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AN ENLARGING CAMERA FOR ASTRONOMICAL PHOTOGRAPHY

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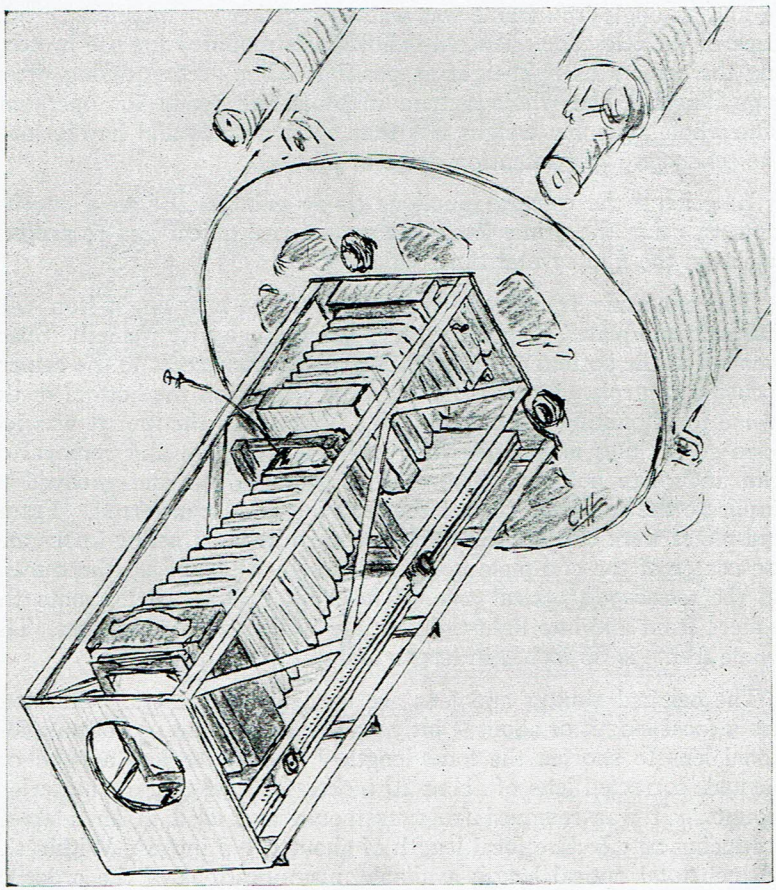

Fig. 1. The camera attached to the 20 1/2 inch telescope.

Students of astronomy at the University of Chattanooga are fortunate in having the use of one of the largest telescopes in the south, a 20 1/2 inch reflector. In October, 1949, two of these students, Barry V. Rhodes and Cord H. Link, Jr., began the design and construction of a photographic camera to be used on the telescope. The purpose of the camera was to produce pictures which might not require further enlargement, or which could be enlarged without having to worry about graininess in the final print. The camera has been used on the moon and on a few of the closest planets with good results.

Since the project was in the nature of an experiment, construction was kept as simple as possible. An old 5 x 7 view camera was borrowed from the physics department, a new bed was constructed for it, and an angle-iron frame was welded together for mounting on the back of the telescope. An old bellows was modified for use in keeping the camera as light-tight as possible. The accompanying drawings illustrate the whole camera in place and ready for operation. The whole assembly weighs less than forty pounds and hardly loads the telescope right ascension drive at all.

In general the camera functions as an enlarger, or as a copying camera, using the prime focus image as a real object and re-projecting it on the film several times enlarged.

The mounting framework was made of one-inch angle iron with 1/8 inch end-plates, diagonally braced, and all electric welded. Space was left at the bottom of the sides for continuous access to the camera focusing controls. Cross members were placed on the bottom of the frame for mounting the camera bed. The top of the mount was left open so nothing would interfere with the insertion and removal of film and plate holders. The camera bed was cut and grooved to duplicate the original bed and the focusing rack transferred. Frame end-plates were cut to clear the telescope mirror adjusting knobs and the center of the end-plate holes was designed to line up the camera on the telescope's optical axis. The front bellows latches onto the camera front and into light-tight fittings on the front end-plates. The whole frame is 36 inches in length and one foot square.

The original shutter and lens are used in the camera. This lens has a focal length of about 9 inches and requires the use of an additional lens to shorten the focal length. The writer had a good cemented, corrected lens of about 10 inches focal length, in shutterless mounts. It was removed from its mount and used in an adaptor, producing an effective focal length of about 4 1/2 inches. Within the 36 inch total optical length available, magnifications of the order of five times are easily obtained. At one time a 135 mm. lens from a press type camera was tried with no better results as to definition at maximum magnification.

The first photographs of the moon, taken with this camera, were limited to the crater Tycho and its near vicinity. On the negative, Tycho has a maximum diameter of one centimeter. The same evening, January 7, 1950, Venus was photographed, its diameter on the negative being 9 mm. On January 20, Saturn was photographed, the diameter of the planet's disk being about 2 mm. and its rings having a length of about 3 1/2 mm. Photographs of Mars were not

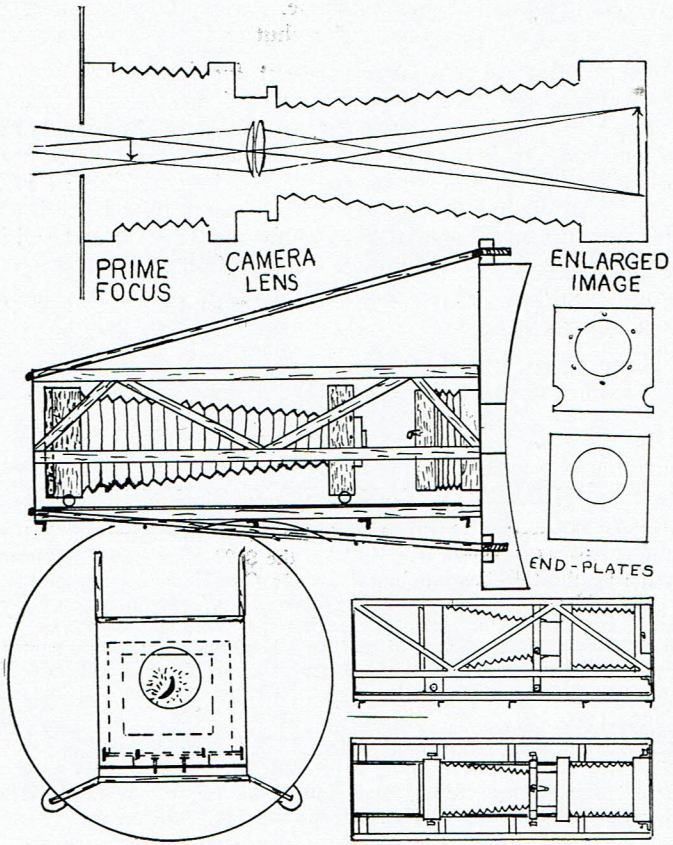

Fig. 2. The adjustable telescope camera. Above, the optical system of the camera. To the right, the end plates of the camera. The other sketches illustrate the construction of the camera.

satisfactory due to motion during exposure. These photographs were taken on Ansco Super Pan press film, exposure times being in the order of one second for Tycho and Venus, and up to 20 seconds for Saturn and Mars.

Operation of the camera leaves a good deal to be desired, since it is usually in an awkward position except when working near the meridian and near the equator. However, the camera faults have

had the good effect of causing the designers to speculate on the features which would be included in the perfect camera of this type. The designers envision a camera in which focusing is accomplished by turning long screws instead of by rack and pinion. The camera could be rotated on its mount to obtain easy access to any part in any position of operation. It would have an adjustable back so that several exposures could be made on the same film without necessitating any readjustment of the telescope. It would have a choice of several shutter types, including a slit shutter for solar photographs.

In general, this camera in its present form produces the results for which it was designed. The pictures taken of the surface of the moon require no further enlargement and those of the planets may be further enlarged without introducing noticeable graininess, and this without using fine grain film or special developer. The 20 1/2 inch telescope is especially suited to planetary photography since it gathers light in amounts sufficient to keep exposure times short, which in turn reduces the chance of motion during exposure.

In future designs of cameras for use with the telescope smaller film size will be used, since it was found that the image produced does not cover the corners of the 5 x 7 film.

NEWS OF TENNESSEE SCIENCE

At the annual meeting of the Association of Southeastern Biologists, held at the University of Alabama, April 21-22, the $100 prize awarded through the Association by the Carolina Biological Supply Co., Elon College, North Carolina, went to Mrs. Nyra Harrington and Mr. R. W. Koza, Biology Division, Oak Ridge National Laboratory, for their paper entitled "Effect of X-radiation on the desoxyribonucleic acid and on the size of grasshopper embryonic nuclei." Dr. Frederick T. Wolf, Department of Biology, Vanderbilt University, won honorable mention for his paper, "The production of indolacetic acid by *Ustilago zeae,* and its possible significance in tumor formation."

In March, Dr. Alexander Hollaender, Director of the Biology Division, Oak Ridge National Laboratory, spent a week in London as the guest of the Ciba Foundation and as speaker at a conference on isotope usage in steroid chemistry on the subject, "Mechanism of chemical protection against radiation."

The Nashville Section, American Chemical Society, has presented a number of lectures during the spring season. Dr. W. W. Heckert, Rayon Division, DuPont Corporation, Wilmington, spoke on March 8 on the subject of fiber synthesis; Dr. Allan T. Gwathmey, University of Virginia, spoke on April 12 on "The study of surface reactions with the aid of large metal crystals"; and on May 2, Dr. A. D. Melaven, University of Tennessee, spoke on "The occurrence, concentration, extraction, and chemical properties of rhenium."

Also at Vanderbilt University, Dr. Kenneth Raper of the Northern Regional Research Laboratory, U. S. D. A., Peoria, Illinois, spoke before the Biology Seminar on March 19 on the subject of "Form and development in simple slime molds."

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