A word of thanks is due the *International Projectionist* for the excellent publicity they have given this project in both their June and July issues. We have every anticipation of a worth-while job being done.

Television

The first regular meeting of the Joint RTMA-SMPTE Committee on Television Film Equipment was held at the Hotel New Yorker on July 18. Their work got off to an excellent start with all of the SMPTE delegates on hand. The primary task at the moment is the completion of a specification for a 16-mm television film projector which originated within RTMA.

While the specification framework has been completed, many of the detail requirements need further study. Approximately a dozen task groups were organized and requested to prepare drafts of various sections for circulation to committee members prior to the next meeting. Standards for picture aperture size to be used in video recording and the area to be scanned in reproduction of opaques and slides were also discussed and recommendations will be made in the near future.

Magnetic Recording

Last April, Glenn Dimmick's subcommittee working on standards for magnetic recording recommended submitting proposed standards for track location on 35-, $17^1/_2$-, 16- and 8-mm motion picture film to the Sound Committee for its recommendations on publication. The ballot was sent out early in July, but serious objections were received from one of the major studios which felt that the limited experience with the present proposals did not warrant wide circulation in the JOURNAL. Further action will be delayed until this problem is resolved within the Sound Committee.

High-Speed Photography Question Box

Here are answers to five questions on high-speed photographic techniques which appeared on p. 122 of the July JOURNAL. These answers were contributed by: J. H. Waddell of Wollensak Optical Co.; Henry M. Lester, Consultant; Kenneth Shaftan of Burke and James; and Eugene L. Perrine of the Armour Research Foundation.

Further questions and answers will appear in subsequent JOURNALS. If you wish to participate send either your questions or answers to Society Headquarters.

A1. This question concerned taking high-speed motion pictures of moving parts inside a black bakelite device the size of a dime. Speeds of 4,000 to 8,000 frames/sec were required. With methods now being used, insufficient exposure has been obtained when using Super XX film and heat generated by the light source altered performance of the device under test.

One suggested solution was the use of continuous flash lighting units to provide ample light free of heating effects normally encountered with tungsten or arc illumination. Adequate exposure and depth of field can be secured by using two flash units properly placed, and a 2-in. lens with a suitable extension tube at effective apertures ranging from $f/6.3$ to $f/9$.

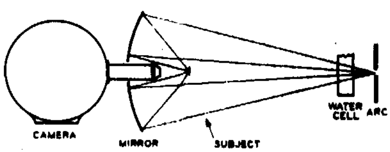

Figure A-1.

A second solution is proposed in Figure A-1. In this method the center was cut out of a 12-in. diameter parabolic mirror of 6-in. focal length so that it could slip over the lens and extension tube of the camera. Precision quality Bausch & Lomb parabolic mirror has been used. Elliptical mirrors are better suited for this application when photographing extremely small areas, but where sharp focus of the light beam is not required the paraboloid is satisfactory. A small, hand-fed carbon arc using from 5 to 10 amp is used about 2 ft behind the subject, and the mirror adjusted so that the arc is focused on the area to be photographed. A water cell for removing the heat is placed in the beam close to the arc so that all light falling on the mirror passes through the cell. The proponent of this method states that sufficient illumination is obtained for magnification on the film of up to five times at a speed of 5000 frames/sec.

A third proposed solution uses a plane mirror with an elliptical hole large enough to accept the camera lens. The mirror is placed at an angle of 45° to the optical axis so that the light is reflected from the mirror to the subject. A partial reflection transmission mirror could be used instead, but that would reduce the exposure by a factor of approximately 50%, and only half the light would reach the subject. Satisfactory mirrors of this type may be secured from Evaporated Films, Inc., Ithaca, N.Y. It is also recommended that long focus lenses with extension tubes be used to secure adequate distance between the subject and the camera. If a water cell is used, as described on p. 450 in the article "High-Speed Photography" in the November 1949 Journal, heat can be reduced to a negligible amount. It is also suggested that a G.E. 750-R lamp or a Rosslite of similar characteristics be employed. Distance from lamp to mirror to subject should be approximately 15 in. for maximum illumination. In making high-speed pictures of this type, a suitable exposure meter should always be used.

A2. The second question concerned high-speed motion pictures of small parts of a mechanical device moving at 15 to 30 cycles/sec. A Fastax camera is employed at a frame rate of 1250 frames/sec, with a 6-in. lens, an object distance of 8 ft, Super XX reversal film, and two 750-w reflector spot lamps. Since all surfaces had similar finish, it was extremely difficult to distinguish between adjacent parts in the projected picture.

The first reply to this question suggested very diffuse lighting through use of a translucent tent between light and subject. It was pointed out that this would obviously result in a considerable loss of light, but with continuous flash lighting units this loss could be tolerated. By appropriate arrangement of the tent and choice of material, however, loss of light can be held to a minimum.

A second answer stated that if the light source is placed correctly, there should not be too much trouble from specular reflections when the exposure factor is correct. Bad flare is produced from machined parts when there is definite over-exposure in a high speed camera. If the exposure is somewhat reduced, brightness of parts, even though made of brightly polished metal, should be easily controlled. The light source must be as near the camera as possible, and either G.E. Electric 750-R or Rosslite lamps should be used.

A3. Question 3 dealt with photographing vibration effect on various components of air-borne instruments. These instruments are extremely small and encased, making it necessary to illuminate and photograph through a hole in the cover. Vibration frequencies of 800 cycles/sec, with object motion as little as 0.001 in. are encountered.

The first reply pointed out that it is possible to photograph and illuminate through a hole in the cover of an encased instrument by high-speed photography only if the hole is large enough. The smallest hole believed to be feasible is about 5 in. in diameter. It was stated, however, that a somewhat smaller hole might be used with variations in technique.

The first method suggested was to direct the light output of a continuous flash lighting unit on a spherical mirror with a hole in the center for the camera lens. A second method was to surround the camera lens with an electronic flash tube, discharging its light output in synchronism with the high-speed camera shutter. It was pointed out that Dr.

Harold Edgerton of M.I.T. has designed an electronic flash lamp capable of doing this job. For conditions outlined in this question, it was suggested an Eastman Type 3 camera be used at frame rates of 3000 frames/sec. A movement of 0.001 in. could then be magnified about 200 times both in time and space, offering an adequate record, either on the screen or in still picture enlargements of single frames.

Another reply suggested use of a Fastax camera with auxiliary control equipment to secure 14,000 pictures/sec. Frame rates of this order are necessary for studying frequencies as high as 800 cycles/sec. It was also suggested that in studying vibrations of extremely small excursion extension tubes be used on camera lenses, and the pictures be projected at about a magnification of 100. Magnification of 100 times of a 0.001-in. excursion will then appear on the screen as 0.1 in. For lighting, a G.E. 750-R lamp should be used, so placed that the plane of vibration is clearly emphasized with respect to the stationary surrounding subject. At least two lamps should be used in this setup with a high-low series-parallel switch in order to focus the camera with lamps in series and expose with lamps in parallel.

A4. This question dealt with photographing a 3 × 5 ft area of a dark machine at a frame rate of 3000/sec. Here again inadequate exposure was being obtained, and high amperage power lines were not available.

The first reply stated that successful results had been obtained under similar conditions, using continuous flash lighting units on dark areas of up to 4 sq ft In this case, also, the machine being photographed was black. The frame rate was 3000/sec, with the lens set at *f*/4. Using Super XX film, a satisfactory record was attained. This type of lighting requires much less power than incandescent units.

A second reply suggests use of sunlight for illumination. If the equipment photographed is extremely dark, it may be necessary to use booster mirrors to light adequately the whole surface. Frame rates of 3000/sec are entirely possible in direct sunlight, but not behind windows.

A5. This question dealt with special processing for reversal film used in high-speed photography. The first reply named two manufacturers of processing equipment suitable for this type of work: Micro Record Corp., New York City; and Morse Instrument Co., Hudson, Ohio. It was pointed out, however, that while machines made by either of these companies could do a job of controlled processing, in both cases the task is tedious and far from satisfactory when a quantity of film is involved. Both require special drying facilities and great care in handling of films with black coatings. It was believed that the advantages of longer first development are questionable unless the additional development is accurately timed and definitely related to the degree of underexposure. Faster film such as Kodak's Linagraph (negative stock is 50% to 60% faster than Super XX reversal) might be used, and is simpler to process on the two units mentioned above. The best answer is to avoid working near the borderline of underexposure, which always results in pictures lacking in detail, definition, contrast and depth.

Another reply suggested referring this problem to the Houston Corp. in Los Angeles which builds special 16-mm processing equipment.

Journals Out of Stock: The Society's stock of JOURNAL issues for March, Part II, July, August and September, 1949, has been exhausted as a result of an unexpected increase in demand and the Society's Headquarters is anxious to purchase a stock of each. Members or libraries having extra copies available are invited to send them in. The going price is 75¢.