Selected Pictures of G. W. Cook's Instruments

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Background

An extensive history of astronomy at the University of Pennsylvania was published by Robert H. Koch (2010). This narrative includes many pictures and associated history of the astronomical instruments owned by Gustavus W. Cook (1867-1940) of Wynnewood, Pennsylvania.

The family of deceased University of Pennsylvania astronomer William Blitzstein gave many of his astronomy-related possessions to fellow Penn astronomer Robert H. Koch. Subsequently, upon the passing of Professor Koch in 2010, the Koch family gave those possessions, and the astronomy-related possessions of Professor Koch, to Bruce D. Holenstein, a former graduate student of Professors Koch and Blitzstein, and to Richard J. Mitchell, the long-term department electro-optical technician and caretaker of the Flower and Cook Observatory. These possessions comprise a volume of approximately thirty-five banker boxes[1]. Most of the contents are books, files, photographic plates and prints, blueprints, and miscellaneous astronomical materials. Inventorying the contents is underway, however, some requests for early access to historical materials have a timely need so an initial search was conducted for pictures of certain instruments. In particular, what was requested were early pictures of Gustavus W. Cook's 8-inch Alvan Clark refractor, and of his spectrohelioscope.

Photographs

The remainder of this text comprises selected pictures of Cook's instruments and some brief commentary. Some pictures of historic interest are included even though they were not direct targets of the initial search. Note that the authors have not done an extensive search of the literature to know which photographs might have been published already where not already noted.

[1]About six boxes of Koch's modern books (published after 1970) were distributed to attendees of the August, 2011 conference *Stars, Companions, and their Interactions: A Memorial to Robert H. Koch.*

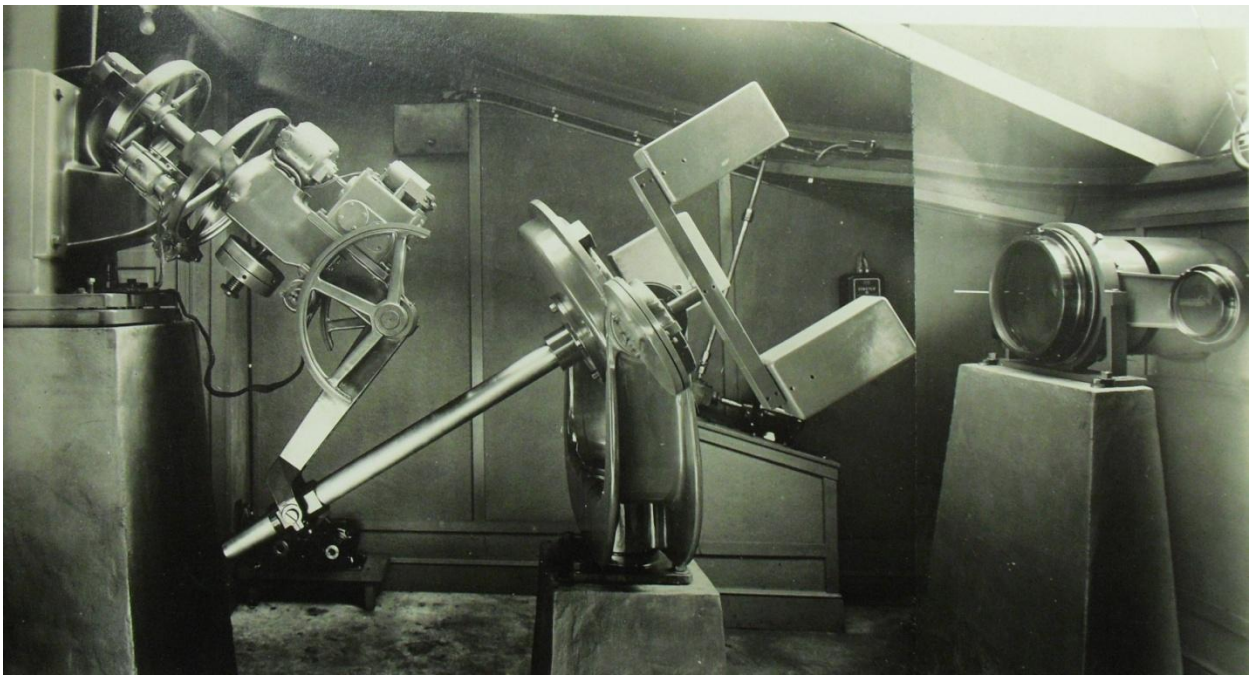


Fig. 1. 15" Fecker Siderostat flat, mount, and Brashear objective. Listed on the back of the picture: "*13" Siderostat Refractor in use at Wynnewood, Pa. Moved to Flower and Cook Obs. 1956. Ca. 1935? Note that in this picture the original objective has been changed to accommodate the photographic corrector lens ."* This photograph was taken at about the same time as Figure 35 of Koch (2010).

Comparison of the sizes of the two objective lenses in the photograph suggest that the smaller finder lens has about a 7-inch aperture. The siderostat finder is not separately listed in Cook's 1926 will, although the Koch (2010) history cites other sources and lists it as having a 6.5-inch aperture with the flat being 8.625-inches.

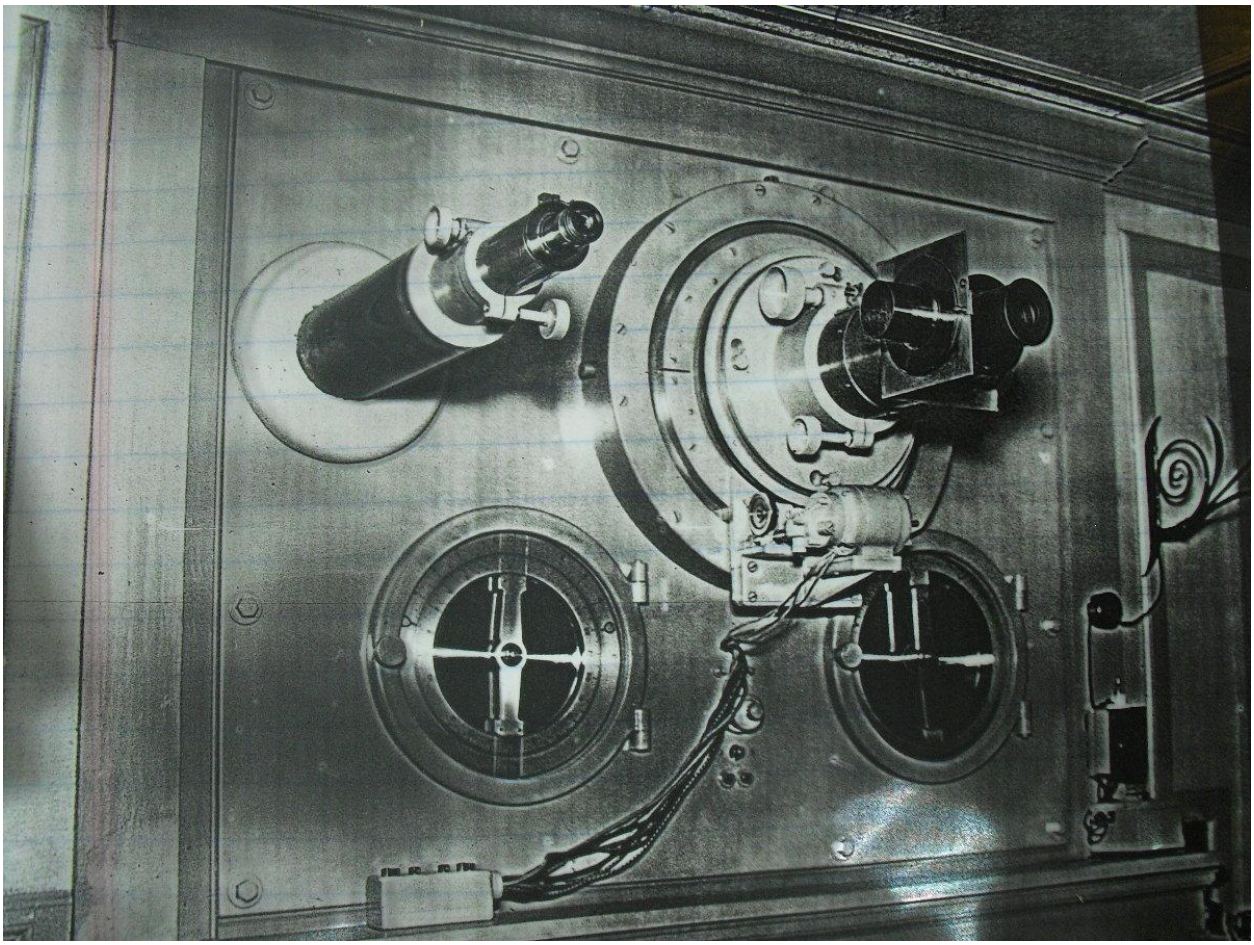


Fig. 2. Fecker siderostat prime focus. The finder on the left was not installed at Flower and Cook Observatory in 1956.

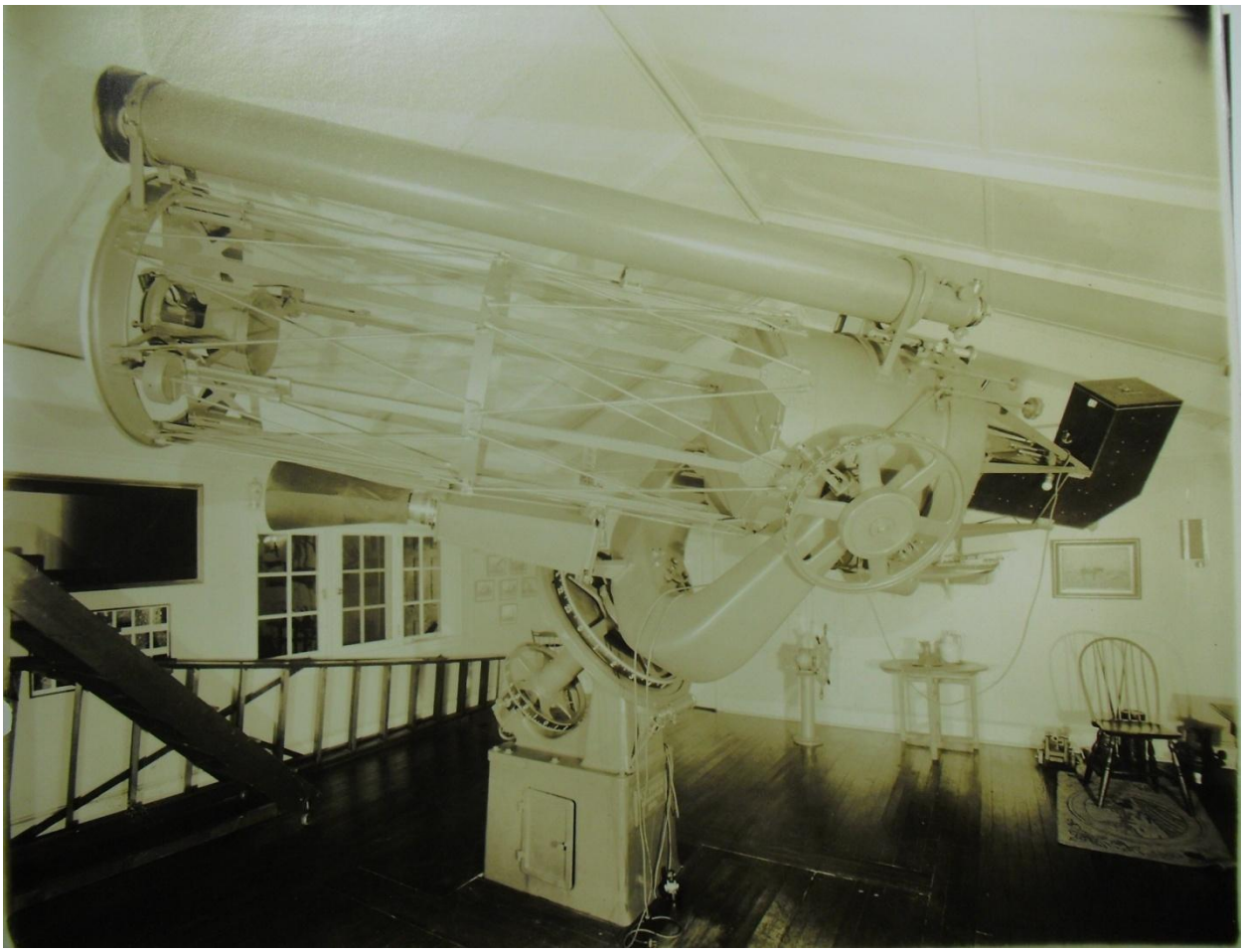


Figure 3. 28.5-inch Fecker reflector. The 8-inch auxilliary scope is by Alvan Clark according to the 1926 Cook will. The picture above is a new copy of the original photograph also shown as Figure 33 of Koch (2010).

Fig. 4. Back of picture reads, "*28.5" Fecker reflector at Cook Observatory. G.W. Cook left, J.W. Fecker right. Spectrograph mounted. Moved to Flower and Cook Observatory 1956. Date? Sometime in the 1930's.*"

Fig 5. One of many pictures of the 28.5-inch Fecker scope in the collection. The 8” Clark auxilliary scope and the 6” Fecker finder scope are visible.

The Sun House contains the camera of a forty-foot focal length horizontal telescope, a room for photographic work and a spectrohelioscope. The lens and flat of the forty-foot telescope are placed on a pier to the north of the building and the coelostat and object lens of the spectrohelioscope are on a pier to the south. The optical parts on the two piers are protected from the weather by light wooden covers.

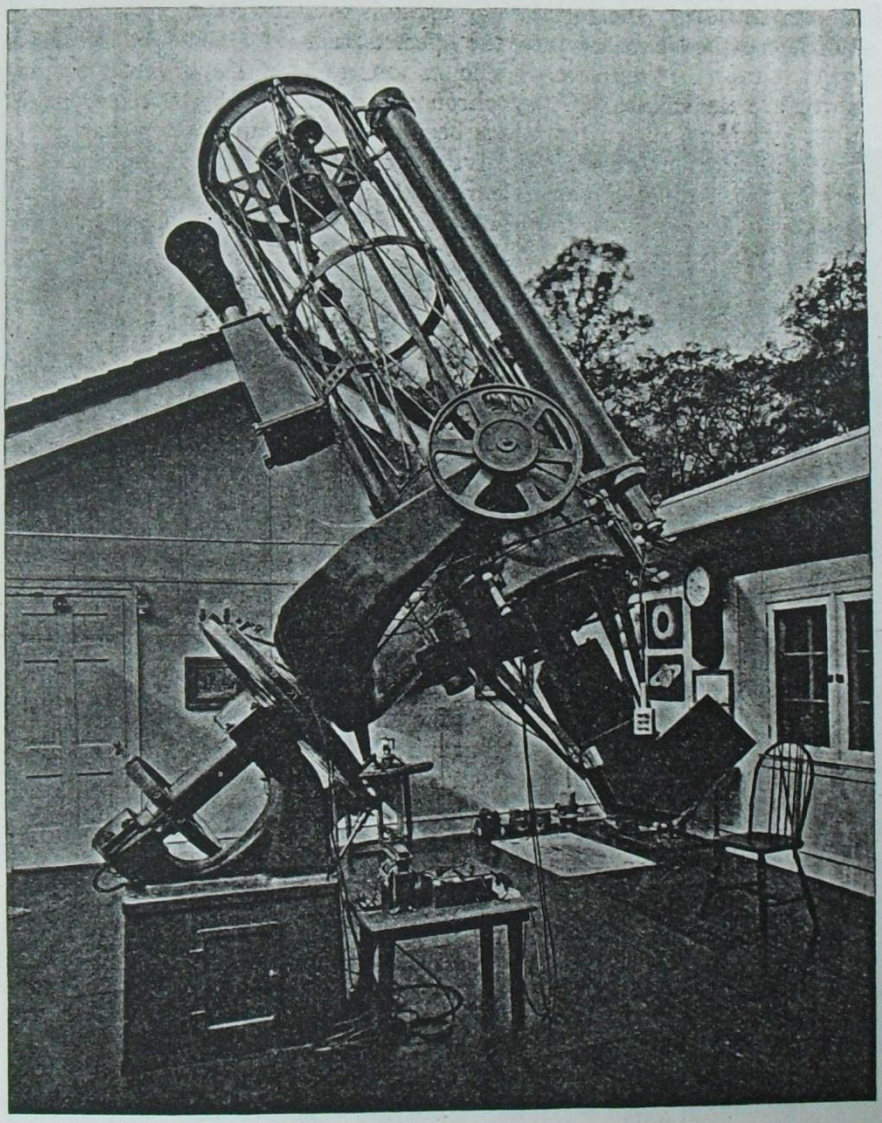
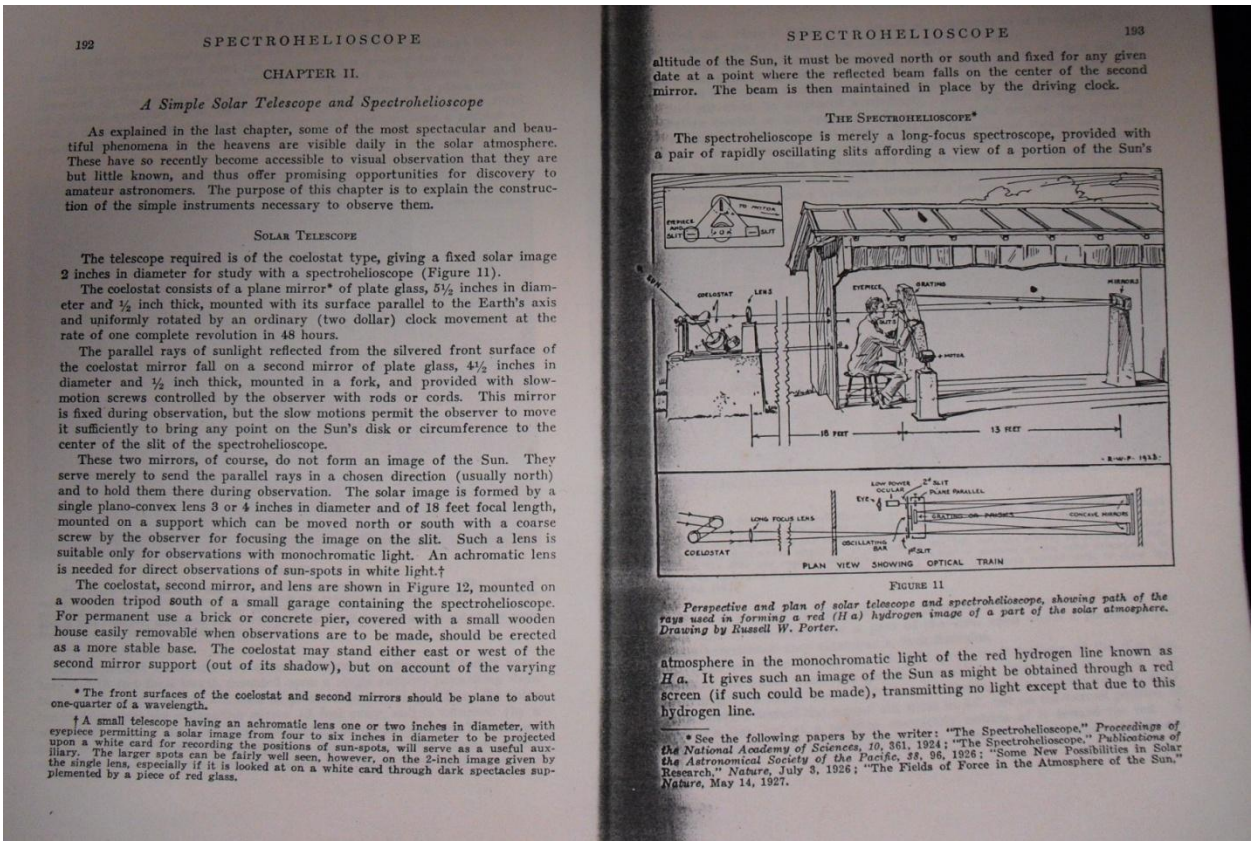


FIGURE 3.
THE 28½-INCH REFLECTOR WITH THE SPECTROGRAPH ATTACHED.
(Photograph by Mr. G. W. Cook)

Fig. 6. Page 201 from Mohler (1935). The finder is on the west side of the 28.5-inch reflector. The finder was on the east side when it was installed at the Flower and Cook Observatory in 1956.



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CHAPTER II.

A Simple Solar Telescope and Spectrohelioscope

As explained in the last chapter, some of the most spectacular and beautiful phenomena in the heavens are visible daily in the solar atmosphere. These have so recently become accessible to visual observation that they are but little known, and thus offer promising opportunities for discovery to amateur astronomers. The purpose of this chapter is to explain the construction of the simple instruments necessary to observe them.

SOLAR TELESCOPE

The telescope required is of the coelostat type, giving a fixed solar image 2 inches in diameter for study with a spectrohelioscope (Figure 11).

The coelostat consists of a plane mirror* of plate glass, 5½ inches in diameter and ½ inch thick, mounted with its surface parallel to the Earth's axis and uniformly rotated by an ordinary (two dollar) clock movement at the rate of one complete revolution in 48 hours.

The parallel rays of sunlight reflected from the silvered front surface of the coelostat mirror fall on a second mirror of plate glass, 4½ inches in diameter and ½ inch thick, mounted in a fork, and provided with slow-motion screws controlled by the observer with rods or cords. This mirror is fixed during observation, but the slow motions permit the observer to move it sufficiently to bring any point on the Sun's disk or circumference to the center of the slit of the spectrohelioscope.

These two mirrors, of course, do not form an image of the Sun. They serve merely to send the parallel rays in a chosen direction (usually north) and to hold them there during observation. The solar image is formed by a single plano-convex lens 3 or 4 inches in diameter and of 18 feet focal length, mounted on a support which can be moved north or south with a coarse screw by the observer for focusing the image on the slit. Such a lens is suitable only for observations with monochromatic light. An achromatic lens is needed for direct observations of sun-spots in white light.†

The coelostat, second mirror, and lens are shown in Figure 12, mounted on a wooden tripod south of a small garage containing the spectrohelioscope. For permanent use a brick or concrete pier, covered with a small wooden house easily removable when observations are to be made, should be erected as a more stable base. The coelostat may stand either east or west of the second mirror support (out of its shadow), but on account of the varying

* The front surfaces of the coelostat and second mirrors should be plane to about one-quarter of a wavelength.

† A small telescope having an achromatic lens one or two inches in diameter, with eyepiece permitting a solar image from four to six inches in diameter to be projected upon a white card for recording the positions of sun-spots, will serve as a useful auxiliary. The larger spots can be fairly well seen, however, on the 2-inch image given by the single lens, especially if it is looked at on a white card through dark spectacles supplemented by a piece of red glass.

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altitude of the Sun, it must be moved north or south and fixed for any given date at a point where the reflected beam falls on the center of the second mirror. The beam is then maintained in place by the driving clock.

THE SPECTROHELIOSCOPE*

The spectrohelioscope is merely a long-focus spectroscope, provided with a pair of rapidly oscillating slits affording a view of a portion of the Sun's

FIGURE 11

Perspective and plan of solar telescope and spectrohelioscope, showing path of the rays used in forming a red (H a) hydrogen image of a part of the solar atmosphere. Drawing by Russell W. Porter.

atmosphere in the monochromatic light of the red hydrogen line known as *H a*. It gives such an image of the Sun as might be obtained through a red screen (if such could be made), transmitting no light except that due to this hydrogen line.

* See the following papers by the writer: "The Spectrohelioscope," *Proceedings of the National Academy of Sciences*, *10*, 361, 1924; "The Spectrohelioscope," *Publications of the Astronomical Society of the Pacific*, *38*, 96, 1926; "Some New Possibilities in Solar Research," *Nature*, July 3, 1926; "The Fields of Force in the Atmosphere of the Sun," *Nature*, May 14, 1927.

Figure 7. This chapter, "*A Simple Solar Telescope and Spectrohelioscope*" from a book entitled *Spectrohelioscope*, is presumed to be by G. E. Hale (19xx). It was found in a folder entitled "Spectrohelioscope" along with Figures 8 and 9 below. Figure 11 from the chapter represents the optical path for the Cook spectrohelioscope. The rest of the chapter features pictures of Hale's spectrohelioscope in Pasadena. One of the authors (RJM) notes that many of the parts in the illustrations match the parts used in the Cook spectrohelioscope.

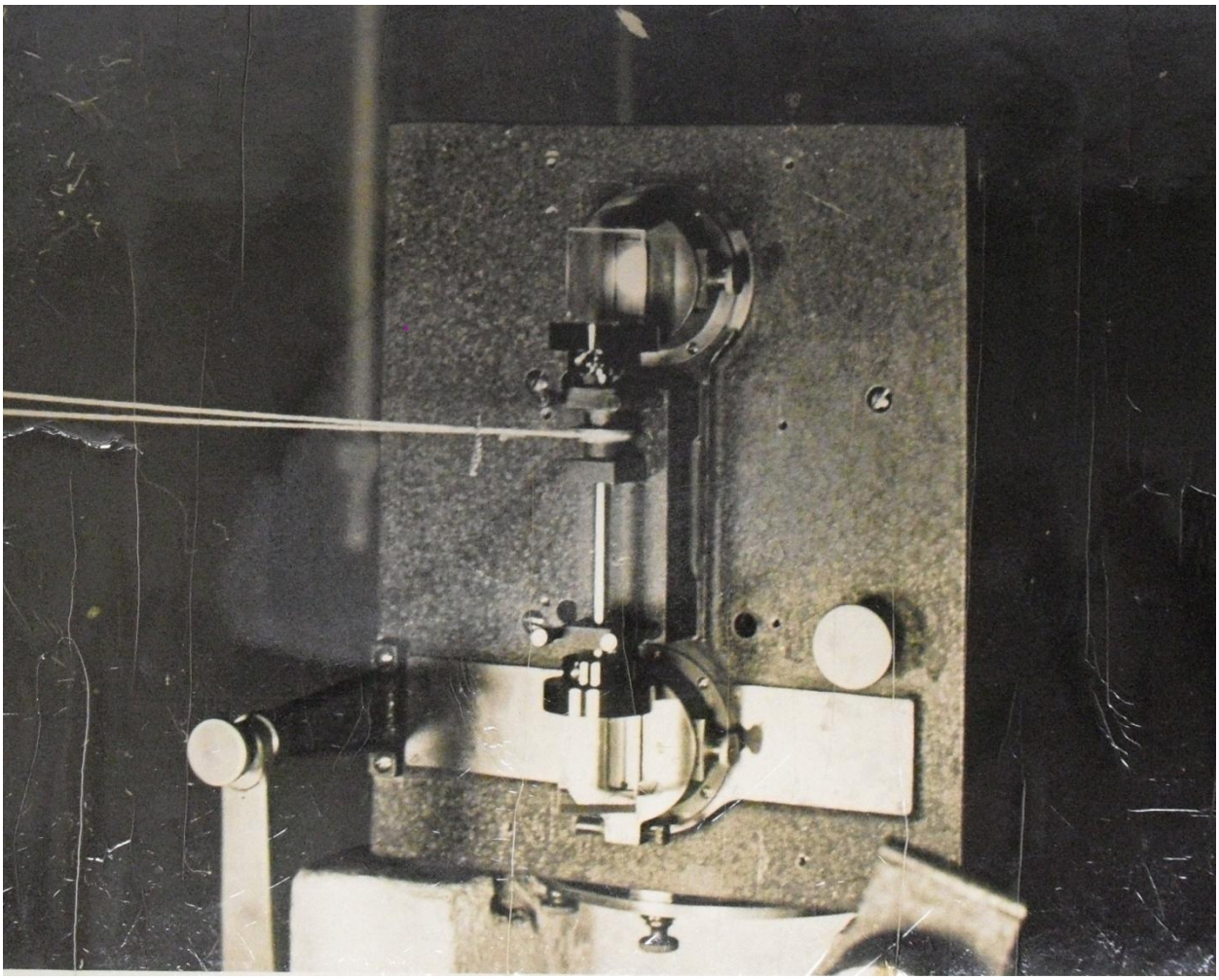

Fig. 8a. Photographs of the Cook spectrohelioscope found in the before mentioned folder. The picture above shows the rotating prisms in front of the entrance and exit slits of the spectrohelioscope.

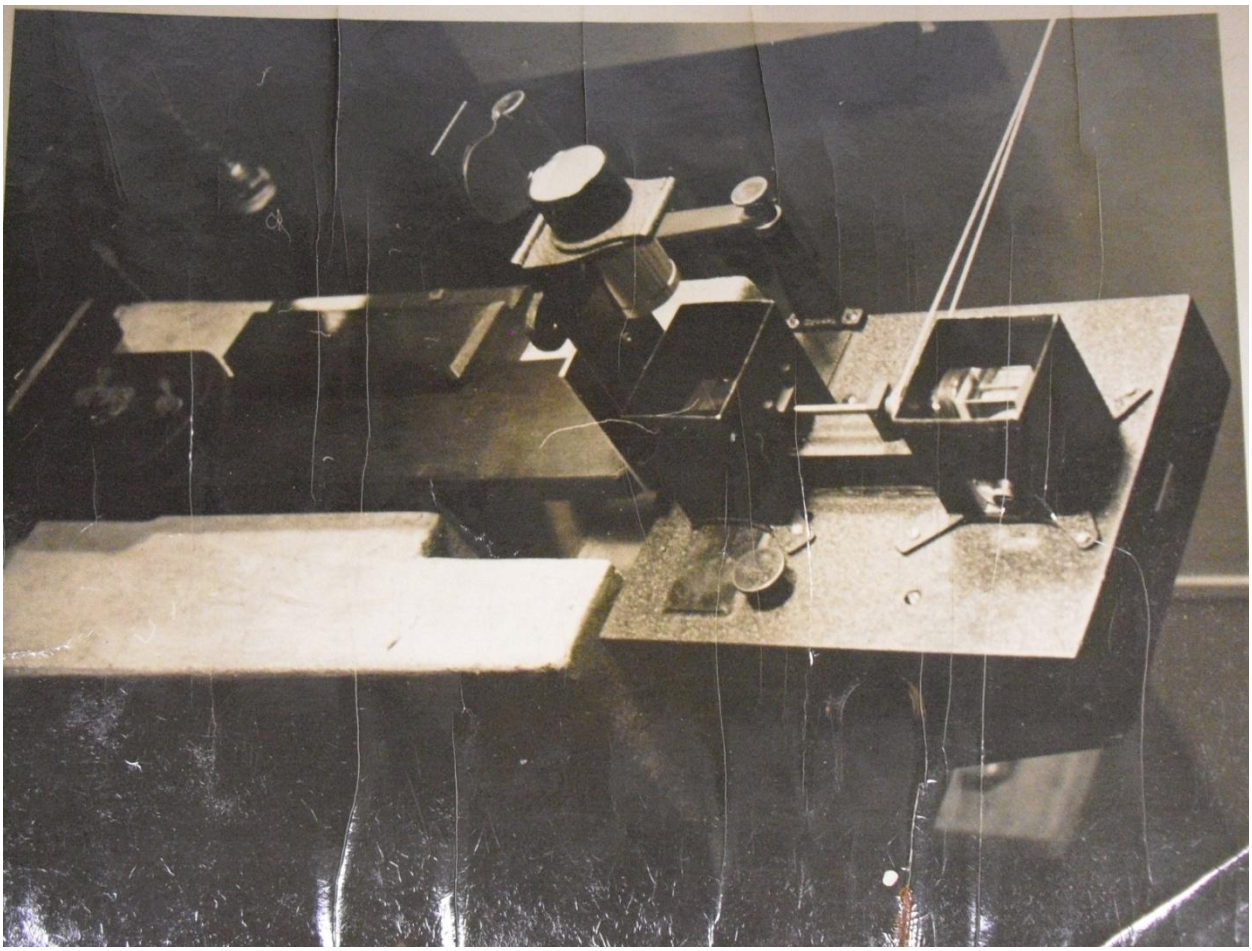

Fig. 8b. This picture shows the rotating prisms from a different angle. There are light baffles around each slit and prism.

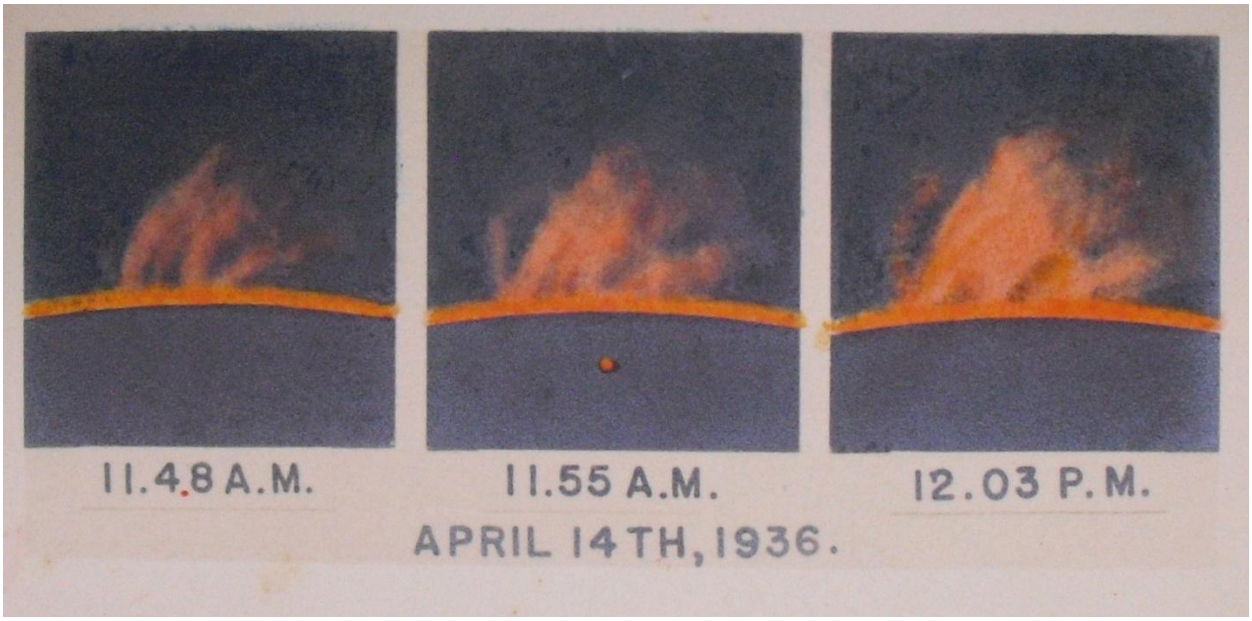

Fig. 9. One of many solar images in the collection taken with the Cook spectrohelioscope. The back of this image is stamped in block capital letters, "*The Cook Observatory, Roslyn House, Wynnewood, Penna*." The caption for Figure 41 of Koch (2010) lists it as having been made by Levitt.

References

Hale, G. E. 19xx, *A Simple Solar Telescope and Spectrohelioscope*, in *Spectrohelioscope* (:) 192-

Koch, R. H. 2010, *Observational Astronomy at the University of Pennsylvania 1751 – 2007*, http://www.gravic.com/graviclabs/pdf/astronomy/Observational%20Astronomy%20at%20UP%201751%20-%202007%20-%20Revision%20B.pdf Accessed 9/9/2011.

Mohler, O. 1935, PopAstr, 43, 199