

PATENT SPECIFICATION

333.065



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PROVISIONAL SPECIFICATION.

Improvements in Lenses.

We, ARTHUR WARMISHAM, a British Subject, and KAPELLA LIMITED, a British Company, both of 104, Stoughton Street, Leicester, do hereby declare the nature of this invention to be as follows:—

5 This invention relates to objectives for photography or projection, and especially to the type comprising four members separated by air spaces, the two outer members being simple and convergent, 10 and the two inner members being compound and divergent and presenting their outer surfaces of weaker curvature toward the median air space. The object of this invention is to provide objectives of said 15 type having effective working aperture $F/1.5$ and improved approximation to anastigmatically flat field of semi-angle 12° or more. This object we attain according to the present invention by 20 forming each divergent member with a

convergent cemented contact surface of deeper curvature than either of its outer surfaces.

Preferably the front divergent member 25 approximates to a concavo-plane form, while the rear divergent member is of meniscus shape.

Dated the Twenty-third day of August, 1929.

ARTHUR WARMISHAM,
KAPELLA LIMITED.

The common seal of Kapella Limited was hereunto affixed in the presence of:—

WM. TAYLOR,
A. WARMISHAM
Directors.
T. E. HUDSON,
Secretary.

COMPLETE SPECIFICATION.

Improvements in Lenses.

We, ARTHUR WARMISHAM, a British 30 Subject, and KAPELLA LIMITED, a British Company, both of 104, Stoughton Street, Leicester, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly 35 described and ascertained in and by the following statement:—

This invention relates to objectives for photography or projection, and especially to the type comprising four members 40 separated by air spaces, the two outer members being simple and convergent, and the two inner members being compound and divergent and presenting their outer surfaces of weaker curvature toward 45 the median air space. The object of this invention is to provide objectives of said type having effective working aperture $F/1.5$ and improved approximation to anastigmatically flat field of semi-angle 50 12° or more. This object we attain according to the present invention by forming each divergent member with a

deeper curvature than either of its outer 55 surfaces.

Preferably the front divergent member approximates to a concavo-plane form, while the rear divergent member is of meniscus shape.

Constructions according to this inven- 60 tion comprise only six glasses and eight air glass surfaces, and they are an improvement on the $F/1.5$ objectives described in British Patent Specification No. 258,092 in respect of field flattening. 65

The invention will now be illustrated by a numerical example of constructional data of an objective and with reference to the drawing.

The notation of the example is that the successive radii of curvature, counting 70 from the front, are called R_1, R_2 , etc., the sign + denoting that the curve is convex toward the front, and - that it is concave toward the front. 75

The thicknesses of the lenses are denoted by T_1, T_2 , etc., and the axial distances between the surfaces R_1 and R_3 ,

R_5 and R_6 , and R_8 and R_9 , are denoted by S_1 , S_2 , and S_3 respectively.

The material is defined in terms of the mean refractive index "D, as convention-

ally employed, and further by the type-number in Messrs. Chance Brothers' optical glass catalogue.

	E.F.L.	1.038		Relative aperture F/1.48		Messrs. Chance Brothers' Catalogue Type.
				"D	V	
10	$R_1 + .58615$					
		$T_1 .2465$		1.6230	56.3	6665
	$R_2 - 2.1483$					
15		$S_1 .07$	air			
	$R_3 - .8761$					
		$T_2 .03$		1.6220	36.2	361
	$R_4 + .6500$					
		$T_3 .11$		1.6449	48.3	5902
20	$R_5 + 23.36$					
		$S_2 .06$	air			
	$R_6 + 1.2340$					
		$T_4 .15$		1.6449	48.3	5902
	$R_7 - .3803$					
25		$T_5 .03$		1.6220	36.2	361
	$R_8 + .4167$					
		$S_3 .08$	air			
	$R_9 + .7683$					
		$T_6 .15$		1.6449	48.3	5902
30	$R_{10} - 1.4860$					

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. Photographic or projection objectives of the type comprising four separated members, the two outer members being simple and convergent, and the two inner members being dispersive and compound, and presenting their outer surfaces of weaker curvature toward the median air space, characterised by each divergent member having a convergent cemented contact surface of deeper curvature than either of its outer surfaces.

2. Objectives as claimed in claim 1 and in which front divergent member is externally of substantially plano-concave form, while rear divergent member is externally of meniscus form.

Dated the Tenth day of April, 1930.

ARTHUR WARMISHAM,
KAPELLA LIMITED.

The common seal of Kapella Limited was hereunto affixed in the presence of:—

WM. TAYLOR,
G. STAFFORD,

Directors.

G. STAFFORD,

Secretary.

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

