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OPERATION OF A NEW TYPE OF DEVICE FOR THE SIMULTANEOUS COMPARISON OF PAIRS OF ASTRONOMICAL PLATES

In a previous paper (CECCARELLI 1967) one of us described the principle of operation of a new type of device designed to allow the simultaneous observation of pairs of astronomical plates for programs like detections of stars with ultraviolet colour excess etc.

The principle of the instrument is very simple and consists into forming the image of one plate on the emulsion surface of the second one by a proper optical system, and in observing this surface with a low magnification microscope.

In the paper quoted the advantages of this device over other instruments already in use, like the blink microscope, were discussed. These can be briefly summarized by saying that this technique should have the same attractive features of the one which is based on a double exposure on the same plate, with the additional advantages of an increase of the limiting magnitude due to the possibility of longer exposure times and of a larger freedom in choosing the two colour bands to be compared.

An instrument of this type has now been built by us with some improvements over the original design. Its performance has shown to be excellent, thus confirming the validity of the discussion previously made.

The mechanical part of the instrument consists into a large and accurate carriage which allows horizontal movements, on 40×40 cm^2 orthogonal coordinates, of a rigid frame which supports the two plates to be compared. The optics which form the image of the lower plate on the surface of the upper one is sketched in Fig. 1. It consists into two microscope objectives (Leitz Wetzlar P1 F1 4/014 170/-) and of a field lens placed between them. Other details of the instrument (micrometric movements, coordinates, reading etc.) are routine items and do not need to be described.

As far as the quality of the images is concerned we can say that it is almost impossible to notice a difference between the images of the faintest stars observed on a single plate and the same images observed simultaneously on two plates. Of course in the last case the graininess of the background is definitely higher. However this does not seem to affect significantly the limit at which a faint star can be detected, probably because the contrast ratio between the star image and the background remains unchanged.

For the detection of ultraviolet excess stars etc, the images corresponding to the two plates are of course kept deliberately separated. If, on the contrary,

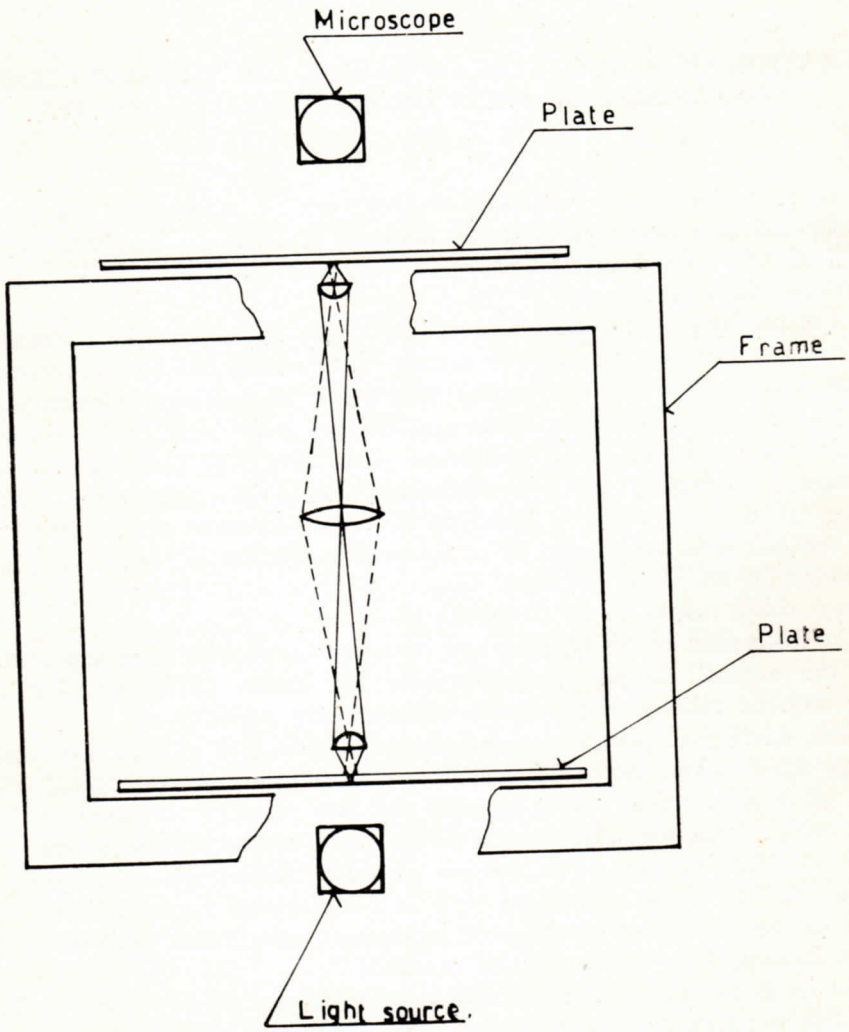

Fig. 1 - Principle of optical working of the instrument.

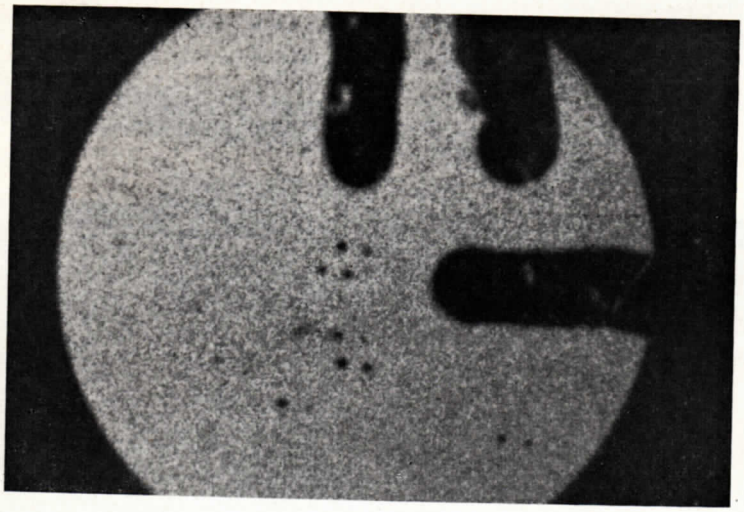

Fig. 2a

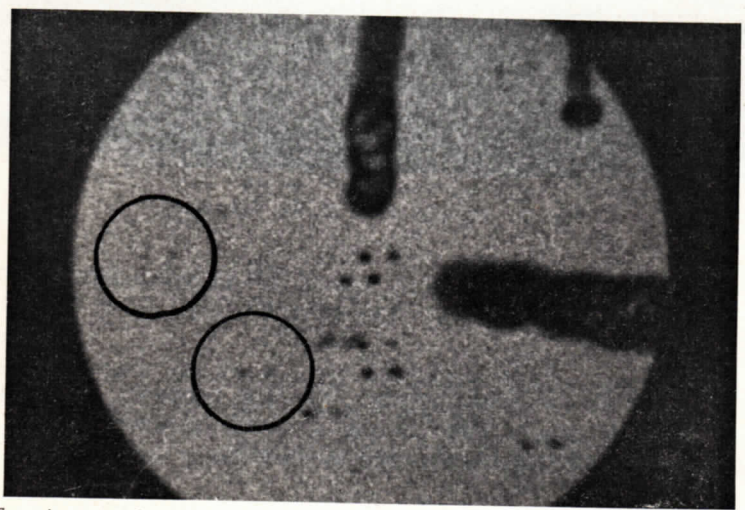

Fig. 2b - Two images of the same field as observed in a two color *U* and *B* plate (Fig. 2a) and in two separate plates superposed by the instrument (Fig. 2b).

the two images are carefully superimposed, then the contrast of faint features is significantly increased due to the property of the device to multiply the transmittances of the two plates. This property might be found useful for instance to allow direct observation of very faint nebular features, which would normally be detectable only by micro-photometric measurements of the plates.

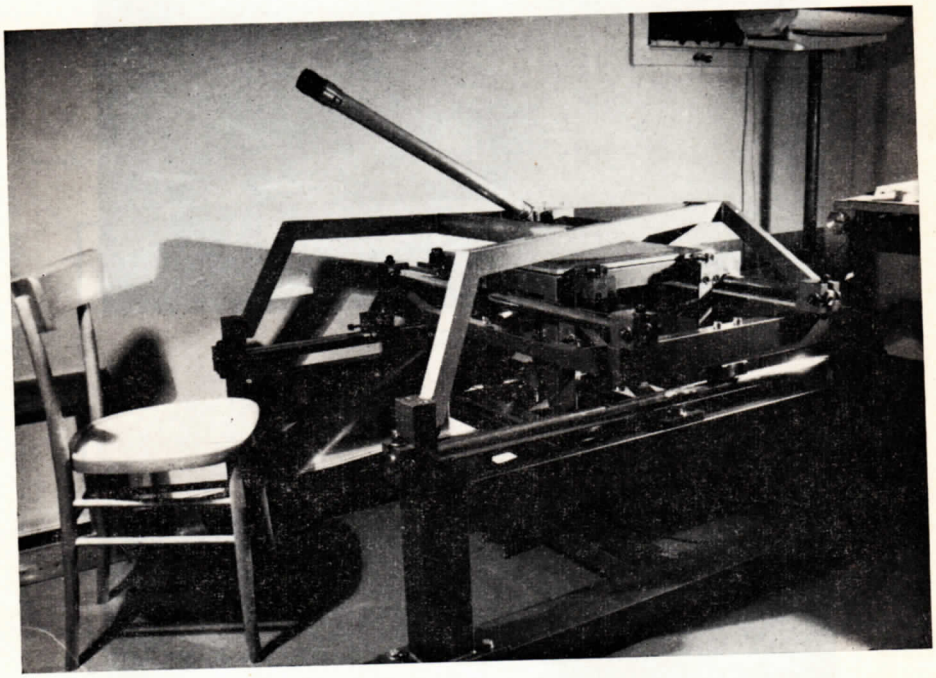

Fig. 3 - General view of the instrument.

Fig. 2, a and b, correspond to the same field observed — respectively — in one 48' Schmidt camera plate having a double exposure in the blue and ultraviolet (B images on the left), and in two plates superimposed with our instrument.

For instance, it can be seen that starlike objects of about 21th magnitude, like those encompassed by the circles, which show quite distinctively both in the B and U plates, do instead show only in the blue filter exposure of the two images plate, and not in the ultraviolet exposure.

Two views of the instrument are given in Fig. 3 and 4.

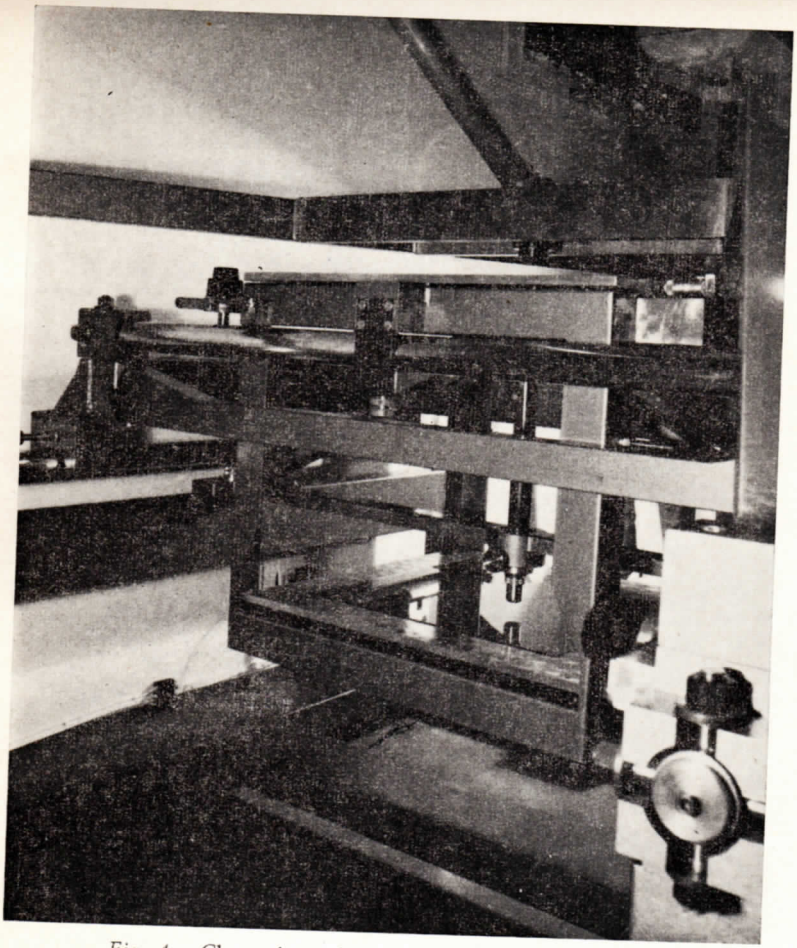

Fig. 4 - Close view of the frame supporting the plates.

The images reproduced in Fig. 2a and 2b correspond to plates PS 9211-1965 (U: 60 min and B: 8 min), PS 1609-1967 (U: 120 min) and PS 1611-1967 (B: 15 min).

We wish to thank the Director of the Mount Wilson and Palomar Observatories for having put these plates at our disposal.

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CECCARELLI, M. 1967, *Mem. Soc. Astr. It.*, **38**, 439.

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