

# Lenses *—their whys— and wherefores!*

A Department Conducted by Charles H. Shipman, of Cleveland, Ohio.

**T**HERE are in general use two classes of lenses: achromatic and apochromatic. The first class produces the blue and yellow-green images of the same size and at the same focal point, but the red image is either different in size or at

a different focal point or both. Before the advent of panchromatic emulsions the red image was of no effect upon the plate of film. Many very fine lenses are still made of this type and serve excellently for all purposes except three color work and

panchromatic work with the red-orange filter. The apochromatic lenses are, of course, good for any kind of photography. They are much more difficult to make and are more expensive in consequence. Even for engravers, both classes are made as it is useless to expend the extra sum for an apochromatic if only black and white subjects are handled.

Taylor Hobson Cooke lenses are made in England by the Taylor, Taylor & Hobson Company of London and distributed in the United States by Eastman Kodak Stores Company, 133 N. Wabash Ave., Chicago, Ill.

The Opic Series O, is the fastest Cooke lens and is made in focal lengths of  $1\frac{3}{8}$ " to  $5\frac{1}{2}$ " at the great speed of F/2. Each element consists of a single and a double, cemented section separated by an air space. Like all very fast lenses the glasses are fairly thick and with deep curves. These lenses are intended for motion picture work and, in the longer focal lengths, for night photography, stage plays, concerts and any work in dim lights that does not require much depth of field. The field covered is wide for so fast a lens being about  $50^\circ$  at F/2. The Series O is now made at openings of F/1.4 for motion pictures. As these lenses are of large diameter, they require cameras of very large front board. The size plates covered are  $1\frac{5}{8} \times 1\frac{1}{8}$  to  $3\frac{1}{4} \times 4\frac{1}{4}$ . The  $5\frac{1}{2}$ " lens has an inside flange diameter of  $2\frac{3}{4}$ ". This would require even a metal lens board to be of at least  $3\frac{1}{4}$ ". As the color correction is good they can

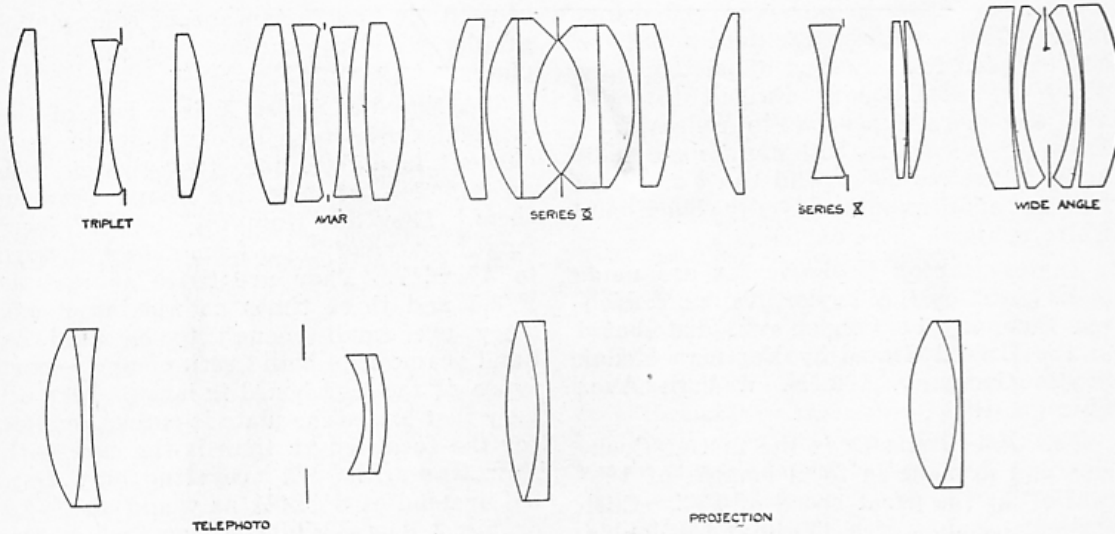
be used for slow instantaneous color photography with Autochrome and Agfa color plates.

The Speedic, Series X is a lens of the original Cooke type except that the rear element is divided into two glasses with an air cell of negative shape between them. They are from  $1\frac{3}{8}$ " to  $9\frac{1}{4}$ " focal length covering plates from motion picture to  $4\frac{3}{4} \times 6\frac{1}{2}$ ". They are twice as fast as F/3.5 and three times as fast as F/4.5. They are small enough to be used on hand cameras, both reflex and sport types, if the lens board is large. Like all very fast lenses the plate is rather smaller for the focal length than is the case with slow lenses, the  $5\frac{1}{4}$ " covering only  $2\frac{1}{4} \times 3\frac{1}{4}$ " instead of  $3\frac{1}{4} \times 4\frac{1}{4}$ " as would an F/4.5 or F/6.3 lens. While not as fast as the Series O, it will serve well for most purposes requiring more than ordinary speed. The  $9\frac{1}{4}$ " would be a fine portrait lens for  $5" \times 7"$  plates in work with children.

The recent World War made necessary lenses of high speed and fine definition with flat field and large covering power. The Aviar, Series II, was developed for the Royal Air Force. It is a four glass lens of the Goerz Celor type, each element consisting of a positive and negative glass with a positive shaped air lens between them. They produce negatives of fine contrast and definition for so large an opening, F4.5. The focal lengths are  $3\frac{3}{4}$ " to  $13\frac{1}{2}$ " for plates  $2\frac{1}{4} \times 3\frac{1}{4}$ " to  $8 \times 10$ ". They are not designed to cover any larger plate than that listed which is normal for the focal length. They are very fine for

COL. CLARENCE D. CHAMBERLIN AND THE REV. PAUL SHULTE ARE PHOTOGRAPHED BY H. A. SCHOENHALS WITH A HAMMER PRESS PLATE AS THEY LOOK OVER COLONEL CHAMBERLIN'S NEW CRESCENT PLANE. THE REVEREND SHULTE IS A LICENSED PILOT, WHOSE PARISH IS DARKEST AFRICA.





DIAGRAMS ILLUSTRATING MR. SHIPMAN'S ACCOMPANYING ARTICLE ON LENSES.

graflex or sport cameras and, in the longer focal lengths, for portraiture, using the next smaller plate than listed, thus the 12½" should be used on a 5x7 or 6½x8½ plate to secure best drawing.

The Triplet is the original Cooke lens and was the first anastigmat developed without the use of the newer Jena Glasses. It is of very simple construction, the front element consisting of a positive and a negative glass, widely separated, and the rear element of a single positive glass. It was invented in 1894 by H. Dennis Taylor who was scientific director of the Optical Works of T. Cooke and Sons. This lens is an anastigmat with flat field free from coma. It is now made in several speeds: F/3.5 in Series II A, 9½" to 15" focal length; F/4.5 in Series II B, 10½" to 20"; F/5.6 in Series VI, 13" to 22". These are all portrait lenses of very fine grade and because of the flat field, free from coma and zonal error, they are fine group lenses. The focal lengths are normal for the size plates listed. The F/3.5 is best for children and the F/5.6 for groups. The F/4.5 is the most all around member of the group and is a fine home portrait lens. They are all fitted with an adjustment to secure soft focus results by changing the separation of the glasses. On distant objects these lenses cover the size plate as listed, but in the studio, with subjects at ten feet, they cover the next larger size plate. The II A is also made in 5", 6¼" and 7½" for hand cameras, reflex and sport cameras. The longer foci are good commercial lenses as when set at sharp, the definition is of the best.

The Wide Angle, Series VII B, is a four glass lens as is the Aviar, but the glasses

are of different shape. Each element consists of a positive and negative glass separated by an air lens, but both are of meniscus form instead of double convex and double concave as in the Aviar and the air lens is negative form instead of positive as in the Aviar. This wide angle lens is therefore of the Gauss type. It is of 2½" to 8" focus for plates 3¼x4¼ to 10x12, the 6¼" covering 8x10 as is the usual custom. The lens opens up to F/6.5 for focusing, thus being easy to use in dark places. Exposures are made at F/16 or less. At F/16 the angle is 90° and at F/32 it is 100°. This allows for a large rise of the front to secure tall building or other objects without distortion. The focus remains unchanged as the lens is stopped down which is not the case with some wide angle lenses which must be focused at the stop used.

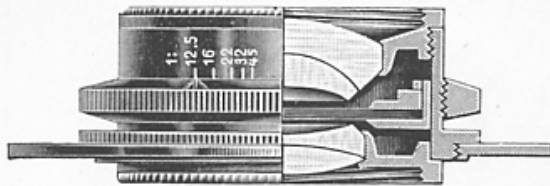
The Telephoto is an anastigmat made in two series, the Eltic, Series VIII B, F/3.5, 8" and 10½", and the Telic, Series VIII, 8½" to 20", F/5.6. With both, on distant objects, the camera extension is only a little more than one-half the focal length. As portrait lenses they are useful for reflex and sport cameras as well as for athletics and other subjects requiring long focal length lenses on short bellows cameras.

The process lenses are made in two types, the Apochromatic, Series IX and the ordinary Achromatic process, Series V B. Both are fine engraver's lenses and the hoods are removable to screw on a prism. An iris diaphragm is provided and the barrel is also slotted to take process stops. The Series IX is 13" to 25" at F/10 and 30" to 48" at F/16 for plates

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9x13 to 36x48 at same size copy and 8x10 to 30x40 at one-half size copy. The Series V B is 9" to 13" at F/8, 16" to 25" at F/10 and 30" to 48" at F/16, the plates being 7x9 to 36x48 at full size copy and 6x7½ to 30x40 at half size copy. While these are fine commercial lenses they of course cannot be used for fast work.

Cooke Cinematograph Projection lenses are well known. They are constructed so that the rear lens is very close to the film gate, thus gathering all the light coming through the film, making the projected image very brilliant. The front lens is large also, so that they pass more light than the ordinary type of projection lens.