

PATENT SPECIFICATION



Application Date: Dec. 18, 1935. No. 35067/35.

461304

Complete Specification Left: Oct. 15, 1936.

Complete Specification Accepted: Feb. 15, 1937.

PROVISIONAL SPECIFICATION

Improvements in Lenses for Photography and the like

We, HORACE WILLIAM LEE, a British Subject, of 52, Grove Park Gardens, Chiswick, London, W.4, and KAPELLA LIMITED, a British Company; of 104, 5 Stoughton Street, Leicester, do hereby declare the nature of this invention to be as follows:—

This invention relates to lenses of the kind described in our patent specification No. 377,537, and it has for its object to provide lenses well corrected for spherical and chromatic aberrations, coma, astigmatism, and also for distortion. In that specification we described and claimed such lenses in which the concave exterior surface of the rear dispersive component has a radius greater than 0.3 the focal length of the system and its convex exterior surface has a radius greater than 0.4 such focal length.

In lenses according to the present invention, the concave exterior surface of the rear dispersive component may have a radius 0.3 or less than 0.3 the focal length of the system, and its convex exterior surface may have a radius 0.4 or less than 0.4 such focal length, provided that we use, in each convergent component of the compound divergent menisci, glass of a refractive index greater than that in the divergent component associated with it but not exceeding it by more than .03.

In lenses according to this invention it is necessary, in order that they be cor-

rected for distortion, that the following conditions shall be observed:—

(1) The spherical aberration on the concave surface of the rear meniscus dispersive component (that on the shorter conjugate side of the system) is at least 75% greater than that on the concave surface of the front meniscus dispersive component.

(2). The point midway between the images of the front and rear surfaces of the entire system, in the space on the long conjugate side of the system, divides the space between the images of the concave surfaces of the dispersive components in a ratio not exceeding 3:1, counting such spaces in order from the long conjugate side of the system.

We now give data for the construction of one example. The notation is that the successive radii of curvature, counting from the front, are called R_1, R_2 , etc., the sign + denoting that the curve is convex toward the incident light, and - that it is concave toward the same. The axial thicknesses of the elements are denoted by D_1, D_2 , etc., and the separations of the components by S_1, S_2 , etc.

The material is defined in terms of the mean refractive index nD , as conventionally employed, followed by the type number in Messrs. Chance Brothers' optical glass catalogue. The Abbe V number also is given.

EXAMPLE.

	Aperture F/2.		Equivalent focal length 1.0			
	Radii.	Thickness.	Separation.	nD .	V.	No.
70	R_1 + .644	D_1 .08		1.61	53.3	610533
	R_2 + 2.650		S_1 .005			
75	R_3 + .404	D_2 .146		1.6234	56.2	623562
	R_4 + 2.267	D_3 .040		1.6083	39.6	608396
80	R_5 + .247		S_2 .20			
	R_6 - .289	D_4 .040		1.6054	38.0	605380

		Aperture F/2.		Equivalent focal length 1.0		
	Radii.	Thickness.	Separation.	ⁿ D.	V.	No.
	R ₇ + .464	D ₅ .130		1.6209	57.2	621572
	R ₈ - .374		S ₃ .005			
5	R ₉ + 1.789	D ₆ .081		1.6234	56.2	623562
	R ₁₀ - 1.04					

HORACE WILLIAM LEE,
KAPELLA LIMITED,

The Common Seal of
Kapella Limited was
hereunto affixed in the
presence of:—

J. RONALD TAYLOR,
Director.

G. STAFFORD,
Secretary.

Dated the Seventeenth Day of Decem-
ber, 1935.

COMPLETE SPECIFICATION

Improvements in Lenses for Photography and the like

We, HORACE WILLIAM LEE, a British
10 Subject, of 52, Grove Park Gardens,
Chiswick, London, W.4, and KAPELLA
LIMITED, a British Company; of 104,
Stoughton Street, Leicester, do hereby
declare the nature of this invention and
15 in what manner the same is to be per-
formed, to be particularly described and
ascertained in and by the following state-
ment:—

This invention relates to lenses of the
20 kind comprising two compound meniscus
dispersive components with their concave
surfaces facing one another, said compo-
nents being between two collective compo-
25 nents having surfaces of different curv-
atures and having their more strongly
curved surfaces turned outwards, and it
has for its object to provide lenses well
corrected for spherical and chromatic
30 aberrations, coma, astigmatism, and also
we described and claimed such lenses in
which the concave exterior surface of the
rear dispersive component has a radius
greater than 0.3 the focal length of the
35 system, and its convex exterior surface
has a radius greater than 0.4 such focal
length.

In lenses according to the present in-
vention, the concave exterior surface of
40 the rear dispersive component may have
a radius 0.3 or less than 0.3 the focal
length of the system, and its convex ex-
terior surface may have a radius 0.4 or
less than 0.4 such focal length, provided
45 that we use, in each convergent compo-
nent of the compound divergent menisci,
glass of a refractive index greater than

that in the divergent component associ-
ated with it but not exceeding it by more
than .03.

In lenses according to this invention it
is necessary, in order that they be cor-
rected for distortion, that the following
conditions shall be observed:—

(1). The spherical aberration on the
55 concave surface of the rear meniscus dis-
persive component (that on the shorter
conjugate side of the system) is at least
75% greater than that on the concave
60 surface of the front meniscus dispersive
component.

(2). The point midway between the
images of the front and rear surfaces of
the entire system, in the space on the
long conjugate side of the system, divides
65 the space between the images of the con-
cave surfaces of the dispersive components
in a ratio not exceeding 3:1, counting
such spaces in order from the long con-
jugate side of the system.

We now give data for the construction
of three examples. The notation is that the
successive radii of curvature, counting
from the front, are called R₁, R₂, etc.,
75 the sign + denoting that the curve is
convex toward the incident light, and -
that it is concave toward the same. The
axial thicknesses of the elements are de-
noted by D₁, D₂, etc., and the separations
80 of the components by S₁, S₂, etc.

The material is defined in terms of the
mean refractive index ⁿD, as convention-
ally employed, followed by the type
number in Messrs. Chance Brothers'
optical glass catalogue. The Abbe V 85
number also is given.

EXAMPLE I.

	Aperture F/2.		Thickness.	Equivalent focal length 1.0			No.
	Radii.			Separation.	μ D.	V.	
5	R ₁	+ .644	D ₁ .08	S ₁ .005	1.61	53.3	610533
	R ₂	+ 2.650					
	R ₃	+ .404	D ₂ .146		1.6234	56.2	623562
10	R ₄	+ 2.267	D ₃ .040	S ₂ .20	1.6083	39.6	608396
	R ₅	+ .247					
	R ₆	- .289	D ₄ .040		1.6054	38.0	605380
15	R ₇	+ .464	D ₅ .130	S ₃ .005	1.6209	57.2	621572
	R ₈	- .374					
	R ₉	+ 1.789	D ₆ .081		1.6234	56.2	623562
20	R ₁₀	- 1.04					

EXAMPLE II.

	Aperture F/2.		Thickness.	Equivalent focal length 1.0			No.
	Radii.			Separation.	μ D.	V.	
25	R ₁	+ .6440	D ₁ .080	S ₁ .005	1.61	53.3	610533
	R ₂	+ 2.534					
	R ₃	+ .4011	D ₂ .146		1.6234	56.2	623562
30	R ₄	∞	D ₃ .040	S ₂ .20	1.6083	39.6	608396
	R ₅	+ .2477					
	R ₆	- .2880	D ₄ .040		1.6054	38.0	605380
35	R ₇	+ .5840	D ₅ .130	S ₃ .005	1.6209	57.2	621572
	R ₈	- .3798					
	R ₉	+ 1.670	D ₆ .081		1.6234	56.2	623562
40	R ₁₀	- 1.040					

EXAMPLE III.

		Aperture F/2.		Equivalent focal length 1.0				
		Radii.	Thickness.	Separation.	"D.	V.	No.	
5	R ₁	+	.6440	D ₁	.08	1.61	53.3	610533
	R ²	+	2.421					
	R ₃	+	.3983	D ₂	.146	1.6234	56.2	
R ₄	-	2.222						
10	R ₅	+	.2469	D ₃	.040	1.6083	39.6	608396
	R ₆	-	.2891					
	R ₇	+	.7937	D ₄	.040	1.6054	38.0	
R ₈	-	.3818						
15	R ₉	+	1.631	D ₅	.130	1.6209	57.2	621572
	R ₁₀	-	1.040					
	R ₁₁	-	1.040	D ₆	.081	1.6234	56.2	
R ₁₂	+	1.631						
20	R ₁₃	+	1.631	D ₇	.081	1.6234	56.2	623562
	R ₁₄	-	1.040					
	R ₁₅	-	1.040	D ₈	.081	1.6234	56.2	
R ₁₆	+	1.631						

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. Objectives of the kind referred to in which the concave exterior surface of the rear dispersive component has a radius not greater than 0.3 the focal length of the system, and its convex exterior surface a radius not greater than 0.4 such focal length, and in which the refractive index of each convergent component of the compound divergent menisci exceeds that of the divergent component associated with it but not by more than .03.

2. Objectives as claimed in claim 1, and constructed substantially according to the examples herein.

Dated the Fourteenth Day of October, 1936.

KAPPELLA LIMITED,
The Common Seal of
Kapella Limited was
hereunto affixed in the
presence of:—

A. WARMISHAM,

Director,

G. STAFFORD,

Secretary,

(For Selves and Co-Applicant).

[This Drawing is a reproduction of the Original on a reduced scale.]

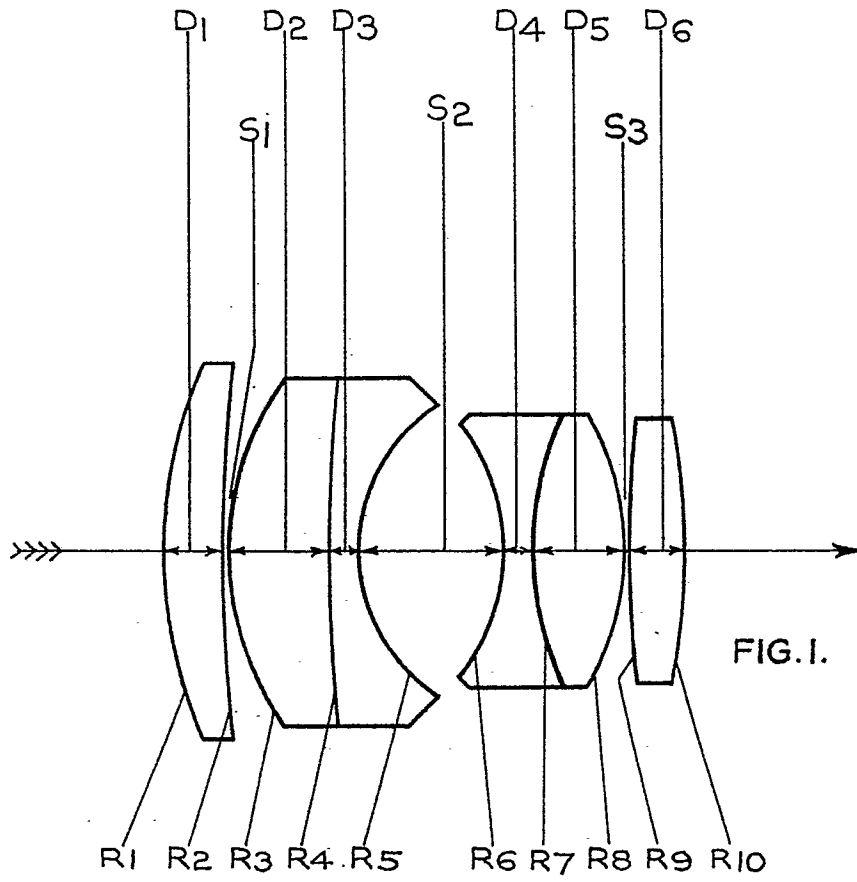


FIG. 1.

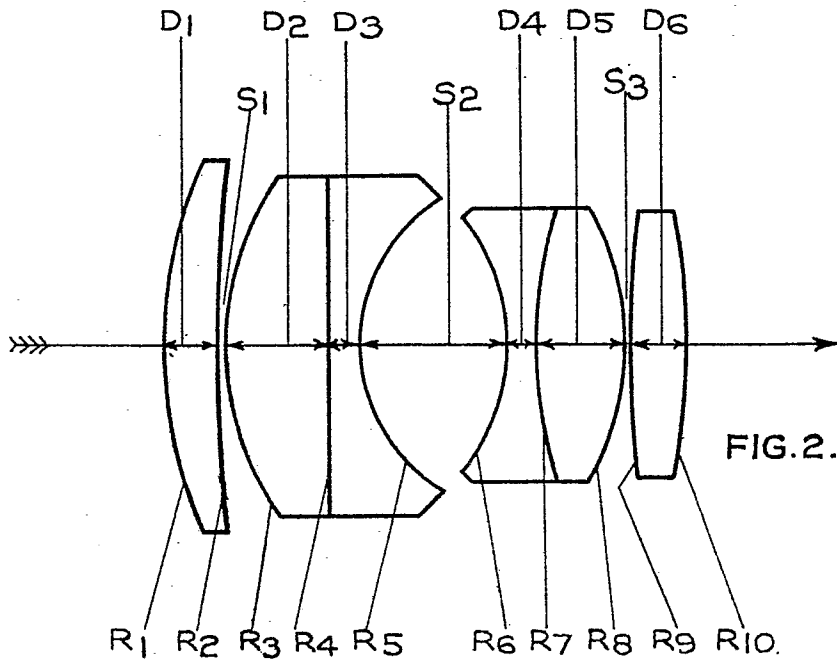


FIG. 2.

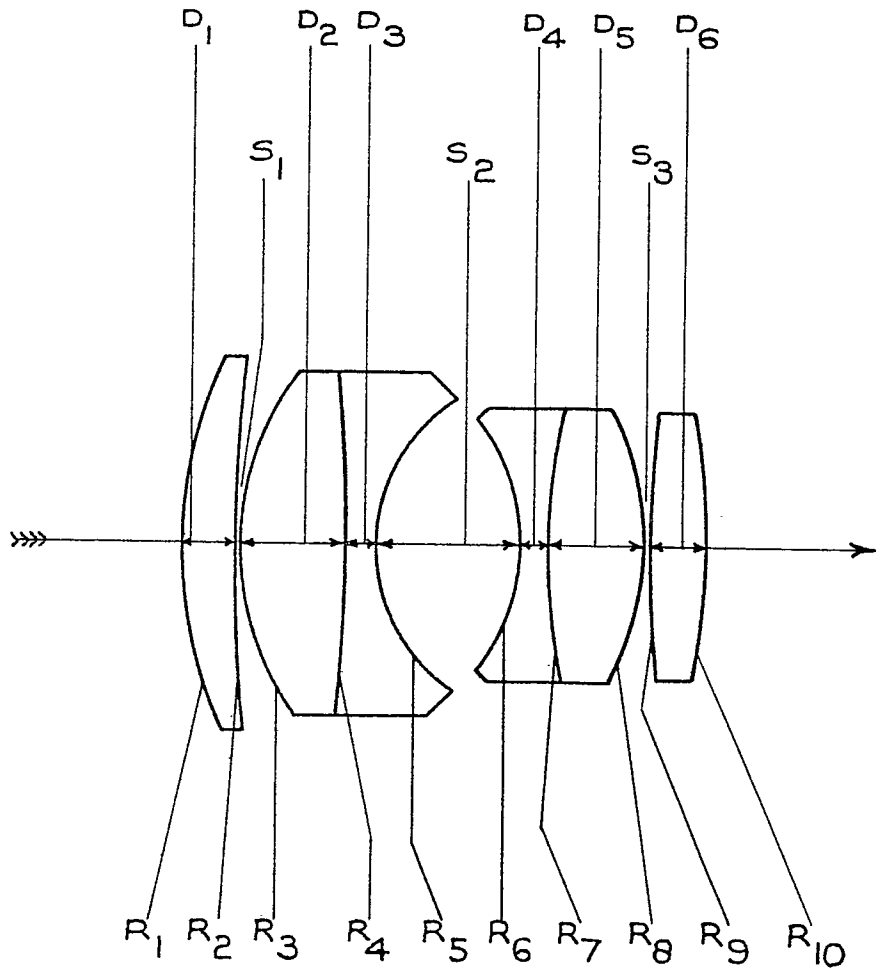


FIG. 3.

461,304 COMPLETE SPECIFICATION

[This drawing is a reproduction of the Original on a reduced scale.]

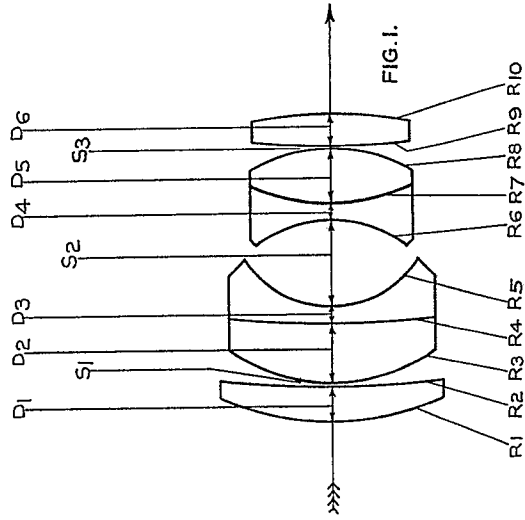


FIG. 1.

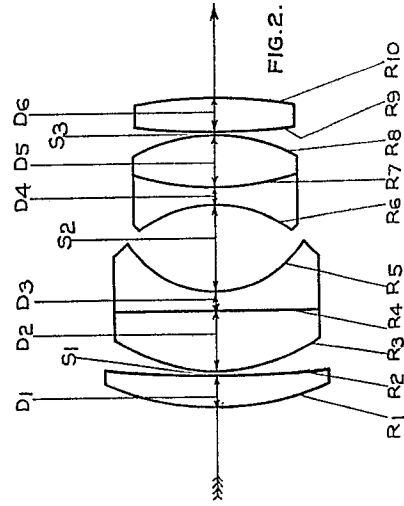


FIG. 2.

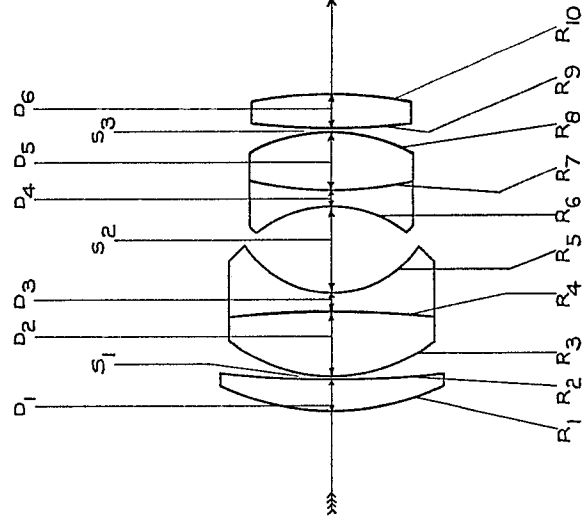


FIG. 3.