N° 322 A.D. 1905

Date of Application, 7th Jan., 1905

Complete Specification Left, 1st July, 1905—Accepted, 23rd Nov., 1905

PROVISIONAL SPECIFICATION.

Improvements relating to Lens and Prism Combinations for Photographic and like purposes

I OTTO PFENNINGER of 105 Hythe Rd. Brighton in the County of Sussex, Photographer do hereby declare the nature of this invention to be as follows:—

Two prisms of certain degrees are inserted anywhere between the front- and the back-combination of a photographic lens, or between the different meniscen or separate lenses forming a photographic lens.

The above named two prisms will form, if touching each other, two similar negatives at the back, but if the prisms are slightly separated or slightly superimposed then the prisms and lenses in combination will transmit three similar negative pictures at the back.

To guide the two or three pictures from the prisms to the focusing surface, the back meniscus, meniscen, single lens or lens-combinations may be cut band-like to addmit the passing of necessary partitions to keep separate the lightrays forming each picture; the partition or partitions may be sectional or a continuous whole.

For focusing the pictures, the front lens or front combination of the lens may be moved forwards or backwards separately or in conjunction with the back lens or back combination, including the prisms if necessary, or an extra single lens can be added to shorten or lengthen the focus; separate casings may be made to hold the separate parts of the optical combinations.

The pictureplane is formed on one photogr. plate or film or two or three photogr. plates or films, the photographic plane may be in a stright, curved or adapted line.

If colour records are required, the necessary colourfilters can be inserted anywhere, but best between the front of the prisms and the pictureplane.

I am also able, by using: ordinary or achromatic prisms, colour correcting or absorbing filters, special lenses or colour filters in my lens and prism combination to correct chromatic aberation.

By using two equal or paired lens and prism combinations at certain distance, sterio's can be produced with all advantages enumerated in this specification.

Prisms and single lenses, prisms and colour filters, single lenses, meniscen and colour filters in single or double combinations may be formed from one piece of glass or may be cemented together and used anywhere in above lens and prism combination.

If my lens and prism combination as specified aforsaid is used the same way or in reversed or partly reversed order in conjunction with projecting or viewing apparatuses, colourscreens and positives from negativepictures, then I am also able to show a positive rendering in natural colours, that is in two or three colours according to the taking of the negative records in the first instance.

My new invention as elaborated aforsaid is in condensed form: the employment of (wedge shaped) prisms between lenses or lens combinations and as such is a new use of a new device in optics.

Dated this 6th. day of January 1905.

OTTO PFENNINGER.

[*Price* 8*d*.]

COMPLETE SPECIFICATION.

Improvements relating to Lens-and-Prism-Combinations for Photographic and like purposes.

I, OTTO PFENNINGER of 105 Hythe Road Brighton, in the County of Sussex, Photographer, 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 relates to a combination of prisms and lens or lenses in, and connected with two chromatic and three chromatic photography, and also optical projection, the latter known as cinematography, bioscopy.

Dr. Tumeaux (Patent 3729[03] was the first to adopt wedge-shaped prisms for this purpose. His patent recommends the prisms in front of the lenses, but certain inherent defects—(giving overlapping of the pictures in the focusing-plane; which cannot be corrected, not even by fixing light screens in front)—render it partly unfit for use.

In the same patent, Dr. Tumeaux also vaguely speaks about prisms at the back of lenses; and a specific form: „two prisms at the back of one lens", I have also investigated. It is true the pictures can be separated without overlapping; but the stronger dispersive power of the prisms required in this case, does not make the device very practicable. Neither Dr. Tumeaux nor Capt. Davidson thought of the possibility: that, prisms could be employed between lenses. The same misconception was formerly entertained, with regard to lens-stops.

If a prism is placed in the front, centre or back of an image-forming lens, or lens combination, the image is deflected. Now on account of the combined actions of prisms and lens, resulting in deflection, inversion, reversion and spectral aberration, it is only a matter of natural consequence, that the formed picture will show signs of unsharpness and of distortion.

The defects of the combination show least, when the prisms are placed at or near the crossing-point of the lightrays, that is, near the optical centre of the lens combination, giving then the smallest angle of deviation, reversion, dispersion *etc* and therefore the defects of distortion and unsharpness will be smallest and scarcely noticeable.

I may also point out, that the longer the focus of the lens, the narrower is the angle of the prism, required; that is, if the lens combination including the prisms, is giving a half inch dispersion, separation of pictures, in four inch focus, then the defect will be ½ × 2 if the distance is only two inches, and the same half inch dispersion and separation is required at the focusing point.

If prisms are used at the back or front of a photographic lens, and it is desirable to transform the same into my lens and prism combination, then a single lens, or a combination of lenses, can precede or follow the prisms, so as to bring the prisms between lenses. This addition is also a help to correct miscalculations in the lens and prism combination.

The adding of an extra lens will naturally shorten or lengthen the focus, and enlarge or reduce the size of picture.

In further explanation of my invention, I make reference to the accompanying drawing's,—(which are only illustrative and not correct to scale)—whereon are shown in plan, some of the possible arrangements for carrying my invention into effect, as set forth in my Provisional, as well as this completing Specification.

Figs. 1. 2. 3. 4. 5. show some of the possible positions of the wedge-shaped prisms, that is, prisms,—(with acute angles)—which may be achromatic or not.

Figs. 6. 7. 8. 9. 10. show some of the positions only, of prisms between lens combinations. They are for pictures in two-plane; if required for three-plane arrangement, then the prisms have to be placed as shown in Fig. 1. 3 or 5 and 11.

Fig. 11. Example of two-plane, *viz.* prisms and lens combination to give two pictures in one plane, that is, plane divided in two.

Fig. 12. Example of three-plane, *viz.* prisms and lens-combination to give three pictures in one plane, that is, plane divided in three.

Fig. 13. Face view of a cut back lens—(with partitions „ *c*" inserted)—of „ *k*" in Fig. 12, forming a sort of truss, or bundle-like whole. If required for Fig. 11, there would naturally be only one partition (*c*), which would be placed in the centre, (13^b.)

Fig. *a*. Example of prisms and lens, cut out of one piece of glass, with the addition of achromatising prisms (dotted).

Fig *b*. Example of prisms and lens cemented together, or joined without cement.

Fig *c*. Partition in sections—(overlapping if necessary)—to allow the focusing.

Fig. *d*. Partition in one length, with fixed focus only adaptable.

Fig. *e*. Colour-screens marked also Y (yellow), R (red), and B (blue)

Fig. *f*. Adapted picture-plane, that is, adapted or adjusted to the line of focus.

Fig. *g*. Achromatic prisms, shown also by shaded lines and dots.

Fig. *h*. Ordinary picture-plane, as used when the two or three photo-records are received on one film or one plate in one line; that is a straight plane.

Fig. *i* Single, double or achromatic lens.

Fig *k*. The back lens or back lenses being cut apart, to let the partitions „ *c*" or „ *d*" pass through to the prisms, so as to isolate each picture, in the space between the prisms to the focusing-surface „ *h*" or „ *f*".

In this back combination „ *k*", each lens part (segment) can naturally be mounted in separate lens mounts, or the lens parts can form one truss, sandwiching the partitions (one or two) „ *c*" or „ *d*" between the aforesaid lens parts, as shown in Fig. 13.

Fig. *ca*—Casings, telescopic or otherwise.

Fig. R. Y. B. stands for the lightrays, red, yellow and blue, (coming from one optical view), which are afterwards sorted out by the colour filters (screens) R—*e*, or Y—*e*, and B—*e*, and give then the necessary colour-records for photography in colours by the subtractive (printing), or additive (transparency) methods.

By this device of lens- and prism-combination, all the pictures are rendered, with the aid of one frontal-lens-combination, from one point of view only, and by the aid of the same device, in reversing the order of passing the lightrays, the two or three photographic records, are naturally reconstructing one picture.

I am aware that in Patent „ Gaelius 395^{00} a faceter lens to imitate the insect eye is used between lenses, but as each part of the facet is not separable and no partitions are used to isolate each picture, no real anticipation takes place.

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

Lens- and prism-combinations in which, wedge-shaped prisms are placed between lenses, and by this optical device effect my object, namely to form: one, two or three photographic picture-records in an adapted-focusing plane.

Dated this 1st day of July 1905.

OTTO PFENNINGER.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1905.

A.D. 1905. JAN. 7. N.° 322.

PFENNINGER'S COMPLETE SPECIFICATION.

SHEET 1.

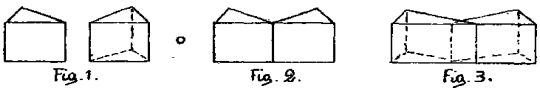

Fig. 1. Fig. 2. Fig. 3.

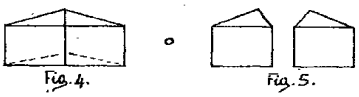

Fig. 4. Fig. 5.

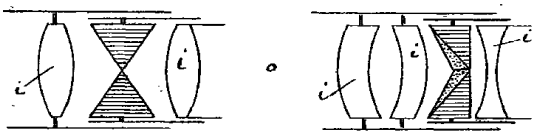

Fig. 6. Fig. 7.

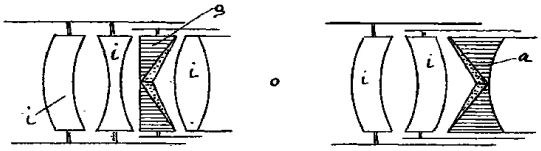

Fig. 8. Fig. 9.

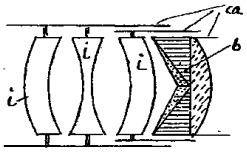

Fig. 10.

SHEET 2.

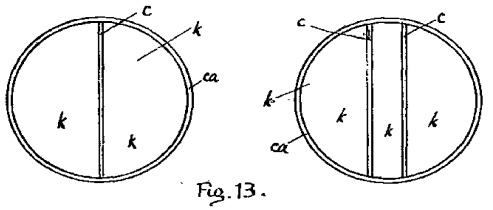

Fig. 13.

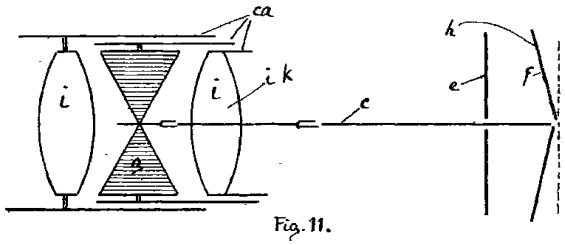

Fig. 11.

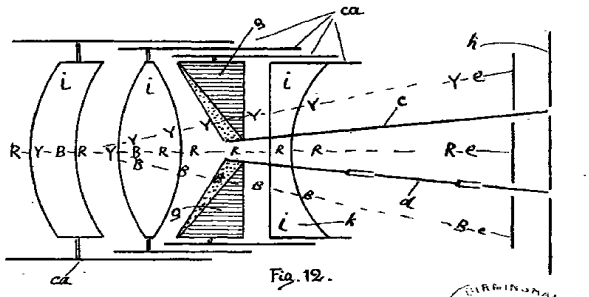

Fig. 12.

Malby&Sons Photo-Litho

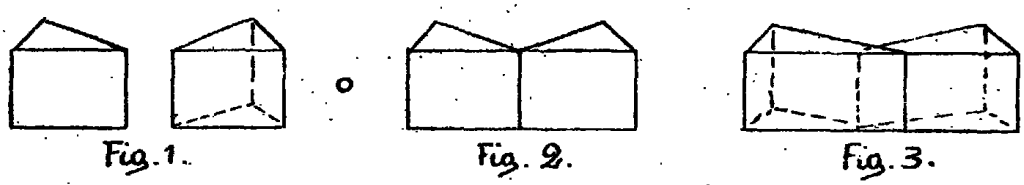

Fig. 1. Fig. 2. Fig. 3.

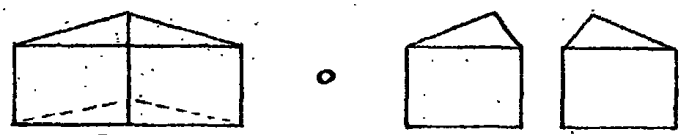

Fig. 4. Fig. 5.

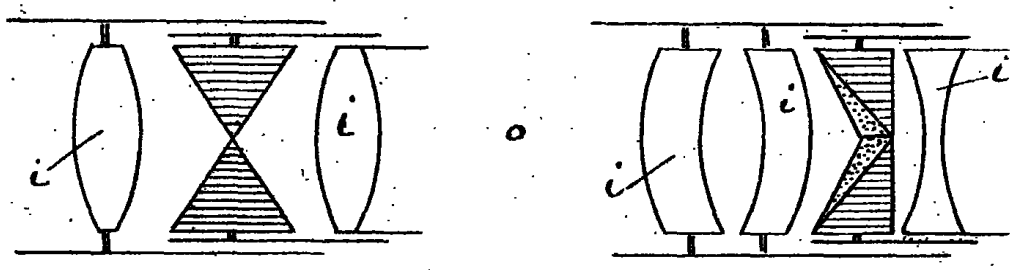

Fig. 6. Fig. 7.

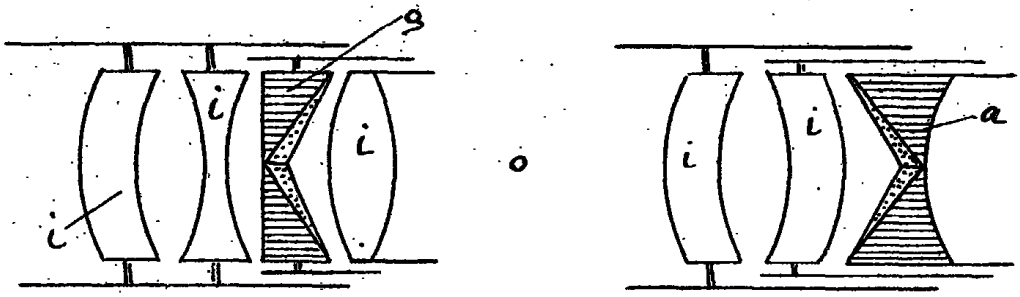

Fig. 8. Fig. 9.

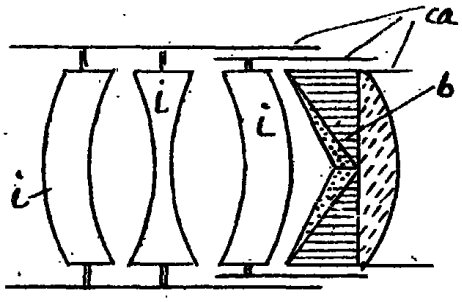

Fig. 10.

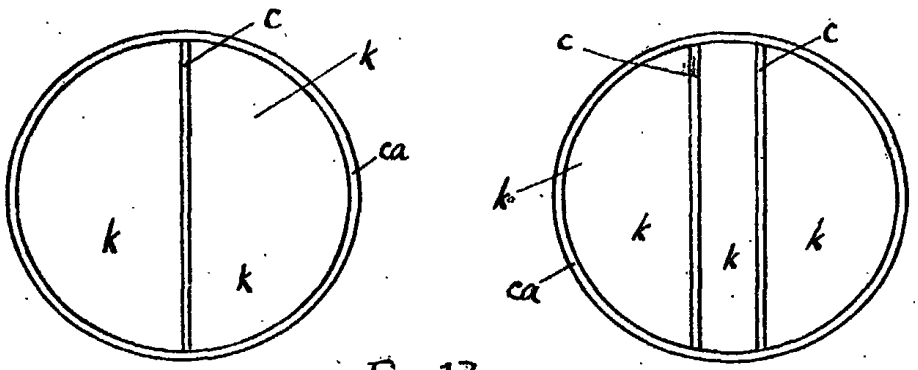

Fig. 13.

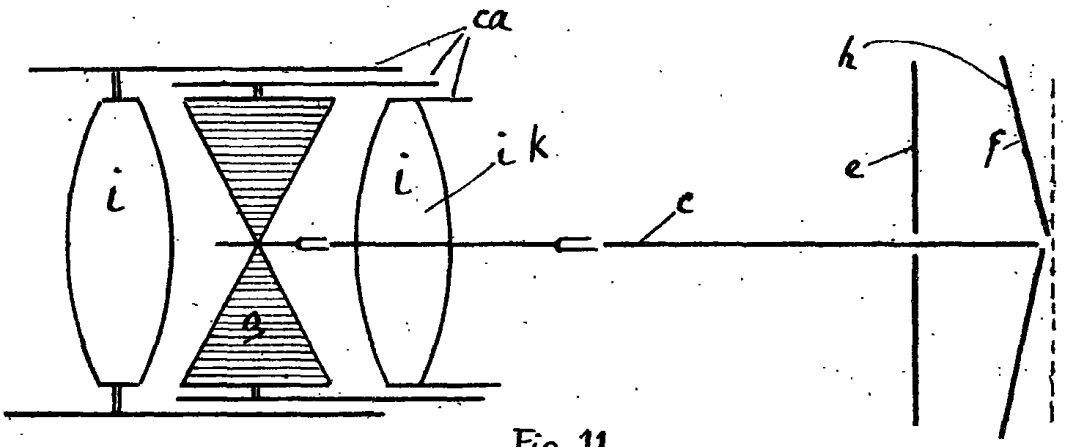

Fig. 11.

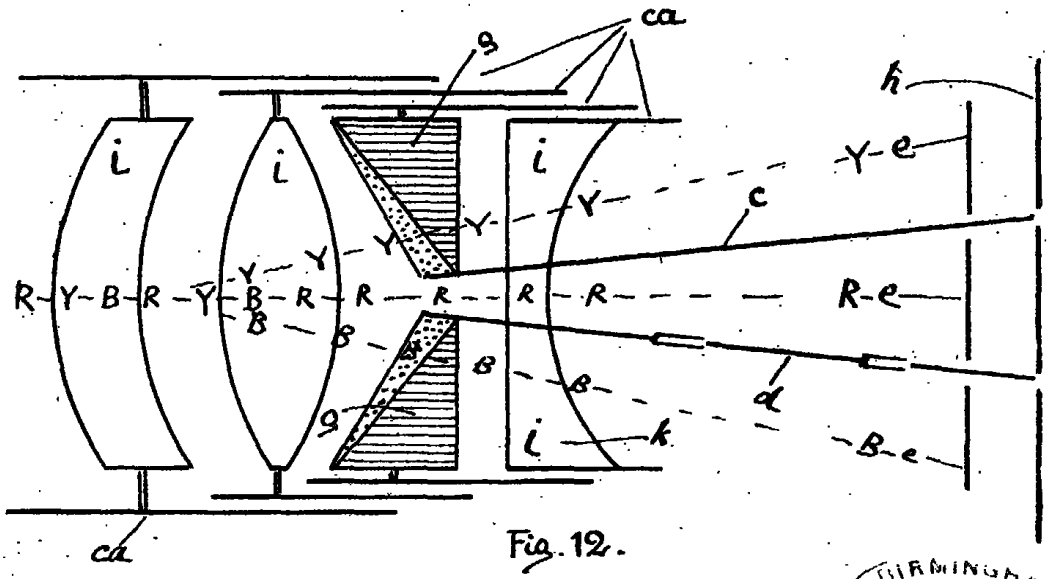

Fig. 12.

Malby&Sons, Photo-Litho.