

PATENT SPECIFICATION

271,186

Application Date: March 4, 1926. No. 6093/26.

Complete Left: May 28, 1926.

Complete Accepted: May 26, 1927.



PROVISIONAL SPECIFICATION.

A Single Lens Photographic Objective.

We, THE HOUGHTON-BUTCHER MANUFACTURING COMPANY LIMITED (an English limited liability company, duly registered), of Clifford Road, Walthamstow, London, E. 17; ALFRED JOSEPH DENNISS, of "The Langdales", Connaught Avenue, Chingford, Essex, General Manager of the aforesaid company, and FRANK HAINSWORTH, of 69A, Wakefield Street, East Ham, London, E. 6, both British subjects, do hereby declare the nature of this invention to be as follows:—

This invention has reference to a single lens photographic objective designed for use in front of its diaphragm.

It has been found that such a position of a lens tends to increase its fundamental aberrations, which may, however, be reduced to reasonable dimensions by making the lens unusually thick. This thickening of the lens substantially reduces the coma, and has a tendency to diminish spherical aberration.

It is further found that in order to reduce distortion, the stop distance must be kept small, and this enables the lens to be made of small diameter, which greatly reduces the aberrations of the extra-axial pencils. The small stop distance, however, necessitates, in order that it may "cover" adequately, a lens of deep meniscus shape which again tends to increase the spherical aberration.

The present invention comprises a

single lens objective having the following features:—

(1) The stop or diaphragm distance (said diaphragm being behind the lens) must not be more than 15% of the focus of the lens measured from R1. 40

(2) The spherical under-correction for a ray $3.8\frac{m}{m}$ from the axis must be greater than 2.5% of the focus of the lens.

(3) $\frac{R2}{R1}$ lies between 1 and 2. 45

The following is an example of a lens of $100\frac{m}{m}$ equivalent focus which fulfils the above conditions in accordance with the present invention:—

| | | | | | | | |
|-----------------------|---|---|---|---|---|----------------------|----|
| R1 | - | - | - | - | - | = 15 $\frac{m}{m}$ | 50 |
| R2 | - | - | - | - | - | = 19.7 $\frac{m}{m}$ | |
| D1 | - | - | - | - | - | = 2.5 $\frac{m}{m}$ | |
| Aperture of lens | - | - | - | - | - | = 10.5 $\frac{m}{m}$ | |
| Stop distance from R1 | - | - | - | - | - | = 7.5 $\frac{m}{m}$ | |
| Nd | - | - | - | - | - | = 1.52441 | 55 |
| Nf | - | - | - | - | - | = 1.53063 | |

Spherical under-correction for a ray parallel to the axis and $3.8\frac{m}{m}$ from it = 3% of the focus. 60

$$\frac{R1}{R2} = \frac{19.7}{15} = 1.31.$$

Dated this 4th day of March, 1926.

TONGUE & BIRKBECK,
Agents for the Applicants.

COMPLETE SPECIFICATION.

A Single Lens Photographic Objective.

We, THE HOUGHTON-BUTCHER MANUFACTURING COMPANY LIMITED (an English limited liability company, duly registered), of Clifford Road, Walthamstow, London, E. 17; ALFRED JOSEPH DENNISS, of "The Langdales", Connaught Avenue, Chingford, Essex, General Manager of the aforesaid company, and

[Price 1/-]

FRANK HAINSWORTH, of 69A, Wakefield Street, East Ham, London, E. 6, both British subjects, 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:—

This invention has reference to a single 80

lens photographic objective designed for use in front of its diaphragm.

It has been found that such a position of a lens tends to increase its fundamental aberrations, which may, however, be reduced to reasonable dimensions by making the lens unusually thick. Thickening the lens substantially reduces the coma, and has a tendency to diminish spherical aberration.

It is further found that in order to reduce distortion, the stop distance must be kept small, and this enables the lens to be made of small diameter, which greatly reduces the aberrations of the extra-axial pencils. The small stop distance, however, necessitates, in order that it may "cover" adequately, a lens of deep meniscus shape which again tends to increase the spherical aberration.

The present invention comprises a single lens objective having the following features:—

(1) The stop or diaphragm distance measured from R1 (said diaphragm being behind the lens) is 15% or less of the focal length of the lens.

(2) The spherical under-correction for a ray incident upon the lens parallel to the axis and at a distance therefrom of 3.2% of the focal length must be greater than 2.5% of the focal length.

(3) $\frac{R_2}{R_1}$ lies between 1 and 2.

The accompanying drawing diagrammatically illustrates to an enlarged scale, and by way of example only, a lens of 100^m/_m equivalent focus which fulfils the above conditions in accordance with the present invention:—

In this drawing:—

A is a single meniscus lens, B its mounting, and C the stop or diaphragm disposed behind the lens.

X—Y is the axis of the lens and Z a ray incident thereon parallel to the axis X—Y and 3.2^m/_m from said axis.

The measurements and characteristics of the lens are as follows, all of said measurements being in millimetres:—

| | | | | |
|----|-----------------------|---|---|------------------------------------|
| 50 | Equivalent focus | - | - | = 100 ^m / _m |
| | R1 | - | - | = 15 ^m / _m |
| | R2 | - | - | = 19.7 ^m / _m |
| | D1 | - | - | = 2.5 ^m / _m |
| | Aperture of lens | - | - | = 10.5 ^m / _m |
| 55 | Stop distance from R1 | - | - | = 7.5 ^m / _m |
| | Stop aperture | - | - | = 6.39 ^m / _m |
| | f/value | - | - | = F/14.4 |
| | Nd | - | - | = 1.52441 |
| | Nf | - | - | = 1.53063 |

Spherical undercorrection for ray Z - - - = 3% of the focal length. 60

$\frac{R_2}{R_1} = \frac{19.7}{15}$ - - - = 1.31.

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:— 65

1. A single lens photographic objective characterised in that (a) the stop or diaphragm distance measured from R1, said diaphragm being disposed behind the lens, is 15% or less of the focal length of the lens; (b) the spherical undercorrection for a ray incident upon the lens parallel to the axis and at a distance from said axis of 3.2% of the focal length is greater than 2.5% of the focal length; 70

(c) $\frac{R_2}{R_1}$ lies between 1 and 2. 75 80

2. A single lens photographic objective which when of 100^m/_m equivalent focus has the following characteristics —

| | | | | | |
|-----------------------|---|---|---|------------------------------------|----|
| R1 | - | - | - | = 15 ^m / _m | |
| R2 | - | - | - | = 19.7 ^m / _m | 85 |
| D1 | - | - | - | = 2.5 ^m / _m | |
| Stop distance from R1 | - | - | - | = 7.5 ^m / _m | |

Spherical under-correction for a ray incident upon the lens parallel to the axis and 3.2^m/_m therefrom - = 3% of the focal length. 90

3. A single lens photographic objective in accordance with Claim 2 in which 95

| | | | |
|-------------------|---|---|------------------------------------|
| The lens aperture | - | - | = 10.5 ^m / _m |
| The stop aperture | - | - | = 6.39 ^m / _m |

4. A single lens photographic objective in accordance with Claim 2 or Claim 3 having the following indices 100

| | | | | |
|----|---|---|---|-----------|
| Nd | - | - | - | = 1.52441 |
| Nf | - | - | - | = 1.53063 |

Dated this 28th day of May 1926.

TONGUE & BIRKBECK,
Bank Chambers, 329, High Holborn, 105
London, W.C. 1,
Agents for the Applicants.

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

