PATENT SPECIFICATION

564,815

COMPLETE SPECIFICATION

Improvements in or relating to Optical Objectives

We, KAPELLA LIMITED, a Company registered under the Laws of Great Britain, and CHARLES GORRIE WYNNE, British Subject, both of 104, Stoughton
5 Street, Leicester, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—
10 This invention relates to an improvement in or modification of the optical objective for photographic or projection or like purposes described and claimed in British Patent No. 522651. The optical
15 objective of such prior Patent comprises two compound dispersive meniscus components with their concave surfaces facing one another, disposed between a front collective component and a pair of rear col-
20 lective components, the three collective components preferably all being simple elements, the refractive indices of the glasses used for the front element of the front compound dispersive component, for
25 the rear element of the rear compound dispersive component and for the front member of the pair of rear collective components being greater than 1.63, whilst the two rear collective components each
30 have their shallower surfaces facing the front. It is to be understood that the term " front," as herein used, refers to the side of the objective nearer to the longer conjugate and the term " rear "
35 to that nearer the shorter conjugate.

The present invention has for its object still further to improve the correction of the aberrations of such objective, and to this end according to the invention the
40 rear element of the rear compound dis-

persive component and the front member of the pair of rear collective components are each made of material having mean refractive index between 1.70 and 1.80 and Abbé V number between 40 and 50. 45 As in the objective of the prior specification both rear collective components have their shallower surfaces facing the front, and the power of the collective rear component lies between 40% and 70% of the power 50 of the whole objective.

The radii of curvature of the rear surfaces of the two rear components are preferably both numerically less than 4.0 and greater than 1.5 times the equivalent focal 55 length of the objective. The sum of the numerical values of the radii of curvature of the concave air exposed surfaces of the two compound dispersive components preferably lies between .5 and .7 times 60 the equivalent focal length of the objective.

A preferred practical example of objective according to the invention is illustrated in the accompanying drawing, and 65 numerical data for such example are given in the following table, in which R_1 R_2 . . . represent the radii of curvature of the individual surfaces counting from the front, the positive sign indicating that the 70 surface is convex to the front and the negative sign that it is concave thereto, D_1 D_2 . . . represent the axial thicknesses of the individual elements, and S_1 S_2 . . . represent the axial air separa- 75 tions between the various components. The tables also give the mean refractive indices n_D for the D-line and the Abbé V numbers of the materials used for the elements, 80

Equivalent focal length 1.000 Radius		Thickness or Air Separation		Relative Aperture F/1.5 Refractive Index n_D	Abbé V Number.
R_1	+ .8082				
		D_1	.1086	1.6135	59.3
R_2	+ 6.164				
		S_1	.0020		
R_3	+ .3971				
		D_2	.1692	1.6431	48.1
R_4	+ 8.000				
		D_3	.0313	1.67605	32.3
R_5	+ .2738				
		S_2	.2006		
R_6	− .3642				
		D_4	.0414	1.608	39.6
R_7	+ 1.263				
		D_5	.1505	1.7445	45.8
R_8	− .5500				
		S_3	.0020		
R_9	+ 5.064				
		D_6	.0576	1.7445	45.8
R_{10}	− 2.251				
		S_4	.0020		
R_{11}	+ 3.604				
		D_7	.0495	1.6135	59.3
R_{12}	− 2.416				

In this example it will be noticed that the two rear components both have their front surfaces R_9 and R_{11} shallower than their rear surfaces R_{10} and R_{12}, and the radii of such rear surfaces lie between 1.5 and 4.0 times the equivalent focal length of the objective. The power of the rear component is about 43% the equivalent power of the whole objective. The mean refractive index of the material used for the front element of the front compound dispersive component is greater than 1.63. The material used in this example for the rear element of the third component and for the fourth component is a glass, known under the reference E.K.2 and manufactured in accordance with British Patent No. 462304. The numerical sum of the radii R_5 and R_6 amounts to about .65 times the equivalent focal length of the objective. The back focal length is .5714 times the equivalent focal length.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. An improvement in or modification of the optical objective claimed in British Patent No. 522651, wherein the rear element of the rear compound dispersive component and the front member of the pair of rear collective components are each made of material having mean refractive index between 1.70 and 1.80 and Abbé V number between 40 and 50.

2. An optical objective as claimed in Claim 1, in which the power of the collective rear component lies between 40% and 70% of the equivalent power of the objective.

3. An optical objective as claimed in Claim 1 or Claim 2, in which the radius of curvature of the rear surface of each of the two rear collective components is numerically less than 4.0 and greater than 1.5 times the equivalent focal length of the objective.

4. An optical objective as claimed in Claim 1 or Claim 2 or Claim 3, in which the numerical sum of the radii of curvature of the concave air-exposed surfaces of the two compound dispersive components lies between .5 and .7 times the equivalent focal length of the objective.

5. An optical objective having numerical data substantially in accordance with the table herein set forth.

Dated this 29th day of March, 1943.

PULLINGER & MALET,

Agents for the Applicants.

[This Drawing is a full-size reproduction of the Original.]