

THE EAGLE EYE OF YOUR CAMERA

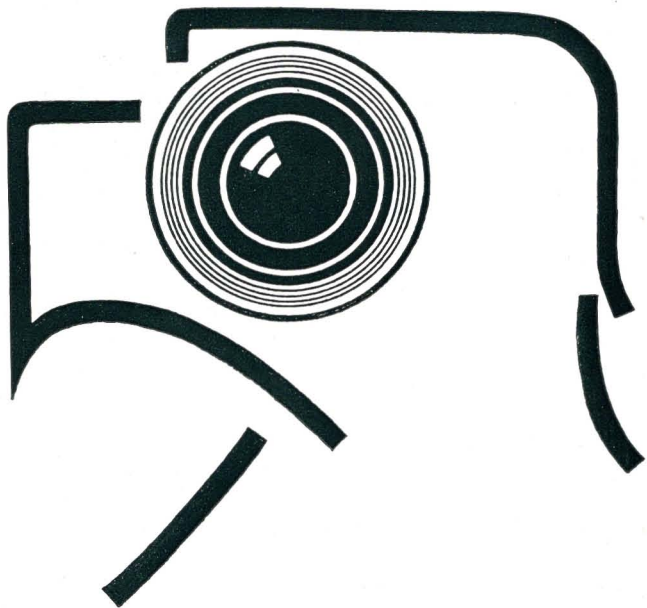


The illustration on the front cover is a composite picture from a photograph, "Eagle's Head" by Bengt Berg, and an aerial view "Alpine Chain" by Mittelholzer.

Reproduction of the illustrations and text, in whole or in part, is not permitted except with our written consent.

Copyright, Carl Zeiss, Jena, 1932.

Photographic dealers supply excellent cameras of well known makes in all the usual sizes, for films, plates and film packs, as well as Cine Cameras, fitted with **ZEISS-TESSARS**. Look for the engraving on the lens mount.



ZEISS TESSARS



TELEGRAPHIC ADDRESS: ZEISSWERK JENA • ESTABLISHED 1846
BERLIN • HAMBURG • COLOGNE • VIENNA • BRUSSELS
BUENOS AIRES • RIO DE JANEIRO • TOKYO

LONDON W 1: Carl Zeiss (London) Ltd., Mortimer House,
37—41, Mortimer Street • NEW YORK: Carl Zeiss, Inc., 485,
Fifth Avenue and at LOS ANGELES, Cal., 728 So. Hill Street

GENERAL DISTRIBUTING AGENCIES IN ALL PRINCIPAL CITIES IN THE WORLD



*"and if I have won some small
renown throughout the world for my
Camera Hunting, I must frankly
admit that I owe half of it to my
Zeiss Tessar lenses."*

Bengt Berg

"The Terror of the Sedge"
© by Bengt Berg

Life holds more for the photographer

Photography is to-day by far the most popular of hobbies, and rightly so, for its pursuit, in every stage of proficiency from child's play to artistic effort, yields great enjoyments, while the permanent records snatched from hurrying time with our own hands, are a lasting source of pleasure. They bring back to life the treasured memories of childhood, recall the joys and freedom of a summer holiday, carry back the memory to the changing moods of landscape and sea and help us to live again the joys of companionship and sport. The brightest and most vivid moments of our lives are held for ever in pictures of ourselves and the world around us, an enduring memory for the years to come. Photography is the touchstone of our taste, our striving after artistic expression, and to many of us it has become a real asset in business and in study, as well as in the pursuit of scientific and technical occupations.

Photography made easy

The modern plate and film, and the progress made in optics and in camera construction, have smoothed the path for the amateur. Cameras are so inexpensive to-day that one can be found to suit any purse. They have become so simple and practical to handle that the A B C of photography can be easily and quickly learnt. The requisite plates and films can be bought anywhere, so that there is no longer any need to be burdened with a big supply, and those for whom developing and printing have no attraction are well looked after by the photographic dealer, who does the work quickly and at a reasonable price. Small wonder, then, that photography has everywhere become a popular pastime.

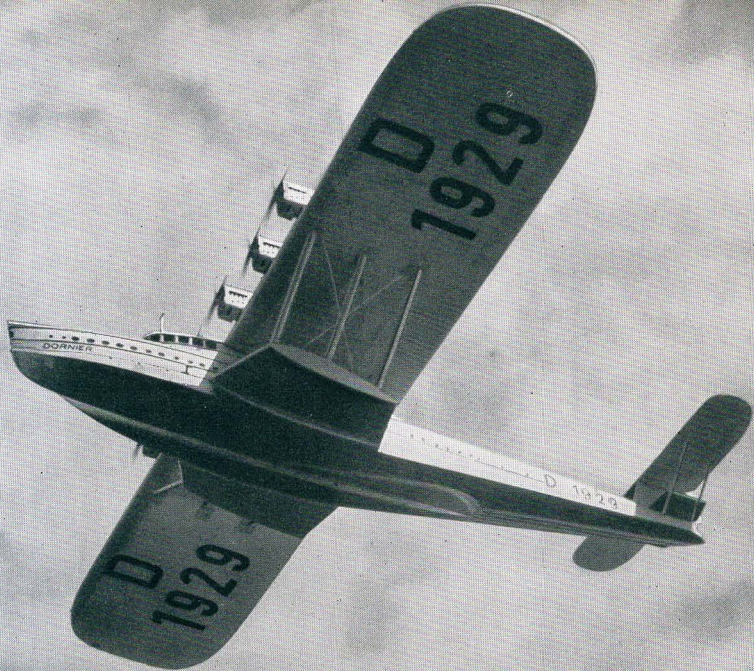
Of course . . .

the beginner, who has at first been satisfied with a simple camera, will eventually discover, notwithstanding his early successes, that his scope is somewhat limited. Fast instantaneous exposures, such as are necessary for sport or for those charming pictures of children at play, snapped unawares, cannot be obtained with a simple instantaneous shutter. Moreover the usual simple lens will not admit sufficient light for such short exposures, even in bright weather. Its definition in the corners, and sometimes even in the centre of the plate or film is not sharp enough for enlarging, whilst the walls of houses may appear curved at the edge of the picture. In short, the beginner's camera will no longer serve for the more difficult tasks of photography—hand exposures on dull days, animal

New York

Phot. Fairchild Aerial Surveys Inc.





Do X

Phot. Dornier

pictures, serious architecture or interior work, large scale pictures from semi-distant or distant view points, in which nevertheless the finest details are to be quite sharply rendered. Those, therefore, who wish for something more than mere snapshots, must needs purchase an efficient camera, and if every possible sphere of amateur photography is to be explored unhindered, the most particular care must be taken that the camera is provided with the best "eye". For upon its eye depends its whole performance.

And so the title of our booklet is

The Eagle Eye of your Camera

The objective should be as the eagle's eye, whose acuity is proverbial. Where its glance falls, every finest detail is laid bare. Just as the wonderful acuity of the eagle's eye has its origin, partly in the sharpness of the



The Erechtheum: Caryatid Porch
Phot. W. Hege

image produced by its cornea and lens, and partly in the ability of the retina—far exceeding that of man's vision—to resolve and comprehend the finest details of this delicate image, so, for efficiency, must the camera be provided on the one hand with a 'retina' (the plate or film) of the highest resolving power—a fine grain emulsion—and on the other hand with an objective which can produce the needle sharp picture of the eagle's lens and cornea. But the simile breaks down already, for the eagle's gaze sweeps all directions: he turns his head if the movement of his eye does not alone suffice to cover the field before him. The camera has not the advantage of this changing succession of glances. It must keep its eye steadfastly in a fixed direction and yet, with the clearness of the eagle's eye, comprehend at one time a large field of view. This, moreover, with so bright an image that the film records every detail of the picture even though the shutter gives it but a moment's glimpse,— $1/100$ of a second or less—shorter than a flash of lightning.

To sum up briefly the chief requirements of a photographic objective:

It must have the *sharpness* of the eagle's eye; it must admit a *large amount of light* so that when exposures of $1/100$, $1/200$ or even $1/500$ of a second are demanded they will leave a sufficient impression on the plate. These two properties, sharpness and rapidity, must moreover be ensured over a *wide field of view*, and in such a manner that the image is formed sharp and bright to the extreme corners of the plate or film over a *flat surface*, whereas the sensitive surface of the eye, the retina, is not flat but curved.

The completeness with which

the ZEISS TESSAR

simultaneously satisfies these requirements is the secret of its supremacy throughout the generation since its introduction, and to-day it is to be found in the hands of many hundreds of thousands of photographers, the envy of all who do not yet possess it. In every sphere of photography the Zeiss Tessar has attained the



"A Storm brewing at Terni."
Phot. Angeli Elore

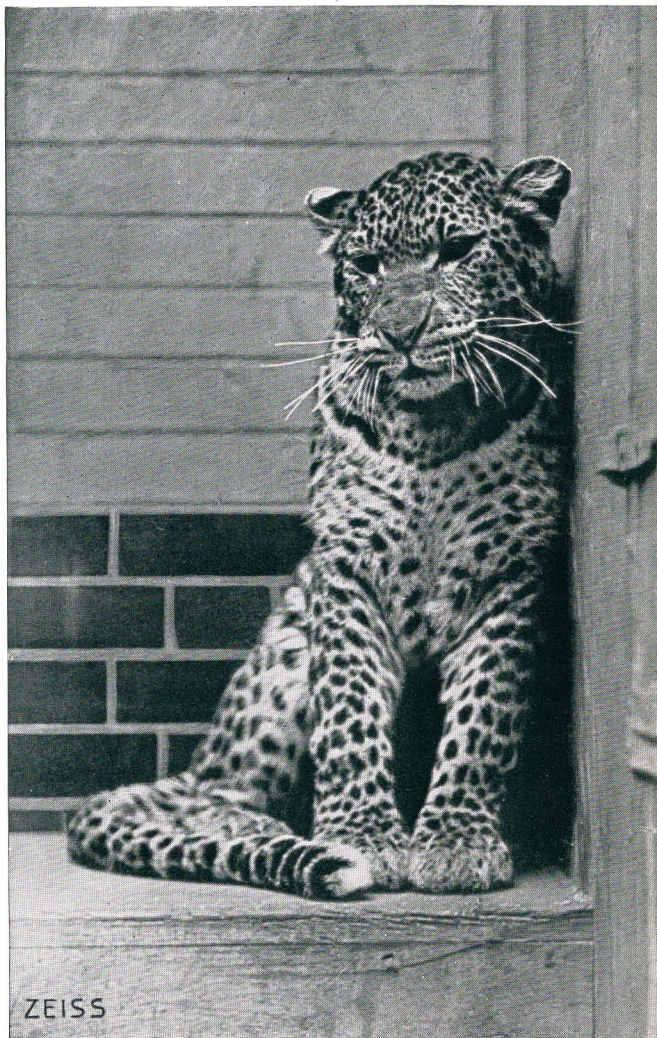
pinnacle of achievement. The world renowned experts thus unreservedly acknowledge it: "And if I have won some small renown throughout the world for my Camera Hunting"—so writes Bengt Berg—"I must frankly admit that I owe half of it to my Zeiss Tessar lenses."

"To my own eyes were added an observer of the most perfect reliability, the precious glass 'eye' of the camera, the Zeiss Objective" writes Kurt Hielscher in his well known work "Unknown Spain." Mr. J. E. Saunders, the famous photographer of Zoo animals and birds, says "I have used the Zeiss Tessar on my reflex for many of my favourite 'close-ups,' and these are the pictures which I show every time. I have known a number of lenses, but I know no F/4.5 which surpasses the Zeiss Tessar for definition, for brilliance of image and covering power."

It is with Zeiss Tessars that the photographs are taken from airship and aeroplane by Dornier, Hansa, Junkers, Mittelholzer, Zeppelin, Fairchild and others.

The Zeiss Tessar is the indispensable and never failing tool for sport and press photographers throughout the world, for the cineoperator at Elstree, the Riviera and Hollywood, for the professional photographer, for the explorer in tropical countries, in the polar regions or the Himalayas, for the archeologist in Egypt or in Central America, to bring home unique and convincing photographic records. And the amateur photographer, proudly displaying his latest camera and cine achievements of the summer holidays, the sea voyage, the mountain climb, the tennis court, the winter sports and the children, adds, with no less pride,

**"They were taken
with a ZEISS
TESSAR."**



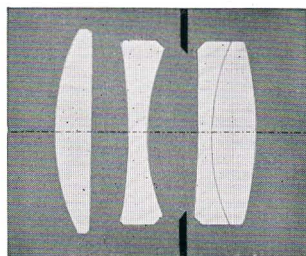
"Rex"

Phot. J. E. Saunders

How has the ZEISS TESSAR attained this supremacy?

Because this ideal universal objective is the result of keen theoretical insight and practical experience in the computation of optical and mechanical construction, of attention to minute detail in laboratory and testing room, of highest precision by hand and machine in the workshop—all of this combined embodying the high tradition of the Zeiss Works.

The construction of the ZEISS TESSAR



The Tessar is a so-called unsymmetrical system of lenses, made from four different kinds of glass. In its construction no attempt was made to give to the front or back component in itself the properties of an individual objective, as must be the case with symmetrical objectives. Efforts were therefore directed solely to securing

for the objective as a whole the highest possible performance

It will be evident that, as a result of this limitation, the optical designer was given many more possibilities in the choice of the individual elements of construction: 7 different curvatures, 4 types of glass, 4 lens thicknesses, 2 air separations, altogether 17 elements which can be varied at will within wide limits. Consequently, in spite of simple construction, he was able to attain a high degree of correction, higher than would have been the case had he been hampered by the task of making the front and back component capable of functioning individually.

"The Jump"
Phot. O. Rutz, St. Moritz



"The Hurdler"
Phot. G. Riebcke



"The Pazieltal"

Phot. C. Rich-Lau

A word on the manufacture of the ZEISS TESSAR

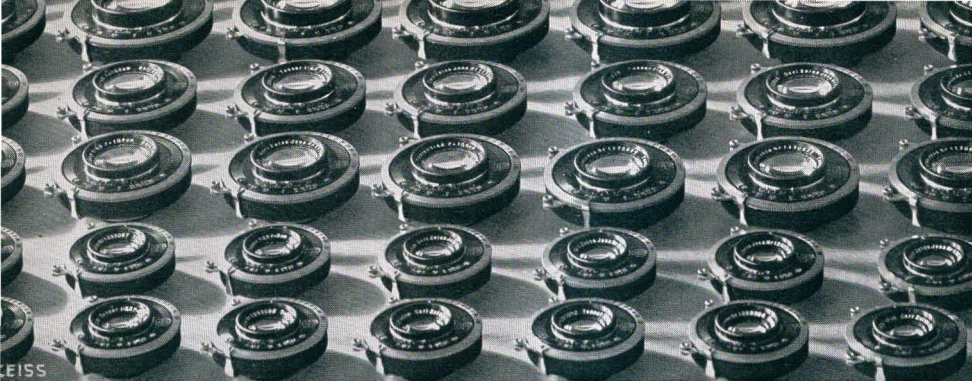
At first sight the photographic objective would appear to the technician as an ideally simple manufacturing problem. Its components, both mechanical and optical, are simple turned parts. The lenses moreover have simple spherical surfaces which, in mounting, are all centred on the one axis, the axis of the cylindrical mechanical parts. On closer scrutiny, however, he will find that the accuracy demanded by high grade objectives is of an order scarcely met with in factory—produced goods outside optics. Thus the final quality of a Tessar is definitely affected, to mention only some typical examples, by an infinitesimal fraction of a millimetre in curvature radius, thickness, separation and centering of its lenses; further, by departures from true spherical form amounting to small fractions of only a thousandth of a millimetre and finally by variations of hundredths per cent in the refractive index of the raw material of the lenses, i. e. the optical

glass, of which there are many different varieties. Since it is not within the power of glass manufacture technique, on account of small unavoidable variations in its product, to maintain with certainty within these narrow limits the variations in the production of successive meltings of a glass type, the refractive index of the glass meltings actually produced must always be measured with extreme accuracy, and the glass variations must, if the objective is to be maintained at the high level set by its theoretical design, be compensated by certain very small alterations in the curvatures, thicknesses, etc.

It will now be understood that for the manufacturing of such a precise product, a many-sided organisation of highly trained workers is required in the laboratories, calculation and drawing offices, in tool rooms and workshops, and also in the many intermediate and final testing departments. Where the tradition of a highly developed organisation, and the means to keep it alive, are lacking, the product must needs suffer. In the Zeiss Works



ZEISS



research, by computation and experiment over a vast sphere, goes on constantly. Every new possibility in manufacture and in glass technique is being utilized, and the meticulous accuracy of the work is scrupulously supervised from first to last. Thus in the hundred thousand and more objectives which leave the Zeiss workshops every year

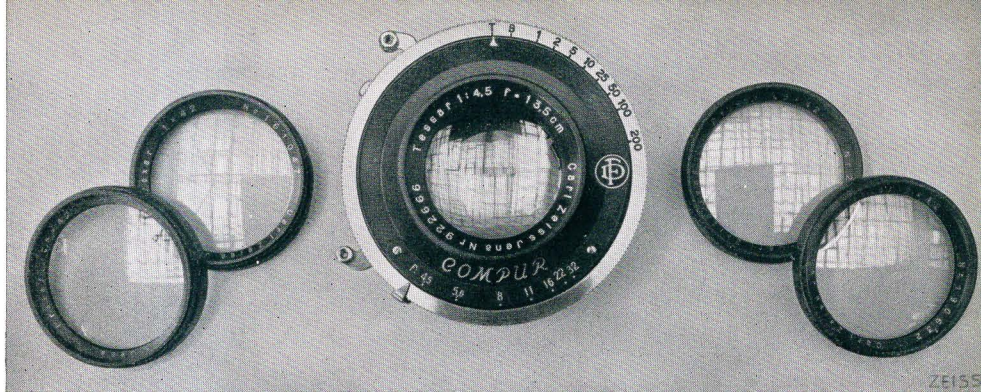
a uniform perfection of image is constantly maintained

“Select a specially good objective”—such orders reach us occasionally from the customers—is therefore a meaningless request. All Zeiss Tessars have to attain the standard of perfection laid down by theory or they cannot bear the inscription “Carl Zeiss Jena.”

Highly specialized performances of special objectives

By a different arrangement of lenses or by using a greater number of them it is quite possible to attain the maximum of performance in certain special directions. The Zeiss objectives mentioned below are examples of special types, viz. :

- maximum rapidity Biotar F/1.4
- widest angle Dagor F/9, Protar, Hypergon
- greatest freedom from distortion Orthometar for photographic sur-
- separate use of front and back [veying
- components Double Protar, Dagor F/6.8
- long focus with short extension Teletessar.



Zeiss Tessar with Proxars and Distars (see p. 19)

But

all the requirements needed for universal photography are best balanced and met with

in the **Zeiss Tessar Lenses**

viz:

sharp, flare-free definition, capable of enlargement, from the centre to the edge of the specified plate size,

great rapidity, which permits short instantaneous exposures even under unfavourable lighting conditions,

exceptional freedom from distortion, obviating any objectionable curvature of the straight lines of houses, etc., at the edge of the picture,

good colour correction, making for the clearest rendering of black and white subjects and also for irreproachable colour photographs,

compact design, so that the falling off of light near the edge is reduced to a minimum and a flat camera design is possible, notwithstanding

sufficient separation of the component lenses to enable a between lens shutter of the most perfect type to be fitted,

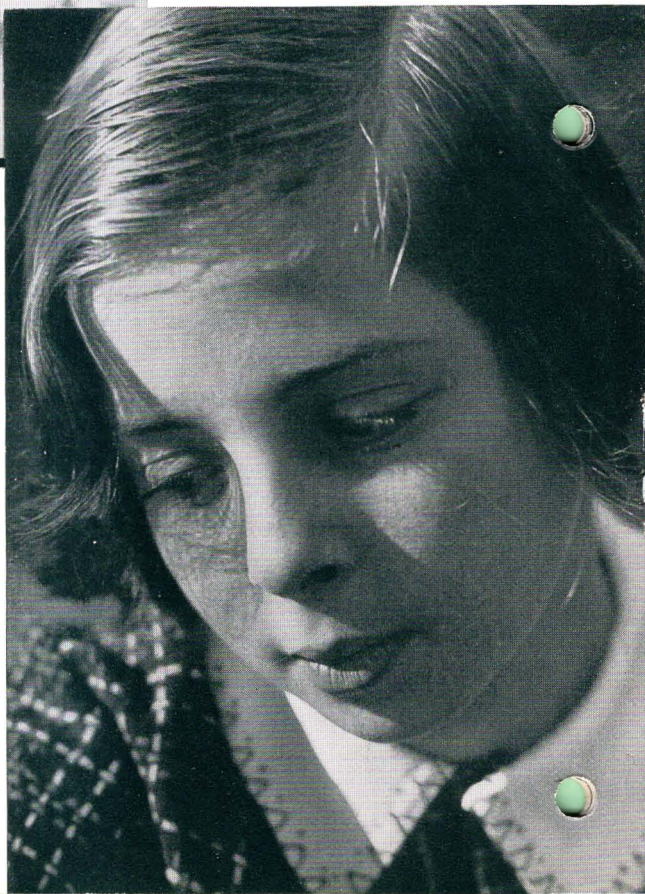
the use of types of glass, as free as possible from colour, which defy the influence of weather in all climates,

reduction to the minimum of the number of lenses, and particularly of glass-air surfaces (every free lens increases the necessary exposure by about $\frac{1}{10}$).

Phot. Hedda Walter



Phot. Aenne Biermann



What is the Price of the Zeiss Tessar?

It is evident that the Zeiss Tessar would be expensive, if only a few thousand lenses of many different sizes were manufactured in a year. Since, however, the sale has increased to many hundred thousands a year and, moreover, the chief demand is confined to a few different focal lengths, production has become more and more economical. This explains why to-day the Zeiss Tessar lens

is actually less than half

the price it used to be. Formerly the Zeiss Tessar cost as much as will now purchase a good double extension camera complete with shutter and Tessar. In purchasing a good camera, it would be, to-day more than ever before, uneconomical to save on the lens. For the saving would amount to only a fraction of the total cost, while the efficiency of the camera's most important part would thereby suffer.

Which Tessar to choose?

In the catalogues of camera manufacturers will be found particulars of Zeiss Tessars of suitable focal length and relative aperture for the various outfits. Sometimes there is a choice of two focal lengths or several relative apertures. The focal length and aperture are engraved on the front mount of every Zeiss Tessar.

In the choice of the focal length

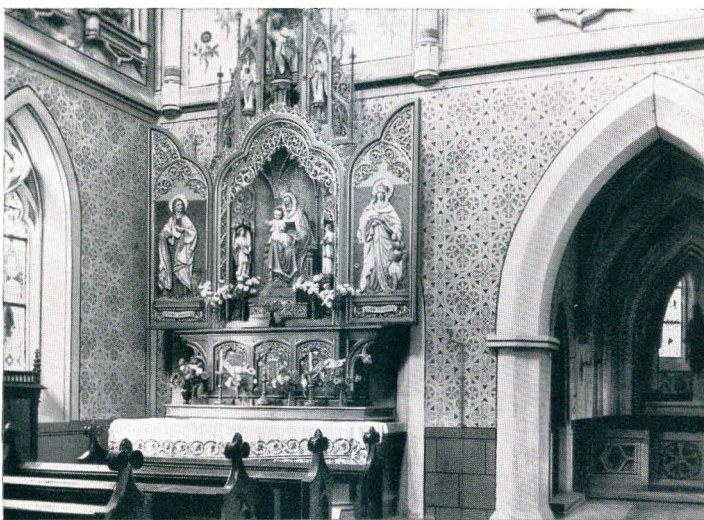
one has to be guided by the size of picture of the hand camera chosen. It should be about the same as the length of the diagonal of the plate or film; thus, for example, the usual Tessar for a $2\frac{1}{2} \times 3\frac{1}{2}$ " camera has a focal length of $4\frac{1}{4}$ ". Where two different focal lengths are given in a camera catalogue as suitable for the same camera, the longer focus is sometimes more satisfactory from the point of view of perspective rendering. Objectives of longer focal lengths give larger images of the subject, whilst those of shorter focal length give pictures of wider angle.

Occasionally it is desired to extend the scope of the fixed focus of a Zeiss Tessar. It is desired, perhaps, to photograph on a larger scale an object which it is impossible to approach any nearer or, vice versa, to include a wider angle. For such purposes the technical photographer has at his disposal a number of Zeiss Tessars of different focal lengths, or he may possess a Double Protar, i. e. a convertible lens set whose components can be combined to make up objectives of various focal lengths.

ZEISS TESSAR + PROXAR



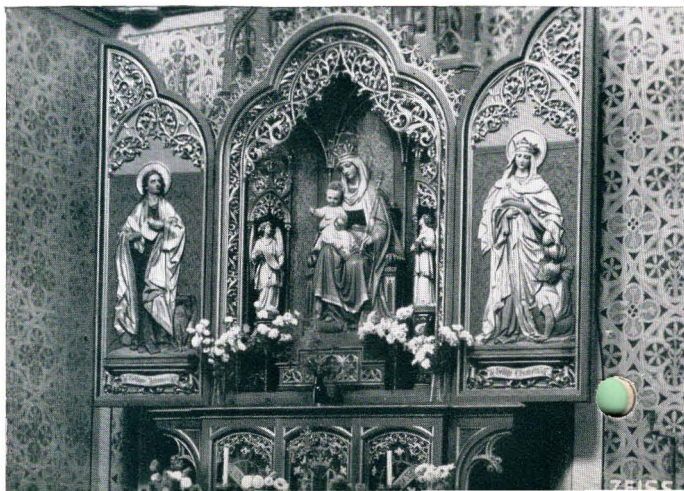
Comparison photographs
from the same point of
view



ZEISS
TESSAR F/4.5
ALONE

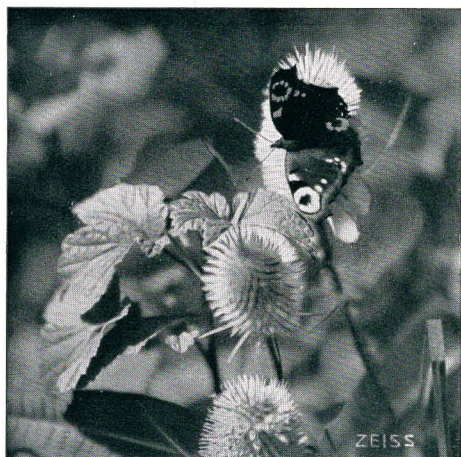


ZEISS TESSAR + DISTAR



Peacock Butterfly
Instantaneous photograph
at 18 inches distance with
ZEISS TESSAR + PROXAR

Portion of 9×12 cm. original
reproduced full size.



But

**the focal length of the
Zeiss Tessar can be
lengthened or shortened**

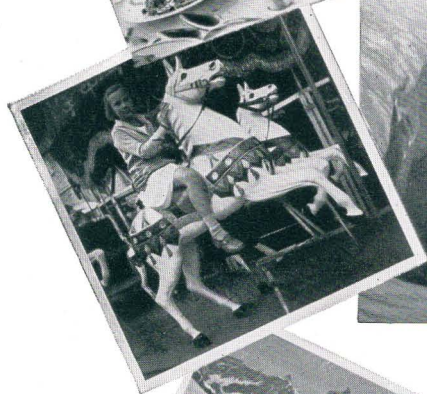
by means of Distars and Proxars. These are simple attachment lenses of special design, which can be obtained either at the outset or at some later date. They are slipped on to the front of the Zeiss Tessar, enabling photographs to be taken at close quarters of such small things as flowers, postage stamps or butterflies. Also groups or portraits and architectural or landscape details may be taken on a much larger scale than would be possible with the Tessar alone. It is indeed a very simple expedient, whereby it is possible to make of the

ZEISS TESSAR with Proxars and Distars a Convertible Objective for Hand Cameras.

This device is much more adaptable and convenient and much less expensive than the usual convertible objectives proper, which become more and more confined to professional large stand cameras.

Rapidity

Zeiss Tessars for general hand camera use, having an image field of at least 50°, have been produced at the Zeiss Works with ever increasing apertures: the series commenced with the F/6.3 Tessar. Then came the F/4.5 Tessar, which conquered the field of the high grade hand camera and remains unchallenged to this day. The F/3.5 Tessar, originally confined



For the miniature photograph

whether it is to be looked at with the naked eye, or through a magnifier, or greatly enlarged, a negative of really needle sharp definition is essential. Here again, the high performance of the camera lens is a sine qua non for good results—results to be proud of.

ZEISS TESSAR

the sharp camera lens

to a small angle of field for Cine and special purposes, was later developed in a new form with a wide field. For the new miniature film cameras the F/2.8 Zeiss Tessar is the latest achievement. Its rapidity is 5 times as great as with F/6.3.

Which of these Zeiss Tessars is the one to choose?—The answer would at first sight appear obvious : naturally the most rapid one, the F/2.8 Tessar. But here some technical considerations enter in ; the weight, dimensions and precision of the camera to which the lens will be fitted, and above all

the depth of focus

Our eyes can see clearly, *at the same time*, everything from about a yard's distance to infinity. The camera's eye can only do so if the effective aperture is very small, either in itself or by virtue of "stopping down" with the iris diaphragm. As the effective aperture is increased, say to 2 cm., the range of distance over which the image is sharp on the *camera's* retina (the plate or film) even with the best objectives becomes more and more restricted, and the more rapidly, the nearer the subject. Thus, for example, where the depth of focus covers a street scene from 30 to 120 feet (with the focus set by scale at 45 feet), the



"Before the Wind"

Phot. G. Riebcke



Amateur Cinematography

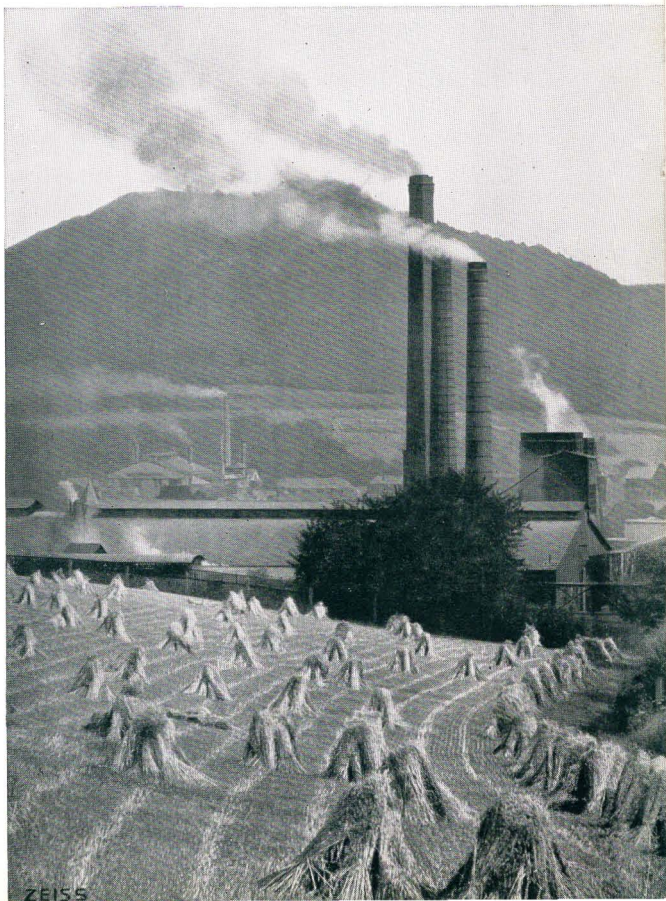
has received a great impetus as a result of the introduction of the sub-standard apparatus utilising 16 mm. and 9½ mm. film. To obtain a really excellent projected image from the very small film picture it must necessarily be needle sharp, and this in its turn demands an objective of precision, a lens specially computed and produced for small cine cameras, the

ZEISS TESSAR
with F/2.7 aperture

corresponding depth with portraits at a scale setting of 3 feet is only from about 34 to 38 inches, or from the nose to the ear*). But the effective lens aperture of 2 cm. mentioned above corresponds, in the case of the Tessar fitted to a $\frac{1}{4}$ -plate camera, to a "relative aperture" of F/4.5 whilst in the case of a "small-film" Tessar it represents F/2.8. The photographer has wisely taken these facts into consideration and will generally prefer **the F/4.5 Tessar for $3\frac{1}{4} \times 4\frac{1}{4}$ " and $2\frac{1}{2} \times 3\frac{1}{2}$ " Hand Cameras.**

Certainly there are also excellent hand cameras of these plate sizes fitted with the F/3.5 Tessar, and special cameras with still wider aperture lenses, f. i. the F/2.8 Tessar. Lenses of such wide aperture and of the focal lengths needed necessitate a larger shutter and often result in too great an increase in the size and weight of the camera. Against these drawbacks there are but few cases wherein the greater rapidity can be effectively utilized without the counteracting disadvantage of small depth of focus, which usually necessitates stopping down. On the other hand the depth of focus given by the full aperture of the F/4.5 Tessar of these focal lengths is very often sufficient, and its rapidity admits of the shortest shutter speed of $\frac{1}{250}$ sec. for sports photography and similar action pictures, and even, in very good light, permits the

*) Hand cameras fitted with Zeiss Lenses are supplied with an up-to-date depth of focus table.



"Bread and Iron"
Phot. Paul Wolff

use of a Zeiss Yellow Filter ; in poor light it still admits of many snapshot exposures at about $\frac{1}{25}$ sec. Where there is too much light or where greater depth of focus is needed, the iris diaphragm can be stopped down as desired. If, again, the photographer finds himself confused among these many possibilities, he can

even as a beginner take photographs with F/4.5 ZEISS Tessar with no more difficulty

than with a simple beginner's camera. He need only set the iris to f/11 and the shutter to $\frac{1}{25}$ second, and may snap away freely to his heart's content. In bright weather he will obtain beautifully exposed negatives ; in dull weather he will very quickly perceive that he needs the powers which lie hidden in his F/4.5 Zeiss Tessar and which, apart from the excellent definition, are twice, five times, ten times as great as those of the beginner's camera with its cheap lens.

For the miniature cameras the F/3.5 and F/2.8 ZEISS Tessars

For these small film cameras up to about $2\frac{1}{4} \times 2\frac{1}{4}$ " picture size, the Zeiss Tessars of about 5 to 7.5 cm. focal length are suitable. With apertures of F/3.8*) or F/3.5 or F/2.8 their depth of focus, even without stopping down, is ample for very many subjects. They admit from 50 to 150% more light than the F/4.5 Zeiss Tessar, and this vast reserve of light may often be utilized with impunity on the miniature camera. These advantages do not have to be bought at the expense of extra weight and bulk, for these ultra-rapid Zeiss Tessar lenses can be fitted to the same size camera as the F/4.5 Zeiss Tessar of the same focal length. The sharpness of the pictures and the degree of enlargement which they permit are just as good, right up to the edges, provided the adjustment and film register are perfect.

Choose the camera with the ZEISS-TESSAR

*) A modification of the F/3.5 Tessar adapted to the shutter size.

Survey of ZEISS OBJECTIVES for different classes of work

Universal Lenses

- The Zeiss Tessars F/6.3, F/4.5, F/3.5, F/2.8 (the last for miniature cameras)
- The Double Protar F/6.3 to F/7.7 and the Protar sets (the individual components can be used as long focus lenses)
- The Dagor F/6.8 (The back component can be used as a long focus lens when stopped down)

Special Lenses

For Cinematography

- The Biotar F/1.4; an ultra-rapid lens
- The Zeiss Tessars F/2.7, F/3.5 of short focal lengths
- The Triotars F/3 and F/3.5
- The Tele-Tessar F/6.3; a special long focus lens

For Miniature Cameras

- The Biotar F/2, an exceptionally rapid lens

For Portraiture

- The Zeiss Tessars F/3.5, F/4.5, F/6.3 of long focal lengths
- The Zeiss Tessar F/5, $f = 50$ and 70 cm.
- The Triplets F/4.8, $f = 50$ cm. and F/5, $f = 70$ cm.
- The Tele-Tessar F/6.3

For particularly rapid exposures with press and reflex cameras with focal plane shutters

- The Biotessar F/2.8

For Wide Angle work

- The Dagor F/9
- The Protar F/18
- The Hypergon F/22

For Aerial Photography

- The Zeiss Tessars F/4.5 and F/5, $f = 50$ and 70 cm.
- The Triplets F/4.8, $f = 50$ cm. and F/5, $f = 70$ cm.
- The Orthometar F/4.5

For Large Image Pictures

- The Tele-Tessar F/6.3
- The Magnar F/10, $f = 45$ cm.
- The combination Tele Objectives, chiefly for exceptionally long distance photographs.

For Photography with Ultra-violet light

- The Quartz Anastigmat F/4.5

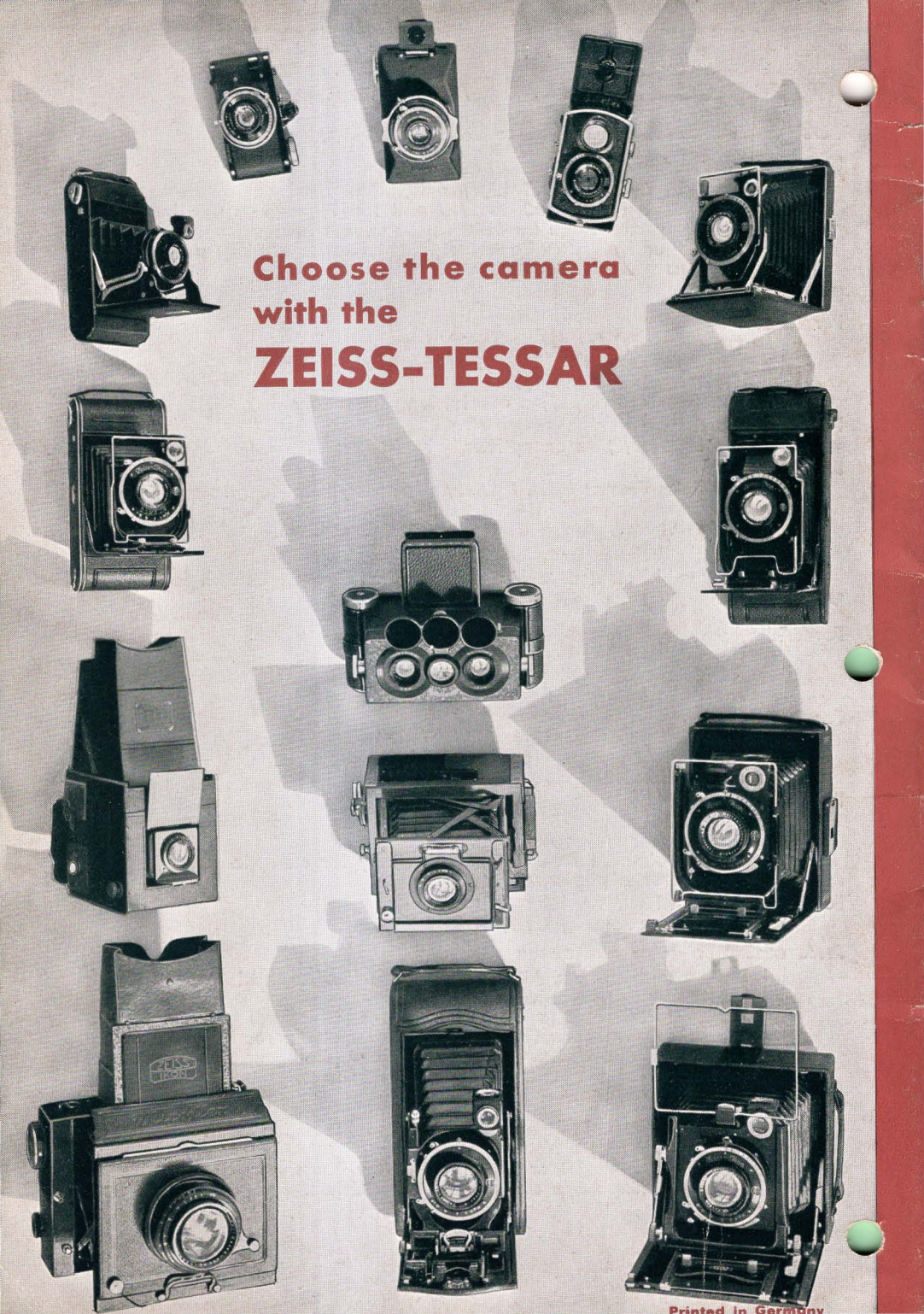
Accessories to Camera Lenses

- Distars and Proxars, Attachment Lenses for lengthening and shortening the focal length.
- Yellow Glass Filters, for compensating the differences between the eye and the orthochromatic plate, for correct colour rendering.
- Ducar and A-Ducar Filters, for colour screen photography with spherical lens effect for compensating the plate thickness.

Process Equipment

- The Apochromatic Planars and the Apochromatic Tessar.
- Reversing prisms and mirrors.
- Revolving collars, filter troughs, R-yellow filters and R-colour filters.
- Focusing microscope and focusing magnifiers.

Leaflets free on request.



Choose the camera
with the
ZEISS-TESSAR

Printed in Germany