Society of Motion-Picture Engineers
Report of Committee on Progress

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A review of the motion-picture industry during the past six months or year shows a number of improvements which have been made and which help to bring the motion-picture industry into greater prominence than before. The object in writing up this review is to summarize briefly some of the notable steps which have been taken by the manufacturers of equipment and the producers of film. It is not within the province of this paper to go into detail regarding any of the matters taken up, as these subjects will in most cases be covered by other papers prepared by those who are more familiar with the details than are the various members of the Committee on Progress. It is hoped that the report may be of value in merely pointing out the general lines of improvements. It is to be feared that some fields may not have received the attention which they merit because of the impossibility of securing from those interested in different lines all of the information which would have proven helpful. However, the Committee wishes to thank the various contributors who have supplied the information which has been used as a basis for this paper.

STANDARD MOTION PICTURE MACHINES

Among the developments which have appeared on standard motion-picture machines, and which help to make these machines more easily operated and more effective, are the following:

An arc lamp with the carbon placed at 90° to each other, and having a magnetic field to control the arc, has been developed, tested out, and found to be very efficient. The increase in efficiency is due to the fact that the crater of the positive carbon can be made to squarely face the condenser. The magnetic field used keeps the arc centered on the positive carbon so that the crater does not wander around, and the carbon burns off uniformly. The small negative carbon used can be brought entirely outside of the angle which includes the condenser, so that there is no shadowing of any part of the screen. It is estimated that a 35-ampere arc on the 90° arc lamp is fully equivalent of a 50-ampere arc on the older type of mechanism.

The difficulty which is experienced by some operators in maintaining an arc at the proper focus of the optical system and keeping it steady so as to produce a clear screen, will be entirely overcome by the use of arc controllers which are now being manufactured and placed on the market. The arc controller has been used for some time past in a few instances, but has never been developed to such an extent that it has become a usual part of the equipment. New designs of arc controllers are such that the mechanism has been considerably simplified, and the action is therefore more reliable and the equipment can be sold at a lower price, thus making it available in many theatres where in the past it would not have been considered. The proper focusing of the arc is such an impor-

tant feature of good projection that the new arc controllers will undoubtedly prove of special value in making possible a higher standard of projection.

The development of motion-picture theatres costing millions of dollars has emphasized the fact that in the past no projection equipment was available which adequately matched the completeness of equipment used in all parts of the house excepting the projection room. In order to overcome this lack of co-ordinate equipment there has been a tendency to develop complete projection units or complete units which will, when properly installed in the projection room, enable the operator to give better service than has been possible in the past. These units are something in line with the complete units suggested by Mr. Jenkins in a paper before this Society some two years ago. The complete projection unit equipment includes extra projectors, which can be used in emergency if there is an accident to any one of the machines. The generating equipment is now installed in duplicate, which is a practice to be recommended as it enables the operator to clean and oil one of the machines and have it ready for service while the other is running. Where only one machine is used there is little time for adjustment and repair, with the result that the machine deteriorates more rapidly than if it had proper care, and there is also risk that it may not be in operating condition when required for the regular performance. The installation of duplicate equipment is a step in the right direction, and it marks a development which has come into much greater prominence in the last year than heretofore.

As an aid to the projectionist in determining whether or not the arc is operating properly a reflector and lens has been arranged so that the image of the arc may be thrown on the walls, ceiling or floor of the projecting room. This enables the operator to tell at a glance the general condition of the arc without glancing through the peep hole in the lamp housing. The image of the arc is not so bright as to cause discomfort to the operator and he is therefore able to keep his eyes in better condition for properly focusing the picture on the screen and giving the patrons best results.

In order to determine the time when change-over should be made from one machine to another, a counter has been developed which shows the number of feet which have been run off the reel. This equipment is extremely simple in construction and reliable in operation. It is necessary only for the operator to set the dial at zero when a new reel is installed. As each foot of film is run off, the counting device, which is of the cyclometer type, advances one numeral. There are other modifications of this same device, and it is of service to the operator in adjusting the speed to run his film in the specified time, and also for determining the length of reel. The present tendency of splicing two 1,000-foot reels together in order to reduce the number of change-overs from one machine to another has brought out the importance of having as nearly as possible uniform tension on the film. With a 2,000-foot film the tension at the start with the usual equipment is very much greater

than is necessary, and this results in undue wear of the film. If the tension at the beginning is made small there will not be sufficient tension to insure that the filament will be taken up when the reel is nearly full. The difference in tension has been overcome in the new type of reel which has been developed. The new reel has a loose wooden hub on which the outer metal part slides. The hub is turned and when the reel is empty there is sufficient friction between the hub and the metal rim to take up the film without undue strain. As the film builds up on the lower reel the weight increases and the friction also increases, thus giving a practically uniform tension, depending upon the weight of the film on the spool for the pull which is required.

Another refinement which has been noted in standard motion-picture machines is the use of a small incandescent lamp placed inside the lamp housing. This lamp can be lighted when it is necessary to change carbons or make other adjustments on the mechanism. This insures that the operator will have ample illumination inside the lamphousing without the necessity of using a portable light, which is more or less troublesome to handle and at best can be considered only a makeshift.

Arc Lamp Carbons

Carbons for the arc lamps used in picture projection were prior to the war imported at the rate of approximately twelve million per year. These carbons were manufactured under labor conditions which made it impossible for American manufacturers to compete, and the industry was developed only through the experimental stage. However, when the war broke out in 1914 the importation of carbons soon ceased and the American manufacturers were called upon to supply the carbons for the entire trade in this country. This meant the construction of large plants, the development and installation of special machinery, and the perfection of manufacturing processes. The result has been very gratifying, as the American made product of today is far superior to the imported carbons of a few years ago. The superior results which are obtained are due to a number of points which merit attention.

The upper carbon for the direct current arc is now composed of a hard specially constructed electrically conducting material, surrounded by a heat-insulating compound embedded within a star-shaped core. The core enables the arc to be centered almost the instant the current is applied, and the old system of burning the carbons for five or ten minutes in order to get a proper crater has been entirely discontinued because unnecessary. The carbons are also made up so as to have a maximum current carrying capacity, so as to increase the illumination per unit of crater area, and enable a firm arc to be maintained with very few adjustments.

The negative carbons on direct current arcs are now usually small in size and are plated with metal so as to increase the conductivity. The negative carbon acts merely as a conductor to carry away the current, and it has been found that the smaller this con-

ductor can be made, the better, and the less is the interference of the light from the positive crater.

Special carbons have been developed which are usually sold in sets, consisting of one 12-inch upper carbon and two 6-inch lower carbons. It is extremely essential that the carbons should be used in the manner designated, as the composition of the carbons is such as to give best results only when the upper carbon is used in the upper holder and the tip presented to the condenser. In the manufacture of this combination a special chemical water glass is used in the upper carbon and a small amount of rare earth in the lower carbon. The yellow tinge in the beam which has heretofore been characteristic of many of the alternating-current arcs, has thus been eliminated, and the picture is projected with a clear bright white light.

There is a very marked tendency toward the use of high current arcs. Where the standard a few years ago was for 35-50 ampere arcs, the present demand is for arcs rating at from 75 to over 100 amperes. There is a possibility that with the growing use of the 90° arc these higher current values may be somewhat reduced.

Gas-Filled Incandescent Lamps for Projection

The growth in the use of incandescent lamps for projection purposes has not been rapid because of the necessity of further development work on various points in the lamp and equipment. One of the most notable changes has been in the lamp itself and has to do with the interior construction.

Experiments have shown that with the filament supported in an upright position, and anchored firmly in place, there is a tendency for the coils to warp because of the expansion and contraction as they are heated and cooled. In order to overcome these difficulties the coil has been suspended from the leading-in wires and expansion joints placed in the lower supports so that the filament is free to expand and contract, but is held in correct position and alignment by the supports.

The lamps for the smaller or portable motion-picture machines have remained with very little change, though there is a tendency to use filament of monoplane construction wherever possible, as the effects produced on the screen are better than with the more usual types of filament arrangement. There are also proposed some changes in bulbs to meet the requirements of the small motion-picture machine. Most of these machines require bulbs with fairly small overall dimensions, and in many cases tubular bulbs are essential.

Electrical Equipment

The electrical equipment used in motion-picture projection has been so well standardized in the past that the last six months or one year has shown very little change. There have been developed and placed on the market a number of constant current regulators for use with incandescent projector type lamps, and controlled

regulators have also been perfected so as to give closer regulation and more accurate adjustment of the current. No changes have been reported on the usual type of projection room equipment, such as motor-generator sets, regulators, etc.

Optical Systems

The optical systems have remained unchanged where arc lamps are used. The increasing length of throw in the larger theatres results in a demand for larger objectives. The mountings of lenses are standardized and the manufacturers of lenses are preparing to meet the demand for larger objectives.

For incandescent lamp projection there are two systems of condensers which are commonly used at this time. These two systems are the plano convex condenser system and the prismatic condenser system. Both systems seem to be well established and doubtless will continue to be used. In the smaller portable machines there has been a tendency to use prismatic condensers of small type and short focal length.

Studio Lighting

In the methods of studio lighting there has been reported no change in the period since our last meeting. The systems used are the arc lamp, mercury vapor lamp, and in some cases the incandescent lamp. Improvements in the arc method of illumination of studios are in the carbons and in the use of large currents to get more powerful units. Mercury vapor lamps have been improved so as to be moved and directed more easily. Incandescent lamps and lighting systems for studios have not been appreciably modified and are commonly used in conjunction with other systems of illumination to secure special effects.