*The Minythoscope**

AN INSTRUMENT FOR VIEWING ANY TYPE OF PHOTOGRAPHY ON GRADUALLY DECREASING SIZE (OR SCALE) FOR MANY PURPOSES†

PART IV: INSTRUMENTAL AIDS IN PHOTO-INTERPRETATION‡

HUGH T. O'NEILL AND WILLIAM J. NAGEL§

SUMMARY: *The minythoscope is an instrument designed for a number of uses, such as:*

a) For viewing any type of photography on a gradually decreasing size (or scale). It thus serves as a means of practice of training and of research in recognizing small objects as they diminish in size and in training photo-interpreters, pilots, foresters, observers in airplanes or on the ground, etc.

b) For side-by-side mathematical comparison of the relative efficiency of any two or more methods of photography, from the recognition of any given object against its background on a photograph, as the size is decreased from two to forty times.

c) For increasing the contrast between a colored object and a differently colored background as the size is decreased, as in b).

d) For providing transmitted light (colored or white), or reflected light (colored or white), or both in the study of photographs as the size is decreased.

e) For simulating roughly, haze effects, and other atmospheric conditions as they affect visibility.

THE minythoscope is an instrument designed to facilitate the convenient observation and the comparative study of objects as they become smaller in size, in order to discover what, if any, general principles are involved when details vanish to coalesce into a new but often characteristic configuration. It may be argued that a special instrument for this purpose is unnecessary since the observer can study the effect of viewing an object on a diminishing scale by merely observing it as he walks away from it. But such simple, direct observation can be greatly enhanced by instrumental means; thus:

a) concentration on a small object becomes easier as the view is contracted in an instrument;

b) extraneous light is eliminated. The color and intensity of the lighting is thereby readily controlled and the procedure can always be duplicated or checked;

c) the scale or size to which a photograph or object on a photograph is reduced is accurate and can be read or calculated. An observer attempting to measure the distance as he walked away from the object would find it awkward procedure;

d) by using series of biconcave lenses, it is readily possible for the observer to remain seated and accomplish the same reduction as if he walked a considerable distance from the object, merely by increasing the distance between the lens and the object;

e) a similar result, requiring less ad-

* From the Greek μίνυθεῖν (Minythein) to decrease, and σκοπεῖν (skopein) to view.

† Invented as part of a research-contract for Wright Air Development Center.

‡ The first three papers of this series were published in PHOTOGRAMMETRIC ENGINEERING, XVIII (1): 134–139 and (5): 699–701. 1952. XXIII (1): 180–185, 1957.

§ Mr. Nagel of the Ansco Division of the General Aniline and Film Corporation.

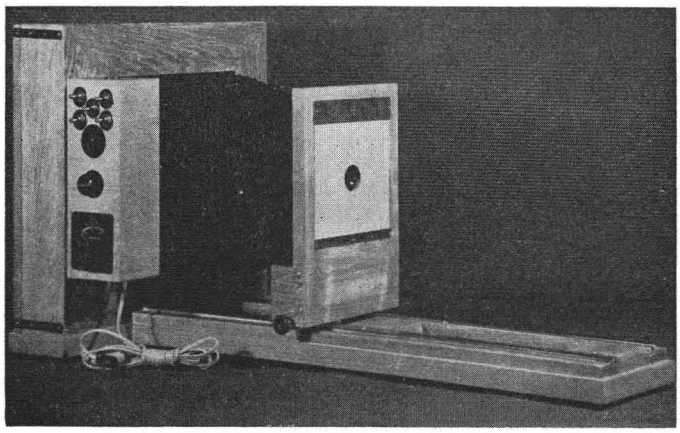

FIG. 1. The minythoscope, front view.

justment of the eye, is obtained by using a biconvex lens, just as is the case when viewing an object in reverse from the "wrong" end of the telescope.

Not finding any instrument on the market, the authors constructed one as shown on Figures 1, 2 and 3, using parts and materials listed at the end of this paper. Other than this, no information is necessary to enable a duplicate copy to be made.

As is the case of any invention, after use, a number of considerable improvements were seen to be possible. Some are:

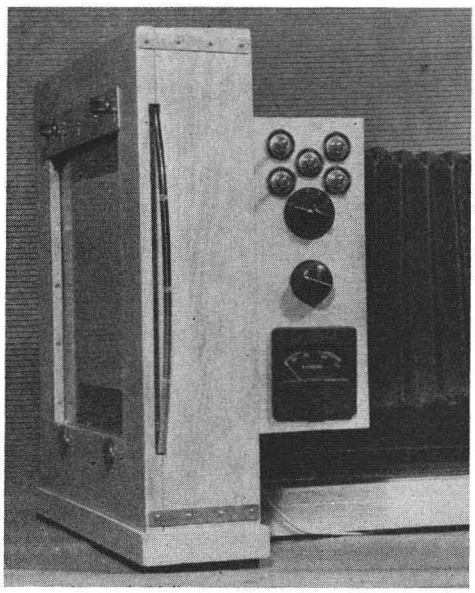

FIG. 2. The minythoscope showing slot containing plastic slide for photographic prints or transparencies.

Improvement 1. By bringing an additional source of light from behind (Figure 3), it was possible to view transparencies as well as prints.

Improvement 2. By making the lens stationary and moving the photograph and its illumination to or from the lens, the observer does not move at all, in order to remain close to the lens.

Improvement 3. An observing tube can be mounted to help the observer keep his eye a fixed distance away from the lens. Other improvements are planned.

SOME SPECIAL USES OF THE MINYTHOSCOPE

The minythoscope enables a single photograph to be studied at many con-

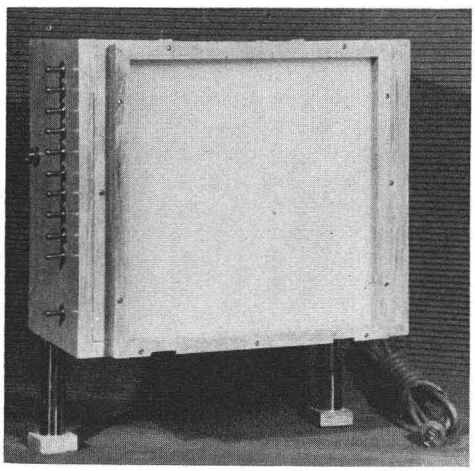

FIG. 3. The panel containing ten fluorescent tubular lamps for illuminating transparencies in the minythoscope.

stantly diminishing scales, without the very considerable expense of taking a whole series of air photographs at a series of increasing elevations. While the comparison is not exact, it is close enough to be very useful. Usually the perspective is not too badly distorted for the recognition of many objects and patterns useful in photo interpretation.

Another use of the minythoscope is in providing a ready direct means of comparing the results of any two or more methods of photography as regards their efficiency in permitting the best recognition of any given object on any given background. This is accomplished by placing, for example, two transparencies made of the same scene under simultaneous and identical conditions except that one is made on film *A* and the other on film *B*. Transparency *A* and transparency *B* are then viewed side by side in the minythoscope, on a scale so small that the object sought is invisible. The apparent size of the photograph is then increased by decreasing the distance between the lens and the transparencies, until the object becomes just visible on one of the transparencies, for example *A* at a scale of 1:40,000. The apparent size of the transparencies is then increased until the same object appears on film *B*, with a scale of say 1:20,000. This makes possible one and the same observer to estimate accurately on a mathematical basis and without any subjectivism, the total performance of any type of film (or the result of any whole method of photography) for any particular purpose or object. It seems worthwhile to stress that this procedure is for a specific purpose. In some cases it is more practical than attempting to estimate the value of a film (or method of photography) on the basis of the sum of single factors such as size of grain, "knife-edge" studies, etc.

In a rough way, the effect of haze in increasing the difficulty of recognizing objects on photographs may be simulated by interposing thin sheets of plastic, coated with a clear lacquer but containing colloid particles of appropriate size and chemical composition.

List of Parts and Materials*

8 General Electric 49×616 Lampholders Sockets
8 General Electric 49×622 Lampholders Clips
4 General Electric L40/IF Lamps (Lumiline)
1 General Electric 25VDN18S Voltmeter range 0–150 volts
1 Ohmite Rheostat Potentiometer, 100 watt Model K, 500 ohms
4 Double pole double throw switches
1 Double pole single throw switches
5 Crowe 272 switch plates
1 Mallory switch 3215 J
1 Mallory switch plate 384
Wire for hook-up and one male plug
Aluminum for lensboard plates & platen lock
Duraluminum for bellow carriage guide
2 Lengths of camera track
1 Set of camera track gears
1 10×10 inches bellows with 31 inches expansion
1 Springtype metal graduated measuring tape
1 Piece $\frac{1}{4}$ inch sponge rubber $11\frac{1}{2}\times11\frac{1}{2}$ inches
1 Piece $\frac{1}{4}$ inch plate glass $11\frac{1}{2}\times11\frac{1}{2}$ inches
2 Sets of hinges for rear assembly
Screws & wood for construction of camera body & light copy frame
1 −40 diopter lens biconcave
1 −20 diopter lens biconcave
1 −10 diopter lens biconcave
1 −5 diopter lens biconcave
1 −20 diopter lens biconvex

* Used in making the minythoscope, by William J. Nagel.