent Focus. Inches.	Diameter of Largest Lens. Inches.	Price.	
					Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Zibet</i>	1	3¼ x 4½	2 ⁷ / ₁₆	½	\$17 50	.....
<i>Zeud</i>	2	4 x 5	3 ⁷ / ₈	¾	17 50	\$34 50
<i>Zoffer</i>	3	4¼ x 6½	4 ¹¹ / ₁₆	½	21 00	38 00
<i>Zein</i>	4	5 x 8	6 ¹ / ₁₆	¾	24 50	41 50
<i>Zircon</i>	5	8 x 10	7 ¹¹ / ₁₆	1 ³ / ₈	31 50	48 50
<i>Zoril</i>	6	10 x 12	10 ¹ / ₄	1	47 00	64 00
<i>Zennir</i>	7	12 x 15	15 ³ / ₁₆	1 ⁵ / ₁₆	71 50	90 00
<i>Zofil</i>	8	16 x 20	23 ¹³ / ₁₆	2	125 50	145 50
<i>Zodic</i>	9	20 x 24	35 ¹¹ / ₁₆	2 ¹⁵ / ₁₆	282 50	.....
<i>Zunn</i>	10	24 x 30	48 ³ / ₈	3 ³ / ₈	631 00	.....

* The next larger plate is well covered with smaller stop.

For sizes of flanges, see page 45.

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

Bausch & Lomb-Zeiss

Protar $f-18$

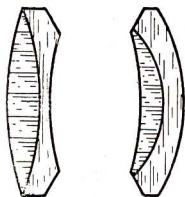
Series V



Actual Size

Series V is intended for the most exacting wide angle photography. For this purpose it is the most desirable lens made, and should be selected wherever an extreme wide angle lens is required, such as architectural and interior work. Anastigmatic and spherical corrections are the most perfect

yet obtained in a lens of this character. The images are entirely free from distortion from center to margin of plate, even with the most extreme angle. No other extreme wide angle lens has equal speed, covering power and effective angle.



The larger sizes were designed especially for copying, and for that purpose cannot be equaled for quality of work. But they are not quite rapid enough for some kinds of photo-engraving.

The angle of view is 110° in the sizes up to and including 7a. Above that number the full angle is 90° . In the smaller sizes the angle utilized is 75° , but the full angle can be utilized by using large plates and smaller stops. In the larger sizes the angle utilized is 40° . The next larger plate is well covered with smaller stop.

The speed is $f-18$, which is sufficient for most outdoor instantaneous photography with sunlight.

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.



Made with Bausch & Lomb-Zeiss Protar, Series V.

Bausch & Lomb-Zeiss Protar—Series V

Telegraphic Code.	No.	Size of Plate Covered with Stop <i>f. 18</i> . * Inches.	Equivalent Focus. Inches.	Diameter of Largest Lens. Inches.	Price.	
					Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Zambo</i>	1	4½ x 6½	3⅜	⅞	\$ 22 50	\$ 39 50
<i>Zanite</i>	2	5 x 7	4⅜	⅞	22 50	39 50
<i>Zeal</i>	3	6½ x 8½	5 ⁹ / ₁₀	½	28 00	45 00
<i>Zebra</i>	4	8 x 10	7 ³ / ₁₀	⅞	35 00	52 00
<i>Zebu</i>	5	10 x 12	8 ³ / ₈	1⅞	44 00	61 00
<i>Zealot</i>	6	11 x 14	10 ⁷ / ₁₀	1⅞	54 50	71 50
<i>Zenith</i>	7	12 x 15	12 ⁵ / ₁₀	1 ⁵ / ₁₀	64 50	81 50
<i>Zeta</i>	7a	16 x 18	15 ³ / ₈	1	75 00	92 00
<i>Zulo</i>	8	12 x 15	18 ¹ / ₈	1	85 50	102 50
<i>Zero</i>	9	16 x 18	24 ¹ / ₈	1⅜	125 50	144 00
<i>Zest</i>	10	20 x 25	37 ⁵ / ₁₀	2¼	247 50	267 50

* The next larger plate is covered with small stop.

See page 45 for sizes of flanges.

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

Bausch & Lomb-Zeiss Protar $f-12.5$

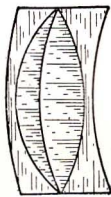
Series VII.



Actual Size

The lenses in Series VII are the component elements which are combined to form the Convertible Protars, Series VIIa. They are listed separately with a view of facilitating the selection of assorted sets of these lenses.

Each single Anastigmat, by means of a special adapter, fits either end of the lens mount.

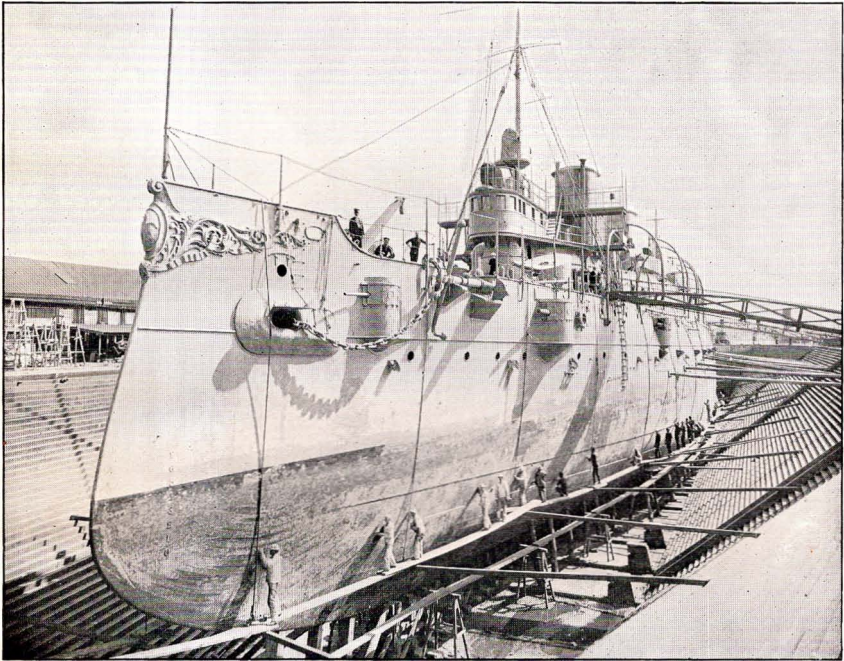


Anastigmatic correction is secured in this single lens by the same method employed for the correction of defects in doublet lenses, viz: the introduction of several lenses of suitable varieties of Jena glass. The images are Anastigmatic, very flat, and with almost no distortion, the little which does exist being found only in that part of the image circle outside of the area actually included by the plate for which each size is listed.

The angle of view is 85° , of which 35° to 48° are utilized on the different plates.

The speed is $f-12.5$, sufficient for instantaneous exposures under favorable conditions.

The only application, as a single lens, is to landscape photography.



Bausch & Lomb-Zeiss Protar—Series VII.

Telegraphic Code.	No.	Size of Plate Covered with Stop <i>f</i> -12.5.* inches.	Equivalent Focus. inches.	Back Focus. inches.	Diameter of Lens. inches.	Diameter of Image. inches.	Price.	
							Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Acacia</i>	1	4 $\frac{3}{4}$ x 6 $\frac{1}{2}$	7 $\frac{3}{16}$	8	$\frac{3}{4}$	11	\$26 50	43 50
<i>Acarina</i>	2	5 x 7	8 $\frac{3}{4}$	9 $\frac{3}{4}$	1 $\frac{5}{8}$	13 $\frac{1}{2}$	30 00	47 00
<i>Aceton</i>	3	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	11 $\frac{3}{16}$	12 $\frac{7}{16}$	1 $\frac{1}{8}$	17 $\frac{1}{4}$	35 00	52 00
<i>Achilles</i>	4	8 x 10	13 $\frac{3}{8}$	15 $\frac{1}{2}$	1 $\frac{1}{2}$	21 $\frac{1}{2}$	42 00	60 50
<i>Acidalia</i>	5	10 x 12	16	17 $\frac{3}{4}$	1 $\frac{3}{4}$	25	54 50	73 00
<i>Aconitum</i>	6	11 x 14	18 $\frac{7}{8}$	20 $\frac{3}{8}$	2	29	75 00	95 00
<i>Adinol</i>	7	12 x 16	23 $\frac{1}{8}$	25 $\frac{3}{4}$	2 $\frac{1}{2}$	35 $\frac{1}{2}$	96 00	116 00
<i>Aeneas</i>	8	13 x 16	27	30	2 $\frac{1}{2}$	41 $\frac{3}{4}$	125 50	145 00
<i>Aeolus</i>	9	16 x 18	30 $\frac{3}{4}$	34	2 $\frac{3}{4}$	47 $\frac{1}{4}$	174 50	.....
<i>Aequator</i>	10	16 x 20	33 $\frac{1}{2}$	37 $\frac{1}{2}$	3 $\frac{1}{4}$	52	227 00	.....
<i>Aether</i>	11	18 x 22	39 $\frac{1}{4}$	43 $\frac{1}{2}$	3 $\frac{3}{4}$	60	296 50	.....

* The next larger plate is well covered with small stop.

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

Bausch & Lomb-Zeiss Protar f -6.3

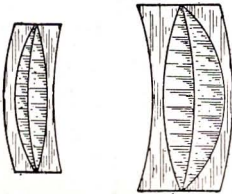
Series VII a.



Actual Size

The lenses listed in this series are the result of efforts made to construct objectives of universal application. Being composed of Series VII lenses, each system can be used separately, while the combination of systems has greater speed and greater effective angle.

When the two single Anastigmats are of different foci, the lens is convertible into three lenses of different foci, giving three individual perfectly corrected Anastigmat objectives in one. When the single elements have the same foci, two separate objectives may be formed.



By the addition of one single Anastigmat, six lenses, three single and three doublet, are obtained, each with different angle, focus, and covering power.

The addition of two single Anastigmats gives ten lenses, four single and six doublets.

Thus all the conditions of universal photography are met, the single elements being used for landscape work and other purposes where long focus, medium speed, and low or medium angle are sufficient, and the doublet giving an extra rapid lens of wide angle suitable for the fastest instantaneous work, the most difficult architectural subjects, and for any situation where speed, angle, covering power, depth of focus and brilliancy are required.

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.



OFFICIAL TEST OF HIGH-PRESSURE WATER MAINS TRAVERSING THE PHILADELPHIA "FIRE BELT."
The upper of these two pictures was made with Series VII a, No. 17, with 12 inch focus.
The lower picture was made with the rear combination of the same lens.

NEW YORK, BOSTON, CHICAGO, U.S.A., FRANKFURT a/m GERMANY

This is the lens for the photographer who attempts all classes of work.

The average angle of view utilized on the different plates is about 55° .

When the foci of the two single elements are the same the speed is $f-6.3$; when different, $f-7$ or $f-7.7$.

For hand cameras these lenses stand at the head of the list both in optical qualities and in their adaptability to the limited space allowed for the lens. In selecting the lens be sure that the back focus of no combination is longer than the greatest extension of which the bellows is capable.

Bausch & Lomb-Zeiss Convertible Protars

Series VIIa

Telegraphic Code.	No.	Size in Inches of Plate Covered with Full Aperture*	Combinations of Single Protars. Focus.		Com- bined Equiva- lent Focus. Inches.	Speed.	Diam- eter of Image. Inches.	Price.	
			Front Lens.	Back Lens.				Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Agonie</i>	1	$3\frac{1}{4} \times 3\frac{1}{4}$	$7\frac{3}{16}$	$7\frac{3}{16}$	$4\frac{1}{8}$	f-6.3	$6\frac{3}{4}$	\$ 51 00	\$ 68 00
<i>Alabaster</i>	2	$3\frac{1}{4} \times 4\frac{1}{4}$	$8\frac{3}{4}$	$7\frac{3}{16}$	$4\frac{1}{2}$	f-7	$7\frac{1}{2}$	54 50	71 50
<i>Alauda</i>	3	4×5	$11\frac{3}{16}$	$7\frac{3}{16}$	5	f-7.7	$8\frac{1}{2}$	59 50	76 50
<i>Albatros</i>	4	4×5	$8\frac{3}{4}$	$8\frac{3}{4}$	$5\frac{1}{16}$	f-6.3	$8\frac{1}{2}$	58 00	75 00
<i>Alizarin</i>	5	$4\frac{1}{4} \times 6\frac{1}{2}$	$11\frac{3}{16}$	$8\frac{3}{4}$	$5\frac{3}{8}$	f-7	$9\frac{1}{2}$	63 00	80 00
<i>Alkaloid</i>	6	$4\frac{1}{4} \times 6\frac{1}{2}$	$13\frac{3}{4}$	$8\frac{3}{4}$	6	f-7.7	$10\frac{1}{2}$	70 00	88 50
<i>Alkohol</i>	7	$4\frac{1}{2} \times 7\frac{1}{4}$	$11\frac{3}{16}$	$11\frac{3}{16}$	$6\frac{3}{8}$	f-6.3	$10\frac{3}{4}$	68 00	85 00
<i>Amidon</i>	8†	$5 \times 7\frac{1}{2}$	$13\frac{3}{4}$	$11\frac{3}{16}$	7	f-7	12	75 00	93 50
<i>Ananas</i>	9	$5 \times 8\frac{1}{2}$	16	$11\frac{3}{16}$	$7\frac{1}{2}$	f-7.7	$12\frac{3}{4}$	87 50	106 00
<i>Anchovis</i>	10	$5 \times 8\frac{1}{2}$	$13\frac{3}{4}$	$13\frac{3}{4}$	$7\frac{7}{8}$	f-6.3	$13\frac{1}{4}$	82 00	100 50
<i>Anilin</i>	11	$6\frac{1}{2} \times 8\frac{1}{2}$	16	$13\frac{3}{4}$	$8\frac{1}{2}$	f-7	$14\frac{1}{4}$	94 50	113 00
<i>Anthracit</i>	12	$6\frac{1}{2} \times 8\frac{1}{2}$	$18\frac{7}{8}$	$13\frac{3}{4}$	$9\frac{1}{8}$	f-7.7	$15\frac{1}{4}$	115 50	135 50
<i>Antimon</i>	13	$6\frac{1}{2} \times 8\frac{1}{2}$	16	16	$9\frac{1}{4}$	f-6.3	$15\frac{1}{2}$	106 50	125 00
<i>Antipyrin</i>	14	7×9	$18\frac{7}{8}$	16	10	f-7	$16\frac{3}{4}$	127 50	147 50
<i>Apostat</i>	15	7×9	$23\frac{1}{8}$	16	$10\frac{7}{8}$	f-7.7	$18\frac{1}{4}$	148 50	168 50
<i>Aristos</i>	16	7×9	$18\frac{7}{8}$	$18\frac{7}{8}$	$10\frac{1}{16}$	f-6.3	$18\frac{1}{4}$	146 50	166 50
<i>Asbest</i>	17	8×10	$23\frac{1}{2}$	$18\frac{7}{8}$	$11\frac{7}{8}$	f-7	20	167 50	187 50
<i>Athene</i>	18	8×10	27	$18\frac{7}{8}$	$12\frac{3}{4}$	f-7.7	$21\frac{1}{2}$	197 00	217 00
<i>Atlas</i>	19	8×10	$23\frac{1}{8}$	23	$13\frac{1}{4}$	f-6.3	$22\frac{1}{4}$	188 50	208 50
<i>Atropin</i>	20	10×12	27	23	$14\frac{5}{16}$	f-7	24	218 00	238 00
<i>Aurora</i>	22	10×12	27	27	$15\frac{1}{2}$	f-6.3	26	247 50	267 50
<i>Autor</i>	25	10×12	$30\frac{3}{4}$	$30\frac{3}{4}$	$18\frac{1}{4}$	f-6.3	26	345 50	.....
<i>Azoflavin</i>	28	11×14	$33\frac{3}{4}$	$33\frac{3}{4}$	$20\frac{1}{2}$	f-6.3	$28\frac{1}{2}$	450 00	.....
<i>Azurin</i>	30	12×16	$39\frac{1}{4}$	$39\frac{1}{4}$	$23\frac{3}{8}$	f-6.3	$31\frac{1}{2}$	589 50	.....

* The next larger plate is covered with smaller stop.

† No. 2 Volute is here regularly supplied. If it is desired to use the lens on a hand camera and No. 2 Volute is not wanted, we can adapt the Volute No. 1 by reducing the diameter of the lens. This in no way affects the speed of the combination. In ordering kindly specify whether No. 1 or No. 2 Volute is to be furnished.

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

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

Bausch & Lomb-Zeiss Convertible Protars in Sets

While a large number of doublet combinations are listed, having their uses for the same purposes as other doublet lenses, there are two sets of the Single Protars which practically cover the entire field. These sets are offered complete with the lenses mounted interchangeably, each set consisting of: One lens mount with iris diaphragm, cap and flange, as described under Series VII; the Single Protar Lenses (three or four as the case may be); and a neat and compact morocco case containing all the parts of the set.

C Set—Bausch & Lomb-Zeiss Convertible Protars

Complete in case, \$103.00. Code word, *Alpha*.

Fitted with Aluminum Volute Shutter, \$121.50.

The six lenses which may be formed with the C set of Protars are shown in the accompanying table, together with their angles, covering power, and speed.

Series.	No.	Size of Plate Covered with Largest Stop.* Inches.	Equivalent Focus of Lenses in Inches.			Largest Stop.	Angle on 5 x 8 Plate. Degrees.
			Front Lens.	Back Lens.	Combined Focus.		
VII.	2	5 x 8		8 $\frac{3}{4}$		f-12.5	48
	3	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$		11 $\frac{3}{15}$		f-12.5	38
	4	8 x 10		13 $\frac{3}{4}$		f-12.5	32
VIIa.	5	4 $\frac{1}{4}$ x 6 $\frac{1}{2}$	11 $\frac{3}{15}$	8 $\frac{3}{4}$	5 $\frac{3}{4}$	f- 7.0	70
	6	5 x 7	13 $\frac{3}{4}$	8 $\frac{3}{4}$	6 $\frac{1}{4}$	f- 7.7	65
	8	5 x 8	13 $\frac{3}{4}$	11 $\frac{3}{15}$	7	f- 7.0	59

*The next larger plate is well covered with small stop.

D Set—Bausch & Lomb-Zeiss Convertible Protars

Complete in case, \$200.00. Code word, *Alphabet*.

Fitted with Aluminum Volute Shutter, \$220.00.

The lenses of this set are the numbers 3, 4, 5, and 6 of Series VII.

The following table shows the ten lenses which may be formed with this set, together with their angles, covering power, and speed.

Series.	No.	Size of Plate Covered with Largest Stop.* Inches.	Equivalent Focus of Lenses in Inches.			Largest Stop.	Angle on 8 x 10 Plate. Degrees.
			Front Lens.	Back Lens.	Combined Focus.		
VII.	3	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$		11 $\frac{3}{15}$		f-12.5	47
	4	8 x 10		13 $\frac{3}{4}$		f-12.5	39
	5	10 x 12		16		f-12.5	34
	6	11 x 14		18 $\frac{7}{8}$		f-12.5	29
VIIa.	8	5 x 8	13 $\frac{3}{4}$	11 $\frac{3}{15}$	7	f- 7.0	71
	9	5 x 8	16	11 $\frac{3}{15}$	7 $\frac{1}{2}$	f- 7.7	67
	9a	5 x 8	18 $\frac{7}{8}$	11 $\frac{3}{15}$	8	f- 7.7	64
	11	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	16	13 $\frac{3}{4}$	8 $\frac{1}{2}$	f- 7.0	61
	12	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	18 $\frac{7}{8}$	13 $\frac{3}{4}$	9	f- 7.7	57
	14	8 x 10	18 $\frac{7}{8}$	16	10	f- 7.0	53

*The next larger plate is well covered with small stop.

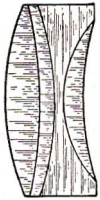
Bausch & Lomb Plastigmat $f-6.8$



Actual Size

Plastigmat has been computed by ourselves and is the outcome of a desire to produce a strictly American Anastigmat. We have accomplished the purpose so completely that it is a source of gratification to ourselves as well as to the many users of these lenses.

Plastigmat has all the attributes of a high grade lens to an unusual extent and is the peer of all symmetrical Anastigmats excepting only the Bausch & Lomb-Zeiss Convertible Protar, Series VII a. It has great speed, crisp definition over a large circle, wonderful covering power and even illumination.



It is produced with the same care, the same method of control and the same final critical test as our other types of Anastigmats.

Plastigmat is a symmetrical lens, the front and back combinations being composed of four lenses each. The glass used is very transparent and absolutely permanent.

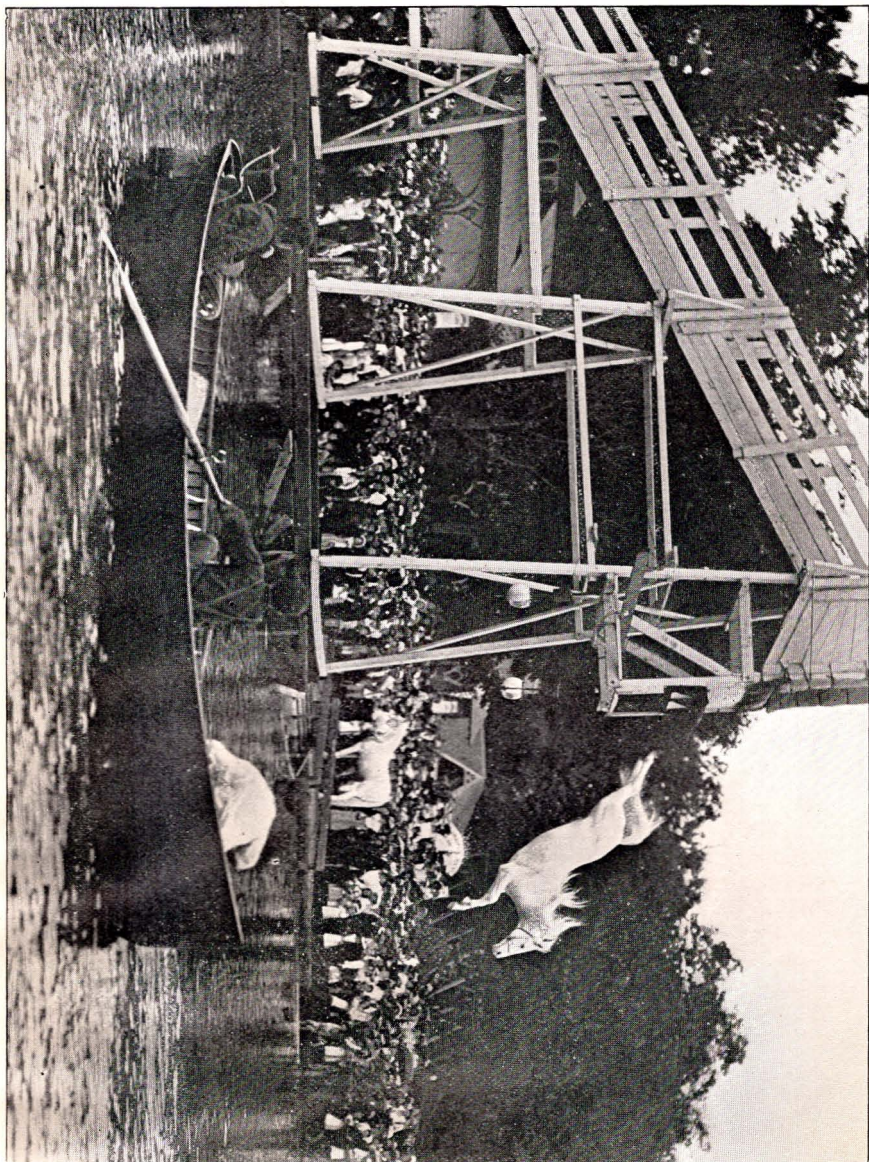
The separate systems show truly remarkable covering power, unapproached by any other lens, but we must here enforce our argument for the superior qualities of the two systems combined. The rear combination can be used at a speed of $f-13.5$. The focal length being nearly twice that of the doublet, images twice the size at the same distance, or the same size at twice the distance, are obtained.

The focus is longer for the various plates than is usual in other Anastigmats, thus guaranteeing correct perspective.

The two systems are far enough apart to permit the application of our Volute and other shutters. The mounting is light, compact and attractive.

The plates for which the different numbers are listed are completely covered at full opening.

Because of its excellent optical properties, light weight, compact form and the applicability of shutters between the lens combinations, Plastigmat is particularly adapted for use with the hand camera. It is an ideal lens for general photography and we can recommend it in every respect where a lens of the highest optical excellence is desired.



DIVING HORSES.
Made with Bausch & Lomb Plastikmat



THE COUNTRY FAIR.
Made with Bausch & Lomb Plastigmat.

Bausch & Lomb Plastigmat

Telegraphic Code.	No.	Diameter of Lens.	Equivalent Focus of Doublet.	Size of Plate Covered Sharply at			Price.	
				<i>f-6.8.</i>	<i>f-16.</i>	<i>f-62.</i>	Plastigmat Only.	Fitted with Aluminum Volute Shutter.
<i>Plastal</i>	1	$\frac{7}{8}$	$5\frac{1}{4}$	$3\frac{1}{4} \times 4\frac{1}{4}$	4 x 5	5 x 7	\$ 34 00	\$ 51 00
<i>Plasteko</i>	2	$\frac{15}{16}$	$6\frac{1}{2}$	4 x 5	5 x 7	5 x 8	40 00	57 00
<i>Plastica</i>	3	$1\frac{3}{8}$	$7\frac{1}{2}$	5 x 7	5 x 8	7 x 9	48 00	65 00
<i>Plastos</i>	4	$1\frac{3}{8}$	$8\frac{3}{4}$	5 x 8	$6\frac{1}{2} \times 8\frac{1}{2}$	8 x 10	55 00	73 50
<i>Plastum</i>	5	$1\frac{5}{8}$	11	$6\frac{1}{2} \times 8\frac{1}{2}$	8 x 10	10 x 12	75 00	93 50
<i>Plästwa</i>	6	$1\frac{11}{16}$	13	8 x 10	10 x 12	14 x 17	90 00	110 00
<i>Plastyo</i>	7	$2\frac{3}{16}$	15	10 x 12	12 x 15	16 x 18	120 00	140 00
<i>Plastref</i>	8	$2\frac{1}{2}$	17	11 x 14	14 x 17	18 x 22	170 00	.....
<i>Plastmar</i>	9	$3\frac{1}{8}$	$21\frac{1}{2}$	14 x 17	16 x 18	20 x 24	210 00	.....
<i>Plastpox</i>	10	$3\frac{3}{4}$	26	16 x 18	18 x 22	24 x 30	300 00	.....
<i>Plasttum</i>	11	$4\frac{1}{4}$	$29\frac{1}{2}$	18 x 22	22 x 25	28 x 36	480 00	.....

Focusing scale for any Plastigmat, 50 cents.

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

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

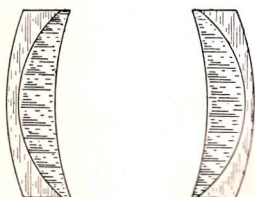
Bausch & Lomb Extra Rapid Universal $f-6$

Series D



Actual Size

This is the most rapid of the rectilinear type of lenses. Though far from equal to the Anastigmats, it is a good lens for general work and gives admirable service for rapid instantaneous work and portraiture in the gallery and home.



The speed is $f-6$ and the angle of view is 70° . The mounting is very compact and the lenses, although of large diameter, are thin and do not

appreciably increase the weight.

Telegraphic Code.	No.	Size of Plate. Inches.	Diameter of Lenses. Inches.	Equivalent Focus. Inches.	Back Focus. Inches.	Price.	
						Lens Only.	Fitted with Aluminum Volute Shutter.
<i>Ukase</i>	0	$3\frac{1}{4} \times 4\frac{1}{4}$	1	$4\frac{3}{8}$	$3\frac{1}{10}$	\$ 24 00	\$ 41 00
<i>Ulaus</i>	00	4×5	$1\frac{1}{4}$	$6\frac{3}{8}$	$5\frac{9}{10}$	28 00	45 00
<i>Ulcer</i>	1	5×8	$1\frac{1}{2}$	8	7	36 00	54 50
<i>Ulema</i>	2	$6\frac{1}{2} \times 8\frac{1}{2}$	$1\frac{3}{4}$	$9\frac{7}{8}$	$8\frac{1}{4}$	46 00	64 50
<i>Ulnim</i>	3	8×10	$2\frac{1}{8}$	$11\frac{1}{4}$	$9\frac{1}{10}$	58 00	78 00
<i>Ulnage</i>	4	10×12	$2\frac{3}{8}$	$14\frac{1}{4}$	$12\frac{7}{10}$	75 00	.....
<i>Umbel</i>	5	12×15	$3\frac{5}{16}$	$17\frac{1}{2}$	$15\frac{1}{4}$	100 00	.....
<i>Umber</i>	6	16×20	$3\frac{3}{4}$	$22\frac{1}{4}$	$19\frac{1}{2}$	130 00	.....

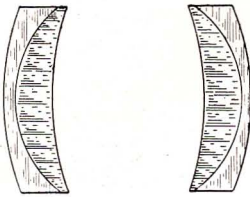
When ordering lenses fitted with shutter, by telegraph, specify *Volute*, in addition to the code word for the size of lens.

Bausch & Lomb Rapid Universal $f-8$



Actual Size

This lens is the original rectilinear or symmetrical type introduced by us and was an important factor in the making of our reputation for the manufacture of photographic products. It is still at the head of lenses of its type, and is recommended where the price of an Anastigmat is beyond reach. It has excellent covering power and its speed of $f-8$ is sufficient for all ordinary purposes. The angle of view is 60° .



Telegraphic Code.	No.	Large Stop Covers	Equivalent Focus Inches.	Diameter of Image Circle Inches.	Diameter of Lenses Inches.	Back Focus Inches.	PRICE.	
							Lens Only.	Fitted with Aluminum Volute Shutter
<i>Ucubis</i>	4 $\frac{1}{4}$	3 $\frac{1}{4}$ x 4 $\frac{1}{4}$	5 $\frac{1}{4}$	8	$\frac{7}{8}$	4 $\frac{3}{4}$	\$ 18 00	\$ 35 00
<i>Umbria</i>	5	4 x 5	6 $\frac{3}{4}$	9 $\frac{1}{4}$	1 $\frac{1}{10}$	5 $\frac{3}{4}$	22 00	39 00
<i>Unca</i>	8	5 x 8	8 $\frac{7}{8}$	11	1 $\frac{3}{8}$	7 $\frac{3}{4}$	26 00	44 50
<i>Unelli</i>	8 $\frac{1}{2}$	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	11 $\frac{3}{4}$	13 $\frac{1}{4}$	1 $\frac{5}{8}$	10 $\frac{3}{8}$	35 00	53 50
<i>Upis</i>	10	8 x 10	13 $\frac{7}{8}$	15 $\frac{3}{8}$	1 $\frac{7}{8}$	12 $\frac{1}{4}$	48 00	68 00
<i>Uraca</i>	12	10 x 12	17	20	2 $\frac{1}{8}$	15	60 00	80 00
<i>Uxantis</i>	15	12 x 15	20 $\frac{1}{4}$	21 $\frac{1}{2}$	2 $\frac{5}{8}$	18	75 00	.....
<i>Utica</i>	18	16 x 18	24 $\frac{3}{4}$	27 $\frac{1}{2}$	3 $\frac{1}{8}$	22 $\frac{1}{4}$	95 00	.....
<i>Uziti</i>	22	20 x 22	31 $\frac{3}{8}$	36	4 $\frac{1}{4}$	28	125 00	.....

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

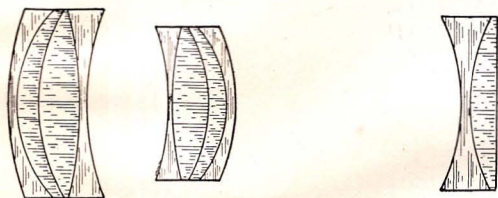
Bausch & Lomb High Power Tele-Photo



The purpose of the Tele-Photo is to obtain satisfactory photographs of distant or inaccessible objects or views.

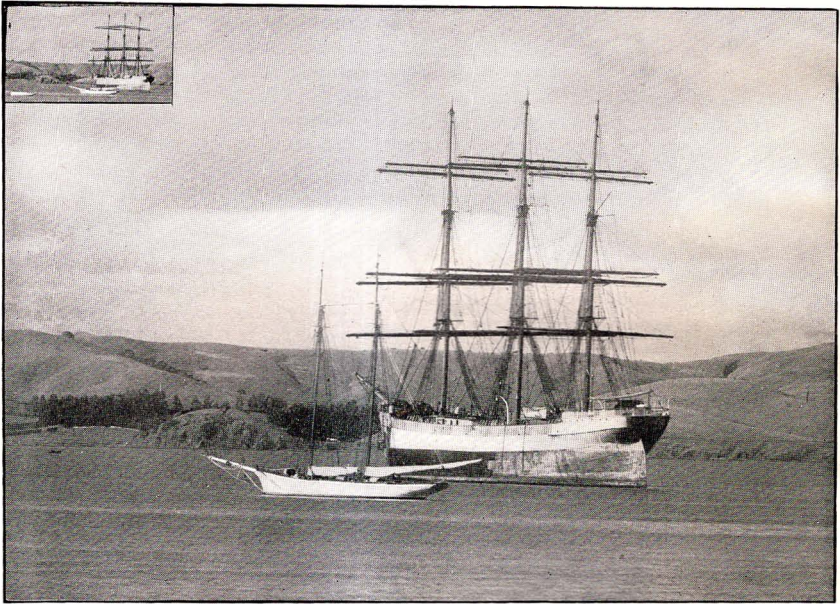
Our Tele-Photo Attachment consists of an achromatic negative system mounted in a barrel with rack and pinion adjustment. It permits a variation of magnifying power from 3 to 8 diameters by varying the distance between the positive and negative lenses.

It is designed to be attached to any photographic lens, but gives satisfactory results only when used with a lens of the highest grade, as even an insignificant defect in the lens is enlarged to obtrusive proportions through the magnifying power of the Tele-Photo.



It has the advantage over a single long focus lens, that it offers a variation in magnification, that it is generally applicable to cameras with bellows extension, and requires much less extension to obtain the same magnification.

The rear end of the Tele-Photo mount is attached to the front board of the camera; the front end is threaded to receive the photographic lens. The adjustable tube has a scale to indicate magnifications.



IN WINTER QUARTERS.

A Tele-Photo Demonstration—This picture was taken with a Bausch & Lomb-Zeiss Protar, Series VII a, with a High Power Tele-Photo Attachment magnifying $5\frac{1}{2}$ diameters. The small picture in the upper corner shows the same scene as it appears in a photograph made with the same lens without the Tele-Photo Attachment.

Bausch & Lomb High Power Tele-Photo

DISTANCE FROM THE FRONT BOARD TO THE GROUND GLASS.

Size.	Equivalent Focus of Photo Lens.	Magnification. Resulting Focus when used with Tele-Photo Attachment.						Price.
		3	4	5	6	7	8	
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	
4 x 5	$6\frac{1}{2}$	$6\frac{3}{8}$	$9\frac{1}{8}$	$12\frac{3}{8}$	$16\frac{1}{8}$	$19\frac{3}{8}$	$22\frac{5}{8}$	\$ 16 00
5 x 8	$8\frac{3}{4}$	$8\frac{1}{2}$	13	$17\frac{1}{4}$	22	$26\frac{1}{2}$	31	18 00
$6\frac{1}{2} \times 8\frac{1}{2}$	$11\frac{1}{2}$	$10\frac{1}{2}$	$16\frac{1}{2}$	$22\frac{1}{2}$	$28\frac{1}{2}$	$34\frac{1}{2}$	$40\frac{1}{2}$	20 00
8 x 10	$13\frac{1}{2}$	$13\frac{1}{2}$	$20\frac{1}{2}$	$27\frac{1}{2}$	$34\frac{1}{2}$	$41\frac{1}{2}$	$48\frac{1}{2}$	24 00
Telegraphic Code.	Size. Inches.	Diameters of Image Circle. When used with Tele-Photo Attachment.						
<i>Tab</i>	4 x 5	$5\frac{1}{4}$	$7\frac{1}{2}$	$9\frac{1}{2}$	12	15	$17\frac{1}{2}$	
<i>Tabby</i>	5 x 8	$6\frac{1}{2}$	$9\frac{3}{4}$	$12\frac{1}{2}$	$16\frac{1}{4}$	$19\frac{3}{8}$	$22\frac{1}{2}$	
<i>Tabid</i>	$6\frac{1}{2} \times 8\frac{1}{2}$	8	11	$14\frac{1}{4}$	18	22	26	
<i>Table</i>	8 x 10	9	$12\frac{3}{4}$	$16\frac{1}{2}$	$20\frac{3}{4}$	26	30	

N. B. — We do not advise the fitting of Tele-Photo Attachment to *any* except the *very best quality* lenses, as results will not be satisfactory.

Lenses should in all cases be sent us in order to secure correct adjustment and fitting.

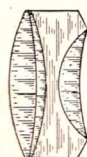
The scale indicating magnification is computed for prevailing foci of photographic lenses, but special standardized scale will be made at an extra cost of 75 cents.

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

Bausch & Lomb Hand Camera Tele-Photo



The Hand Camera Tele-Photo is offered as a serviceable but inexpensive attachment giving limited magnifications. It has been used for a number of years with very satisfactory results. It is applicable to almost any camera when used at a magnification of $2\frac{1}{2}$ diameters, but enlarges up to 4 diameters with added length of bellows.



The methods of attachment and use are the same as with the High Power Tele-Photo. The adjustment for magnification is by sliding tube in cloth lining.

Our Hand Camera Tele-Photo will be found satisfactory in

the desirable qualities of rapidity, illumination and definition.

Telegraphic Code.	Size.	Series.	Approximate Focus of Photo. Lens. Inches.	Bellows Length, $2\frac{1}{2}$ Magnification.	For Cameras Mentioned and for Others Having as Much Bellows Length.	Price.
<i>Telhaba</i>	4 x 5	A	6 $\frac{3}{4}$	9 $\frac{1}{4}$	} Premo.	\$9 00
<i>Telhaco</i>	5 x 7	A	8 $\frac{1}{2}$	13 $\frac{3}{4}$		10 00
<i>Telhader</i>	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	A	10 $\frac{1}{2}$	15		11 00
<i>Telhaef</i>	4 x 5	B	6	8 $\frac{1}{4}$	} Poco, Monroe, Ray, Montauk, Ascot, Graphic.	9 00
<i>Telhafar</i>	5 x 7	B	7 $\frac{3}{8}$	12		10 00
<i>Telhagon</i>	6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	B	10 $\frac{1}{2}$	16		11 00
<i>Telhaha</i>	*4 x 5	C	6	7 $\frac{1}{2}$	} Kodak.	9 00
<i>Telhaima</i>	*5 x 7	C	8 $\frac{1}{2}$	9 $\frac{1}{2}$		11 50

* Pictures of the above sizes will trim slightly smaller.

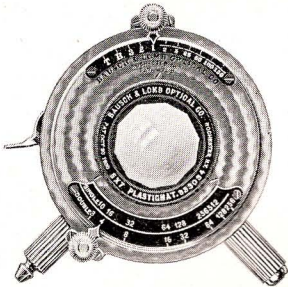
The Hand Camera Tele-Photo can be fitted to Anastigmat and other types of lenses at an extra cost of \$2.50. As these lenses are usually of considerably shorter focus than the R. R. and Symmetrical lenses for which the Hand Camera Tele-Photo is designed, the image circle will not quite cover the plate for which the Anastigmat is rated, except at the high magnification. Adapters are necessary for lenses not having standard screw, and an extra charge of \$1.50 is made for them.

If bellows length is less than given above, we supply the Tele-Photo giving the $2\frac{1}{2}$ magnification and over. In this case, however, the corners of the negative may be cut and the print trim smaller with the lower powers. The full bellows length should be given when ordering.

Bausch & Lomb Volute Shutter

Theoretically and practically the proper place for a shutter is at the diaphragm point of the lens. An Iris Diaphragm, opening and closing at that point, gives the maximum illumination with the minimum motion, absolutely uniform exposure, and an increase in the depth of focus, covering power and definition of the lens, with no distortion of the image, the entire picture impressing itself upon the plate from the moment the shutter begins to open until it closes.

Volute represents the highest type of this form of shutter. It is the most rapid, compact, convenient, dust proof, durable and elegant Iris Diaphragm Shutter ever offered. It gives bulb and time exposures and works automatically at varying speeds very closely approximating from 3 seconds to $\frac{1}{150}$, $\frac{1}{100}$ and $\frac{1}{75}$ second respectively in Nos. 1, 2 and 3. All speeds are controlled by our patent pneumatic retarding device. An exposure of $\frac{1}{150}$ second is fast enough for athletes, race horses, express trains and the like in motion with very good sized images. There is no other Iris Diaphragm Shutter giving equal speed.



The shutter is set by simply moving the pointer at the top. Any size opening, from pin hole to largest stop, is obtained by placing the lower pointer opposite the stop number desired. No extra stops or diaphragms are needed.

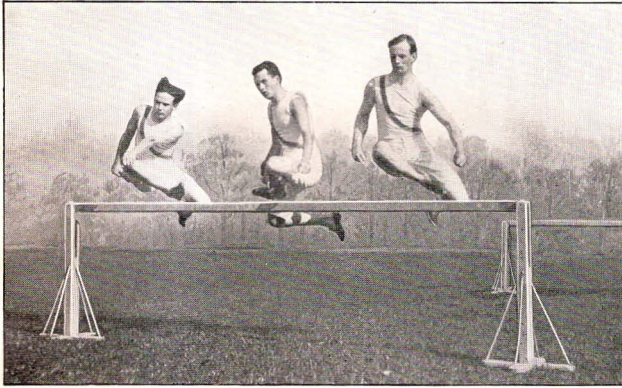
Volute can not open or expose the plate while being set. It can be arranged for use with two or more lenses.

When exposure is made the shutter opens instantly and remains open to the full extent until the exposure is completed when it closes instantly, thus giving the greatest possible exposure and correct relative exposures for all speeds.

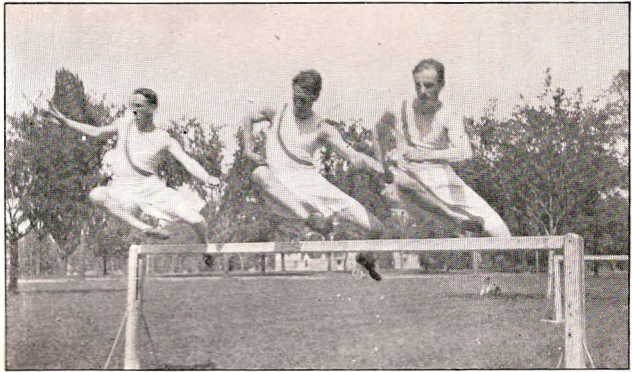
The shutter is set by raising the setting lever. Exposure is made either by pneumatic bulb or by depressing the setting lever.

All working parts are enclosed within the case, protecting them from dust and making the shutter more convenient to use. The actuating mechanism is simple, durable and not liable to get out of repair. The workmanship is the very finest throughout. Volute is made in three sizes and can be applied to lenses up to and including those having an aperture of 52 mm. It can be fitted to any lens and is supplied on all makes of cameras.

It is furnished with rubber bulb and hose.



Made with VOLUTE—Every Detail Sharp—Speed $\frac{1}{150}$ Second



NOT QUITE FAST ENOUGH
Made With Very Good Shutter Having Speed of $\frac{1}{100}$ Second

Bausch & Lomb Volute Shutter

Telegraphic Code.	No.	Will Take Lenses with Opening of	Automatic Exposure	Price.	
				Fitted to Lenses of Our Manufacture.	Fitted to Lenses of Other Manufactures.
<i>Volu</i>	1	24 mm.	3 sec. to $\frac{1}{150}$ sec.	\$17 00	\$18 00
<i>Volaaf</i>	2	36 mm.	3 sec. to $\frac{1}{100}$ sec.	18 50	20 00
<i>Volutar</i>	3	52 mm.	3 sec. to $\frac{1}{75}$ sec.	20 00	22 00

☞ On account of its very small size, Volute is applicable to the pocket cameras. The blades being extremely thin, it can be applied to those lenses in which the combinations are very close together.

NEW YORK, BOSTON, CHICAGO, U.S.A., FRANKFURT a/m GERMANY

Bausch & Lomb Iris Diaphragm Shutter



This is the original shutter of the Iris Diaphragm type. The Iris Diaphragm Shutter has been in use for 3 years and has been an important factor in the development of modern photography. While superseded by the improved Volute, it still holds its position as a favorite, is in every way reliable and is capable of accomplishing all but the most critical results.



It does not jar the camera even when working at the highest speeds, and cannot open or expose the plates while being set. It always improves the covering power and depth of focus of the lens with which it is used. It works at a maximum speed of about $\frac{1}{100}$ second in the smallest size.

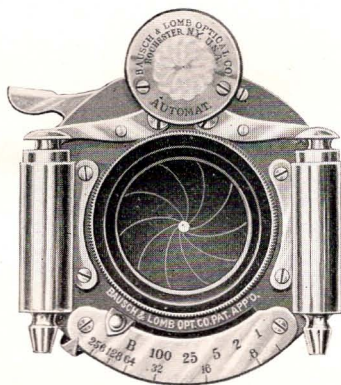
It is operated either by pneumatic bulb or finger release. A simple turn of the setting lever makes it ready for exposure. Time of exposure is controlled by our patent retarding device.

It is supplied with rubber bulb and hose.

Telegraphic Code.	No.	Will Take Lenses with Opening of	Price.	
			Fitted to Lenses of Our Manufacture.	Fitted to Lenses of Other Manufactures.
<i>Dalphon</i>	1	22 mm.	\$12 00	\$13 00
<i>Danites</i>	2	28 mm.	13 00	14 00
<i>Dara</i>	3	35 mm.	14 00	15 00
<i>Darius</i>	4	45 mm.	15 00	16 00

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

Bausch & Lomb Automat Shutter



This shutter is strictly automatic, in that it is always set ready for exposure and is released by simple pressure of the pneumatic bulb or finger release. This is an important feature as there are many occasions when there is not sufficient time to set the shutter or when, in endeavoring to get a quick result, the setting is forgotten. It is very compact and neat in appearance. Since its first introduction it has become very popular and is destined to grow in favor.

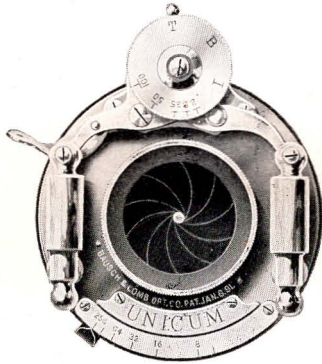


The speed can be made to vary from approximately 1 second to about $\frac{1}{100}$ second. It has time device by which shutter may be opened and closed by two successive pressures and bulb device by which shutter may be kept open with one pressure. Speeds are controlled by our patent retarding device. An Iris Diaphragm gives any size stop, the stop values being read off on a scale graduated especially for the particular lens used with the shutter.

It is supplied with rubber bulb and hose.

Telegraphic Code.	No.	Will take Lenses with Opening of	Price.	
			Fitted to Lenses of Our Manufacture.	Fitted to Lenses of Other Manufactures.
<i>Autom</i>	1	23 mm.	\$10 00	\$11 00
<i>Autara</i>	2	30 mm.	12 00	13 00
<i>Autexil</i>	3	40 mm.	14 00	15 00

Bausch & Lomb Unicum Shutter



Of all the medium priced shutters, this has been and is the most popular in this country and Europe. Hundreds of thousands of them are in use. It

is well made and durable, simple in construction and reliable in movement. The speed, controlled by our patent pneumatic retarding device, can be made to vary between speeds approximating 1 second to about $\frac{1}{100}$ second. It has time device by which shutter is opened by first pressure and closed by the second pressure, and bulb device by which shutter is kept open during pressure.



The blades are so shaped as to give the most even illumination possible with two blades only, the aperture formed by

them being first elliptical, then circular. An Iris Diaphragm gives any size of stop desired. It is supplied with rubber bulb and hose.

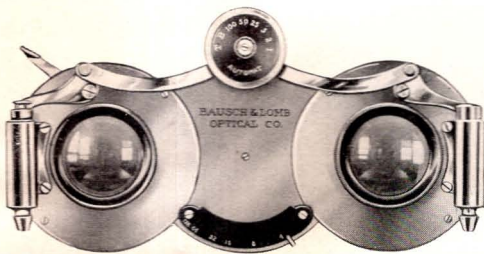
Telegraphic Code.	No.	Will take Lenses with Opening of	Price, With Retarding Device.	
			Fitted to Lenses of Our Manufacture.	Fitted to Lenses of Other Manufactures.
<i>Unicar</i>	1	21 mm.	\$ 6 00	\$ 7 00
<i>Unirexa</i>	2	26 mm.	8 00	9 00
<i>Unilot</i>	3	35 mm.	10 00	11 00

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.



Bausch & Lomb Automat Stereo Shutter

Owing to the newly awakened interest in stereoscopic photography and the demand for adequate equipment for this class of work, we have been led to construct our Automat Stereo Shutter. Specially designed for this work,



perfectly constructed and finished, painstakingly tested to absolute uniformity of operation of blades and diaphragms, this shutter will give complete satisfaction. It has time device by which shutter may be opened and closed by two successive pressures, and bulb device by which shutter may be kept open

with one pressure. It works automatically at a speed varying approximately from 1 second to about $\frac{1}{100}$ second. It is applicable for use with the best high priced and Anastigmat types of lenses. It is supplied with rubber bulb and hose.

Telegraphic Code.	No.	Will take Lenses with Opening of	Distance between Centers.	Price.
<i>Sterematrix</i>	1	22 mm.	$3\frac{1}{4}$ inches.	\$20.00

Bausch & Lomb Photo-Engraving Prisms

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. They effect a great saving in time and labor, and obviate the danger of stretching or damaging the film during manipulation. Their use does not reduce

the sharpness of the image which the lens produces.

Only optical glass of the best quality free from stain and defects is used. The three surfaces are of the highest polish and utmost precision. The silvering of the diagonal surfaces is of the most perfect whiteness and is guaranteed against deterioration.

The metal mount forms a perfect protection to the prism. It is so arranged as to bring lens and prism as close together as possible, thus retaining the greatest effective angle of the objective together with maximum illumination and



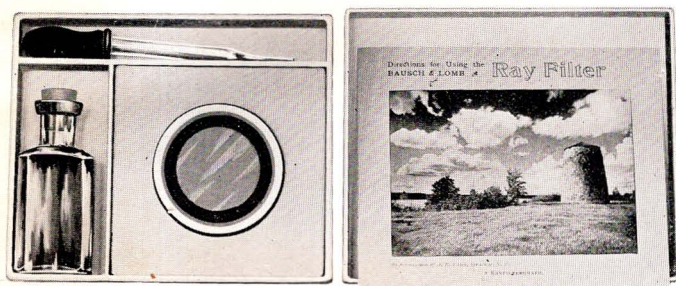
speed. A threaded adapter makes it possible to attach the prism to any photographic lens.

To secure convenience of manipulation we furnish an adapter with revolving collar and clamp, which makes it possible to move the objective, with the prism, on its own axis in any direction and secure it in any desired position.

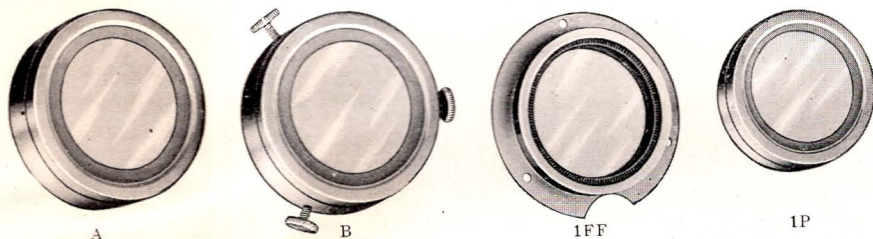
Full Aperture of Prism. Inches.	Figures in the margin show correct size Prism for Lenses as below.					Price.	
	Bausch & Lomb-Zeiss Apochr. Tessar. Series VIII.	Bausch & Lomb-Zeiss Protar. Series IIa.	Bausch & Lomb-Zeiss Protar. Series IV.	Bausch & Lomb-Zeiss Protar. Series V.	Bausch & Lomb-Zeiss Tessar. Series IIb.	Fitted to B & L-Zeiss Lens.	Fitted to Lenses of other make.
2½	.....	No. 6	No. 7	No. 9	No. 7	\$ 54.00	\$ 57.00
2¾	No. 1	.....	.....	.....	.....	60.00	62.00
3	.....	No. 7	No. 8	No. 10	No. 8	90.00	92.00
3½	No. 2	No. 8	.....	.....	No. 9	130.00	132.00
4	No. 3	.....	.....	.....	No. 10	180.00	183.00
4½	No. 4	.....	No. 9	.....	No. 11	240.00	245.00
5	No. 5	.....	No. 10	.....	.....	310.00	315.00

In estimating the size of prism which is required for a particular lens, a size should be selected which is at least equal to the diameter of the hood. A size which is larger than this is preferable, but under no circumstances should a smaller one be selected, as, in the work in which these prisms are required, it is of great importance to utilize all the light which the lens can transmit.

Bausch & Lomb Bichromate of Potash Ray Filter



This attachment, by absorbing certain rays from the light which reaches the lens, equalizes the effects which the various component colors in white light have upon the sensitive photographic plate. The true color values of all objects are therefore accurately reproduced in the monochrome picture. Over exposure of the sky is prevented and detail in the clouds reproduced. The rays of light which cause halation are absorbed, and thus halation is impossible. Distant objects appear distinctly in the image even when photographed through miles of atmosphere.



The Bichromate of Potash Ray Filter is simple in construction, consisting of a neat metal ring in which is mounted a glass cell, the top and bottom of which are made of two thin pieces of a high grade optical glass, with surfaces perfectly plane and parallel. The cell holds a solution of bichromate of potash. This construction is specially adapted for the three color process, inasmuch as the cells may be filled with fluids of any desired color, and the shades may be easily varied by strengthening or diluting the solutions, which do not degenerate.

Our Ray Filter fits like a cap on the front of the lens, the most convenient position for attachment or removal, and is manufactured in four styles.



RED AND WHITE ROSES.

A Ray Filter Demonstration.—The picture at the left was photographed in the ordinary way. The picture at the right represents the same subject photographed with Bausch & Lomb Bichromate of Potash Ray Filter.

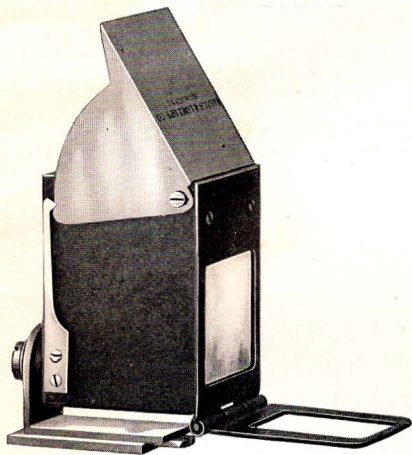
Bausch & Lomb Bichromate of Potash Ray Filter

Number.	Inside Diameter. Inches.	Price.	Price of Morocco Cap.
1P	$1\frac{3}{8}$	\$ 3 25	\$ 70
1FF	$1\frac{3}{8}$	3 25	75
1	$1\frac{3}{8}$	3 25	70
2	$1\frac{3}{4}$	3 50	70
3	$2\frac{3}{16}$	3 50	75
4	$2\frac{9}{16}$	4 00	80
5	$2\frac{15}{16}$	4 50	90
6	$3\frac{3}{8}$	5 00	1 00
7	$3\frac{3}{4}$	5 50	1 10
8	$4\frac{1}{8}$	6 00	1 20
9	$4\frac{3}{4}$	8 00	1 35
10	$5\frac{1}{2}$	10 00	1 50

Style "A" is cork lined and fits over hood of lens. When ordering send strip of good paper just reaching around hood. Style "B" has three binding screws and can be fitted to lenses varying in size from the diameter given in table to one-half inch smaller. Style "1P" is similar to style "A" but with mounting reduced to fit regular hand cameras 4 x 5 and 5 x 7. Style "1FF" is intended for box cameras with fixed focus lenses and is attachable by extra flange fastened to front of camera.

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

Bausch & Lomb Iconoscope



The Iconoscope is the ideal finder, giving a reduced image of the exact portion of the view of which a photograph is desired. Correct optical principles are the basis of construction, the result being an instrument of absolute precision. The image is sharp and clear, without distortion, every detail being clearly seen, while the brilliancy is sufficient to reproduce all objects actually as they appear to the eye. Inasmuch as the image is not reversed or inverted, all objects are seen in their natural positions.

The picture is projected by two plano-concave lenses, through a glass prism directly to the eye, the angle of projection being such as not to cause inconvenience to the photographer, who easily glances from the image to the

object without assuming an unnatural position.

The mounting is of metal throughout, but is light, convenient and attractive. It is fastened to a metal slide, working in a metal bed plate attached to the camera bed. Consequently, by having several bed plates, a single Iconoscope may be made to do duty on any number of cameras.

An adjustable hood prevents reflections, and the image therefore does not require to be shaded. A spring click holds the instrument in the proper position.

The Iconoscope is made in three sizes, in which the images vary in size while retaining the same proportions.

Size.	Height.	Width.	Depth.	Each.
A	1 $\frac{1}{2}$ in.	$\frac{7}{8}$ in.	$\frac{7}{8}$ in.	\$5 00
B	1 $\frac{1}{2}$ "	1 $\frac{1}{8}$ "	1 $\frac{1}{8}$ "	5 50
C	2 "	1 $\frac{1}{4}$ "	1 $\frac{1}{4}$ "	6 00

Each Iconoscope is furnished in a neat box.

We make two types of Iconoscope in each of the three sizes, to cover all conditions. We designate these (S) "short focus" and (L) "long focus." When ordering specify S or L, as the case may be.

SIZE OF PLATE.	SHORT FOCUS "S."	LONG FOCUS "L."
4 x 5	About 5 $\frac{3}{8}$ in. Equiv. Foc.	About 6 $\frac{3}{4}$ in. Equiv. Foc.
5 x 8	" 6 $\frac{1}{2}$ " " "	" 8 $\frac{5}{8}$ " " "
6 $\frac{1}{2}$ x 8 $\frac{1}{2}$	" 8 " " "	" 11 $\frac{3}{4}$ " " "
8 x 10	" 9 $\frac{3}{8}$ " " "	" 13 $\frac{1}{2}$ " " "

Bausch & Lomb Projection Lenses



Our Projection Lenses are the only ones produced in this country and in them is offered an optical production of great reliability as opposed to the unreliable quality of European lenses. They utilize an exceptionally large amount of the light of the lantern and give sharp, clear, beautifully illuminated pictures. The field is extremely flat. The illumination is uniform over the entire screen. The mounting is of superior finish, the movable tube being nicked and working in a cloth sleeve. The adjustment is by spiral pinion and diagonal rack and works with great accuracy.



Where a small picture is to cover a large screen at a short distance, the special wide angle objective No. 6 is recommended.

No.	Size.	Back Focus. Inches.	Equivalent Focus. Inches.	Diameter of Lenses. Inches.	Price.
1	4/4 Plate	10 $\frac{1}{2}$	15	3	\$32 00
2	2/3 "	8 $\frac{1}{2}$	12	2 $\frac{1}{4}$	21 00
3	1/2 "	7	10	2 $\frac{1}{4}$	14 50
4	1/3 "	5 $\frac{1}{2}$	7 $\frac{1}{2}$	1 $\frac{3}{4}$	12 00
5	1/4 "	4 $\frac{1}{2}$	6	1 $\frac{3}{4}$	7 00
6*	1/4 "	3	5	1 $\frac{3}{4}$	8 00

PROJECTION TABLE

Showing Distance from Object to Screen, Diameter of Picture, in Feet, and Focus of Lens Which Must be Used When Object is Three Inches in Diameter.

Equivalent Focus of Lens.	Distance from Object to Screen, in Feet.									
	10	20	30	40	50	60	70	80	90	100
15 in.			6	8	10	12	14	16	18	20
12 "			7 $\frac{1}{2}$	10	12 $\frac{1}{2}$	15	17 $\frac{1}{2}$	20	22 $\frac{1}{2}$	25
10 "		6	9	12	15	18	21	24		
7 $\frac{1}{2}$ "	Diameter of Image on Screen	4	8	12	16	20	24			
6 "		5	10	15	20					
5 "		6	12	18	24					

BAUSCH & LOMB OPTICAL CO., ROCHESTER, N. Y.

Bausch & Lomb

Condensing Lenses

These lenses are made from carefully selected glass. We take the greatest care in annealing and in finishing the surfaces. They are used almost exclusively in this country on account of their superiority.

If mounting is desired, we furnish our light and compact improved mount whose construction is such that there is the least possible danger of the lenses breaking when heated.

Diameter. Inches.	Focus. Inches.	One Lens. Unmounted.	Pair of Lenses. Mounted.
4	5½ or 6½	\$ 1 25	\$ 4 00
4½	5½ or 6½	1 35	5 00
4¾	5½ or 6½	1 50	6 00
5	6½	1 75	7 50
5½	8	2 25	9 00
6	10	3 00	12 00
6½	10	4 00	18 00
7	12	5 75	24 00
8	12	7 50	32 00
9	14	10 00	40 00
10	15	13 50	50 00
12	18	27 00	80 00
14	21	40 00	120 00

Brass Flanges for Bausch & Lomb Lenses

Number	1	2	3	4	5	6	7	8	9	10	11
Diameter, inches	1½	1¾	2	2¼	2½	3	3½	4	5	5½	60
Price, each	\$.50	.50	.75	1.00	1 00	1.25	1.50	1.75	2.00	2.50	3.00

Morocco Caps for Bausch & Lomb Lenses

Number	1	2	3	4	5	6	7	8	9	10	11	12
Diameter, inches	1½	1¾	1⅞	2⅞	2⅞	2⅞	3⅞	3⅞	4⅞	4⅞	5⅞	5⅞
Price, each	\$.60	.60	.65	.70	.70	.75	.80	.90	1.00	1.10	1.20	1.25

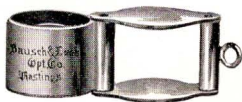
Grained Leather Caps for Bausch & Lomb Lenses

Number	1	2	3	4	5	7	8	9	10
Diameter, inches	1¾	1½	2⅞	2⅞	2¾	3⅞	3⅞	4⅞	5½
Price, each	\$.40	.45	.50	.55	.60	.70	.80	.90	1.00

Focusing Glasses

Hastings' Aplanatic Triplet Magnifiers

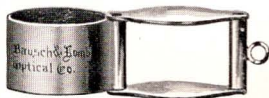
These lenses are made after formulæ by Professor Charles S. Hastings and are the best magnifiers obtainable. They are very compact and are therefore especially adapted as a pocket companion. The field embraces a wide angle and the image is sharp and flat to the very edge. The working distance is large, and the definition is such as to show details not visible with other magnifiers of equal magnification. The mountings are German silver, nickered.



Catalog No.	Diameter.		Magnification. Diameter.	Focus.		Real Field. Mm.	Each.
	In.	Mm.		In.	Mm.		
15576	$\frac{1}{4}$	6	20	$\frac{1}{2}$	12	8	\$7.00
15578	$\frac{3}{8}$	10	14	$\frac{3}{4}$	18	14	7.00
15580	$\frac{1}{2}$	12	10	1	25	20	7.00
15582	$\frac{3}{4}$	18	7	$1\frac{1}{2}$	38	30	7.00
15584	1	25	5	2	50	40	7.00

Achromatic Triplet Magnifiers

These lenses are thoroughly achromatic. The field is large and flat and the image sharply defined and free from all color. The mountings are German silver, nickel plated. Optically and mechanically these lenses are of high quality.



Catalog No.	Diameter.		Magnification. Diameters.	Focus.		Each.
	In.	Mm.		In.	Mm.	
15566	$\frac{1}{4}$	6	40	$\frac{1}{4}$	6	\$4.00
15568	$\frac{3}{8}$	10	20	$\frac{1}{2}$	12	4.00
15570	$\frac{1}{2}$	12	14	$\frac{3}{4}$	18	4.00
15572	$\frac{5}{8}$	15	10	1	25	4.00
15574	$\frac{3}{4}$	18	7	$1\frac{1}{2}$	38	4.00

Focusing and Retouching Glasses

Large field of view and slight magnifying power particularly adapt these lenses for this class of work. They are our own production in their entirety. The lenses are carefully ground and the mountings are neat and durable with nickered rim and ebonized wood handle.

Catalog No.	Diameter.		Each.
	In.	Mm.	
16312	2	50	\$.60
16314	$2\frac{1}{2}$	62	.80
16316	3	75	1.00
16318	$3\frac{1}{2}$	87	1.50
16320	4	100	2.00
16322	5	125	2.50

Reducing Glasses

Very useful, especially in industrial photography. The lens is double concave and mounted in nickered rim with ebonized wood handle.

Catalog No.	Diameter.		Each.
	In.	Mm.	
16324	2	50	\$1.00
16326	$2\frac{1}{2}$	62	1.50
16328	3	75	2.00
16330	$3\frac{1}{2}$	87	3.00
16332	4	100	4.00
16334	5	125	5.00

Choice of Lenses for Hand Cameras

Hand cameras require that the mountings of lenses be as compact as possible in order to permit the camera to fold in a small space. Our mounts are designed to meet this condition, as is evidenced by a glance at the illustrations of our lenses reproduced in actual size in the preceding pages. The other properties being about the same, that of speed is the all important consideration. Lenses of ordinary speeds are satisfactory under usual conditions, but it is the extraordinary work on dark or misty days, in early morning or twilight, for which it is important to be prepared.

Since hand camera work consists chiefly of instantaneous exposures, it is desirable to obtain speed, covering capacity and depth of focus with proper angular field. These characteristics are combined to the greatest possible extent in the lenses which we here recommend for this class of photography. In all, the equivalent focus is shorter than the diagonal and longer than the short side of the plate, and the angle is sufficiently large so that each can be used on the plate next larger than the one for which it is listed, giving the immense advantage of greater angular range. The speed of all is ample for every kind of hand camera work.

It is often desirable, and, in cases of interiors and confined situations, absolutely necessary, to use lenses having considerable angle, which is to be obtained only by using a shorter focus. At the same time covering power must be obtained to the greatest possible extent. Such are the lenses mentioned in Table II. Under favorable conditions they can be used for instantaneous exposures.

An ideal outfit should comprise both medium and wide angle lenses. Both classes are made interchangeable in the shutter or barrel, and are optically of the greatest possible efficiency.

In the following tables we give a resumé of lenses suitable for hand cameras, from which a selection can be readily made. For additional information concerning the optical properties of lenses, reference may be made to preceding descriptions.

Table I—Medium Angle Lenses

Lens.	3¼ x 4¼.	4 x 5.	5 x 7. 5 x 8.	6½ x 8½.
Planar I a	No. 10	No. 11	No. 13	No. 14
Unar I b	No. 4	No. 15	Nos. 6, 7	No. 8
Tessar II b	No. 4	No. 5	Nos. 6, 7	No. 8
Protar II a	.....	No. 1	No. 3	No. 4
Protar VII a	Nos. 1, 2	Nos. 3, 4	Nos. 8, 9, 10	Nos. 11, 12, 13
Plastigmat	No. 1	No. 2	Nos. 3, 4	No. 5
Extra Rapid Universal	No. 0	No. 00	No. 1	No. 2
Rapid Universal	No. 4½	No. 5	No. 8	No. 8½

Table II—Wide Angle Lenses

Lens.	3¼ x 4¼.	4 x 5.	5 x 7. 5 x 8.	6½ x 8½.
Protar IV	No. 1	No. 2	No. 4	.....
Protar V	.....	No. 1	No. 2	No. 3

To Our Patrons

Articles listed in this catalog can be obtained from any dealer in photographic goods, either in the United States or Canada. Where there is any difficulty in obtaining our products through the dealer, we shall be pleased to supply them direct as per catalog.

Special sizes of lenses, either larger or smaller than listed, will be made to order only. Prices on application.

Price for matching two lenses for stereoscopic work, \$3.00

Lenses on Approval

We send lenses on ten days' approval to responsible parties sending satisfactory references, or will forward lenses for examination and trial in care of the express companies. The purchaser may, if he desires, forward the price of the desired apparatus with his order. The goods will then be sent on ten days' trial, and if not wanted, the amount in full will be returned on receipt of goods uninjured and charges paid.

Lenses may be ordered on approval through dealers in photographic goods.

Terms

Parties unknown to us will please send cash with order; or, if desirous of opening a credit account, will please give information and references that will enable us to pass upon the matter.

Checks drawn on banks other than New York, Boston, or Philadelphia are subject to collection charges of fifteen cents for amounts less than one hundred dollars, or one-eighth of one per cent. for amounts more than one hundred dollars, and this sum should be added to remittance.

When cash accompanies order, and goods are to be sent by mail, *add amount of postage to remittance*, otherwise goods will be sent by express, charges collect. Goods sent by mail are at purchaser's risk.

Goods will be sent by express C. O. D. only when amount is more than five dollars, express and return charges to be borne by purchaser. One-fourth of total amount should accompany order.

