

THE  
SOCIETY OF  
MOTION PICTURE  
ENGINEERS



Its Aims and Accomplishments  
Synopsis of Papers Published  
Author and Subject Indexes  
Officers and Committees

July, 1916-June, 1930

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# THE SOCIETY OF MOTION PICTURE ENGINEERS

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July, 1916—June, 1930

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## THE SOCIETY OF MOTION PICTURE ENGINEERS

### ITS AIMS AND ACCOMPLISHMENTS

The S. M. P. E. embraces a group of men who are united in the common purpose of securing advance in the science and art of motion pictures. Although these men are recruited from every part of the industry, from the laboratories of colleges and the big manufacturing firms, from studios, from theaters, and in fact from all places and all countries where the art of motion pictures is practiced, it has not been possible to bring news of the Society's work before every individual who should be interested. That is the purpose of this booklet.

In 1916, at the height of the World Crisis, the confusion arising at home and abroad through want of coöperation and standardization prompted C. Francis Jenkins, inventor and scientist, to enlist the sympathy of a dozen manufacturers and their technicians to found a society which should have for its avowed purpose "advancement in the theory and practice of motion picture engineering and the allied arts and sciences, the standardization of the mechanism and practices employed therein and the dissemination of scientific knowledge by publication."

Within a year over a hundred men joined the new venture and the program of activities was started which has now become so well known to many in the Industry. The new society began to hold semi-annual conventions at which papers were read and discussions invited; and all the material, which was considered by a committee of publication of technical or scientific interest, was printed in a magazine issued as the *Transactions*. These have appeared in unbroken succession until January, 1930, when they were superceded by a monthly JOURNAL, which in its attractive orange cover is already a familiar sight in libraries and film laboratories of the world.

The Governors of the Society of Motion Picture Engineers are very jealous of its prestige. A typical engineering society, it receives financial support from the industry which it serves, but business considerations are never allowed to color its work. Although the Society has grown to ten times its original size, the same broad,

disinterested aims are pursued as in the beginning. A humorist has remarked that it requires a large balloon full of "aims" to support a very small basket of "accomplishments." Perhaps, but in this case the accomplishments are not lacking.

Besides printing a JOURNAL, whose merit is so appreciated that its articles are often reprinted in the industrial magazines, the Society, through a permanent Standards Committee, has made possible the interchangeability of apparatus parts throughout the industry. A booklet has been issued setting forth desirable film standards and sprocket dimensions, and this second booklet records and cross-indexes all the scientific papers which have appeared in the *Transactions* during the 15 years of its life. A less tangible accomplishment is the personal coöperation, secured through the conventions, and the friendships which have been promoted in an industry not exactly famous for its spirit of brotherhood. It is no small tribute to the appreciation of manufacturers that they have allowed their employees to go from New York and the East to Hollywood to attend a West Coast convention. Many of the members who had been working on film problems for years would never have seen their product used in the field but for this and other similar opportunities.

The Society grants two kinds of membership, an *Active* status to persons carefully selected for their technical qualifications, who by their ability to vote on questions of policy can carry on the business of the Society; and *Associate* rank to any one in good standing professing interest in motion picture matters.

The Society has a President, a Past President, two Vice-Presidents, a Secretary, a Treasurer, and a Board of Governors, composing a directive unit which manages the affairs of the Society. The officers are chosen by election and every active member may feel he plays a part in the Society's work and progress.

Headquarters in New York have not proved sufficient for the Society's almost international scope. There is now a London section, numbering over 100 members, meeting in the British capital, which will more and more form a useful contact between America and Europe. Another section in Hollywood keeps in direct touch with the directors and cameramen in the field, and also enables the Society to maintain close coöperation with the Academy of Motion Picture Arts and Sciences. New York and Chicago have established sections under capable local leadership. The sections serve as

recruiting ground for many of the excellent papers which are appearing in the JOURNAL.

It is not possible to suggest in this short note all the subjects which are presented at meetings. The chemistry and physics of the photographic process take a prominent place, and to these must be added the fundamentals of sound recording. Against this background appear a host of specialized papers on optics, projection, theater lighting, studio technic, artistic and musical appreciation, of such wide variety that some article in every issue of the JOURNAL must appeal to the reader.

A technical society, like a telephone exchange, becomes more useful the larger it grows. Much has been accomplished, but more remains to be done. As long as the industry continues to thrive on the products of science and invention, just so long will there be work which can only be performed by those willing to give disinterested service. It is in the societies where such work is being done by those who have knowledge, that knowledge can best be gained by those who are not so fortunate.

The Governors of the Society of Motion Picture Engineers cordially invite to the appropriate grade of membership any new friend who may have become interested in these pages.

#### QUALIFICATIONS FOR MEMBERSHIP

**ACTIVE MEMBER**—An Active member shall not be less than 25 years of age and shall be:

- (a) A motion picture engineer by profession. He shall have been in the practice of his profession for a period of at least three years and shall have taken responsibility for design, installation, or operation of systems or apparatus pertaining to the motion picture industry.
- (b) A person regularly employed in motion picture or closely allied work, who by his inventions or proficiency in motion picture science or as an executive of a motion picture enterprise of large scope, has attained a recognized standing in the motion picture profession. In the case of such an executive, the applicant must be qualified to take full charge of the broader features of motion picture engineering involved in the work under his direction.

**ASSOCIATE MEMBER**—An Associate member shall not be less than 21 years of age and shall be:

A person who is interested in or connected with the study of motion picture technical problems or the application of them.

When, in the judgment of the Board of Governors, an applicant is not suited for the grade of membership for which he has applied, but is

eligible to the other grade of membership, the applicant shall be so notified by the Secretary and shall be given the opportunity of changing his application accordingly.

No application shall be approved by the Board of Governors until they have satisfied themselves of the fitness of the applicant.

Applications should be mailed to the Chairman of the Membership Committee or to the Secretary. When the applicant is accepted for membership by the Board of Governors he will be so notified, in writing, by the Secretary.

All checks should be made payable to SOCIETY OF MOTION PICTURE ENGINEERS.

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#### ENTRANCE FEES AND DUES

The entrance and transfer fees, payable on admission to the Society, or upon transfer, are as follows:

Admission to grade of Active member.....	\$30.00
Admission to grade of Associate member.....	\$20.00
The transfer fee from Associate to Active grade is the difference between the admission fee, or.....	\$10.00
The annual dues are as follows:	
For Active members.....	\$20.00
For Associate members.....	\$10.00

#### REFERENCES

Applicants shall give references to the members of the Society as follows:

For grade of Active..... Three (3) Active members.

For grade of Associate..... Two (2) Active members.

References should be named who have personal knowledge of the Applicant's experience. It is suggested that Applicants give more than the required number of references.

Synopses of the Scientific Papers  
Published in the Transactions  
and Journal of the Society  
of Motion Picture Engineers

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# TRANSACTIONS

NOS. 1-38

NO. 1, 1916, WASHINGTON, D. C.

## **Incorporation, Constitution and By-Laws. Standardization**

HENRY D. HUBBARD

A discussion of standardization, what it is, how applied, and its necessity to the motion picture industry.

NO. 2, OCT. 2-3, 1916, NEW YORK CITY

## **Chairman's Address**

C. FRANCIS JENKINS

An appeal for standardization.

## **Precision, The Dominant Factor in Motion Picture Machines**

W. B. WESTCOTT

A plea for the standardization of reel spindles, sprocket holes, and the speed of projection.

## **Motion Picture Film Perforation**

DONALD J. BELL

A discussion of film shrinkage and its relation to standard gauges, and how the standard dimensions of film are obtained.

## **Condensers, Their Contour, Size, Location and Support**

C. FRANCIS JENKINS

Reasons for the use of condensers and the loss by reflection. The correct position of condensers, location of shutter, and the factors entering into the location of elements of projection lenses are given. The meniscus lens and condenser breakage are discussed.

NO. 3, APRIL 6-7, 1917, ATLANTIC CITY, N. J.

## **President's Address**

C. FRANCIS JENKINS

Establishment of Standards.

## **Motion Picture Cameras**

CARL LOUIS GREGORY

An outline of the necessity of camera standardization, the frame line being the principal item.

**Report of the Committee on Electrical Devices**

The advantages and disadvantages of alternating current and how objections may be overcome. Various methods of changing alternating current to direct current where alternating current is available and direct current is desired. Various apparatus for obtaining proper arc voltage when alternating current is to be used. Determination of proper arc voltage for both alternating and direct current at various currents. Relation of the frequency of alternating current and its synchronism with the shutter flicker. Nature, size, and structure of carbons required for both alternating current and direct current for various currents. Proper angle of carbons for alternating current and direct current. Maximum density of current at carbon points to obtain maximum efficiency.

**Motion Picture Nomenclature**

List of various terms used in the industry and definitions.

**NO. 4, JULY 16-17, 1917, CHICAGO, ILL.****President's Address**

C. FRANCIS JENKINS

An appeal for original development, standardization, and fair play.

**Report of the Committee on Optics**

Standardization of projection lenses, focal lengths, opening of lens support, aperture plate, and maximum angle of projection.

**Motion Picture Standards**

Standards adopted by the Society.

**Motion Picture Nomenclature**

List of various terms used in the industry and definitions.

**NO. 5, OCT. 8-9, 1917, NEW YORK, N. Y.****President's Address**

C. FRANCIS JENKINS

**Motion Picture Standards**

Standards adopted by the Society.

**Motion Picture Nomenclature**

List of various terms used in the industry and definitions.



**Offset Projection**

WILL C. SMITH

The effects of projection at an angle. Corrective suggestions are given.

**The Motion Picture Booth**

C. FRANCIS JENKINS

Historical article followed by an appeal for greater safety in the projection room by the use of booths so placed and glassed in as to compel cleanliness, care, and therefore safety.

**Report of the Committee on Electrical Devices.**

The characteristics and advantages of each form of apparatus used for converting alternating to direct current and the principles by which the selection of any apparatus may be made. Complete wiring diagrams and operating charts are given.

**The Projection of Motion Pictures by Means of Incandescent Lamps**

A. R. DENNINGTON

Various filament arrangements and condenser systems, and the effect of the objective lens on the screen results. Screen results from various incandescent lamps are tabulated.

**Light Intensities for Motion Picture Projection**

J. T. CARDWELL AND R. P. BURROWS

Certain factors of screens and their relation to a satisfactory picture are given, such as the importance of screen brightness, extraneous light, and film density. An intensity of five foot-candles is sufficient for good vision. A brief discussion of the relation between arc and incandescent lamp optical systems to screen brightness together with a bibliography on the subject.

**NO. 6, APRIL 8-9, 1918, ROCHESTER, N. Y.****President's Address**

C. FRANCIS JENKINS

An appeal for greater safety.

p. 5

**Standardization of Exposure**

JOHN W. ALLISON

An appeal for standardized exposures so as to obtain uniform density of film. An indirect system of lighting is described and an exposure meter which will give the results desired.

p. 7

**Optical Requirements of Motion Picture Projection Objectives**

ALFRED S. COREY

A technical discussion of the subject giving formulas used in

determining the various factors entering into the design of projection objectives. p. 9

**Artificial Light in the Motion Picture Studio** MAX MAYER

Explains the nature of light sources, the color composition of light, and the concentration of source; describes reflection surfaces and diffusing screens. The arrangement of light sources is discussed together with the installation of the equipment and floor lamps. p. 18

**Condensers** C. FRANCIS JENKINS

A suggested type of condenser combining reflectors and a lens in order to utilize the maximum solid angle of light from an incandescent source. p. 26

**The Portable Projector: Its Present Status and Needs**

ALEXANDER F. VICTOR

A historical paper leading to a discussion of inflammable and non-inflammable film as used in portable projectors ending with an appeal to standardize a non-inflammable film for portable projectors. p. 29

**Theoretical vs. Practical as Applied to Standardization and Some of the Things to Be Considered as Proper Subjects for Standardization**

F. H. RICHARDSON

A plea for the standardization of camera and projector speeds and the distance of front row theater seats from the screen. p. 33

**Incandescent Lamps for Motion Picture Service** A. R. DENNINGTON

The design of various types of incandescent sources is discussed, showing how an optical system utilizes a definite area of source. Specific data are given. The effect of the mirror on the lamp rating, temperature, and screen illumination is shown and the various types of condenser systems and objective lenses are discussed. The effect of the shutter is shown. A comparison of screen illumination between arc and incandescent lamps is given and a description of lamp house equipment and electric control equipment. p. 36

**Some Considerations in the Application of Tungsten Filament Lamps to Motion Picture Projection**

L. C. PORTER AND W. M. STATES

A comprehensive study of the effects of improper setting of

lamps and condensers to the screen results; profusely illustrated together with considerable practical data. Transmission of objectives is treated and the test apparatus used described. p. 47

## NO. 7, NOV. 18-20, 1918, CLEVELAND, OHIO

- President's Address** C. FRANCIS JENKINS  
p. 5
- Society History** C. FRANCIS JENKINS  
p. 6
- Standardization of the Motion Picture Industry and the Ideal Studio**  
JOHN W. ALLISON  
A review of a previous paper by the author together with an outline of a suggested ideal studio and laboratory. p. 9
- Motion Picture Film in the Making** GEORGE A. BLAIR  
Description of the process of film manufacture, the elements entering into its composition, the care taken in keeping the film uniform, the inspections made during the manufacture, and a check on the completed film for uniformity both photographically and physically. p. 16
- Carbon Arc for Motion Picture Projection** W. C. KUNZMANN  
Description of projection equipment. Proper carbon combinations for various current values and proper carbon settings are suggested. The author gives a brief outline of carbon manufacture and discusses the characteristics of direct and alternating current arcs, as regards the color of light, the reliability, flexibility, and steadiness of the arc. p. 20
- The Projection Room and Its Requirements** F. H. RICHARDSON  
A brief history of the "booth" is given followed by recommendations as to the details of structure such as dimensions, ventilation, sanitation, observation ports, position of room, and safety equipment for the ideal booth. p. 29
- Natural Color Cinematography** WM. V. D. KELLEY  
Description of the methods of obtaining natural color film with single and double coated emulsions. The negative film, methods of coloring, the color filters, printing, and production patents are discussed. p. 38

**The Function of the Condenser in the Projection Apparatus**

HERMANN KELLNER

A theoretical discussion of the condenser and applicational results. Absorption tables, diagrams, and efficiency diagrams of various systems are given. p. 44

**Sprocket Teeth and Film Perforations and Their Relation to Better Projection**

A. C. ROEBUCK

A general discussion of the subject followed by a description of a method for obtaining a generated sprocket tooth. p. 63

**Fundamentals of Illumination in Motion Picture Projection**

R. P. BURROWS

A simple explanation of the various fundamental units used in the measurement and determination of light intensities and how these units are applied in the industry. p. 74

**Advantages in the Use of the New Standard, Narrow Width, Slow-Burning Film for Portable Projection**

W. B. COOK

The author discusses the history of this subject giving his idea of the solution of the problem, and points out the economy and durability of this film in use. p. 86

**NO. 8, APRIL 14-16, 1919, PHILADELPHIA, PA.****President's Address**

H. A. CAMPE

p. 5

**White Light for Motion Picture Photography**

WM. ROY MOTT

The author discusses the relation of light to the motion picture industry, pointing out the difference between theater stage and motion picture stage lighting and covers the artistic relation of light together with the importance of high intensity of light. He shows the daily and yearly variation of daylight. In comparison to daylight the author discusses white light as obtained from flame arcs, under the headings of the spectrum of the white flame arc, the psychological effect of color, the relation to make-up, and film sensitiveness, and gives data on the amount of light in relation to current and arc voltage. A description is given of several types of flame lamps together with a table of lamps and trims. The method of converting enclosed arcs to flame lamps is given and a description of the long life multiple trim arrangement. Various flame carbons, such as the Star

Core and Metal Coated Carbons, are discussed and the general advantages of the white flame lamp for photography indicated.

p. 7

### **Some Phases of the Optical System of the Projector**

F. H. RICHARDSON

A practical discussion of the action of the light rays beyond the condenser and a discussion with data to show the distribution of intensity of the light beam beyond the aperture and consequent loss of light.

p. 42

### **Condenser Design and Screen Illumination**

H. P. GAGE

Illustrates the desirability of suitable design in order to obtain the proper balance between the different parts of the optical system to obtain maximum efficiency. A description is given of a simple and little used method of observing the operation of the optical system.

p. 63

### **Adding Color to Motion**

WM. V. D. KELLEY

A history of color motion pictures.

p. 76

### **Attachments to Professional Cinematographic Cameras**

CARL L. GREGORY AND G. J. BADGLEY

A discussion of many necessary and useful mechanical and optical attachments to the camera.

p. 80

## **NO. 9, OCT. 13-15, 1919, PITTSBURGH, PA.**

### **President's Address**

H. A. CAMPE

p. 9

### **Preliminary Measurements of Illumination in Motion Picture Projection**

W. E. STORY, JR.

The author discusses a new method for measuring the illumination from optical systems by the use of a photo-electric cell and compares it to old methods. Some valuable data and curves are given showing variations in light delivered by various sizes of source, condensers, and objectives.

p. 12

### **Selection of Proper Power Equipment for the Modern Motion Picture Studio**

H. F. O'BRIEN AND H. A. CAMPE

The authors cite most of the factors that must be considered in making the proper selection of power equipment in motion picture

studios and suggests the type of equipment that should be selected to produce the best possible results under given conditions.  
p. 22

**The Continuous Reduction Printer**                      ALEXANDER F. VICTOR  
A description of a new type of printer to reduce from standard size negative to the safety standard positive.                      p. 34

**Stereoscopic Motion Pictures**                      C. FRANCIS JENKINS  
A historical discussion of the subject.                      p. 37

### NO. 10, MAY 9-11, 1920, MONTREAL, CAN.

**Motion Picture Standards**                      p. 5

**Motion Picture Nomenclature**                      p. 7

**Remote Control Switchboards for Motion Picture Studios**  
H. A. MACNARY

The author describes the remote control systems with a detailed description of one type of control box and push button station and discusses the operation of such a system.                      p. 12

**Papers Committee Report**                      p. 20

**Motion Pictures in Connection with Isolated Lighting Plants**  
R. L. LEE

Discussion of the difficulties in construction and description of the apparatus necessary.                      p. 24

**Educational Possibilities of Motion Pictures**                      B. E. NORRISH  
A popular paper on the subject.                      p. 29

**Report of Committee on Progress**  
A progress report on projection machines, carbons, incandescent lamps, electrical equipment, and optical systems.                      p. 33

**Tests of Screen Illumination from Motion Picture Projectors**  
W. F. LITTLE

The author describes several test methods and analyzes the results obtained. He shows the changes in screen intensity with electrical values, lamp temperature, and focusing.                      p. 38

**The Tinting of Motion Picture Film**                      G. A. BLAIR  
The methods of tinting are discussed together with the choice of dyes. The properties of acid dyes are given together with formulas for tinting, preparation of the solution, nature, strength,

and temperature of the dye bath and some of the troubles encountered. p. 45

**Heating and Ventilation of Motion Picture Theaters** O. K. DYER  
An analysis of the requirements in heating and ventilating motion picture theaters and a discussion of methods used. The temperature and humidity of air and its effect on the audience is discussed. The subject of air washing is treated. p. 54

**The Various Effects of Over-Speeding Projection** F.H.RICHARDSON  
Discussion of the effect of over-speeding projection as it affects the mechanism, film sprocket holes, the objects presented, and the accompanying music. p. 61

**The Eccentric Star Intermittent Movement** WILLARD B. COOK  
The author describes this movement, compares it to other movements and outlines the advantages in the use of this particular type of intermittent. p. 70

**Standards in Theater Design to Safeguard from Fire and Panic**  
WILLIAM T. BRAUN  
An ideal code outline designed for maximum safety, tabulated from the codes of large cities and the National Board of Fire Underwriters. p. 74

**The Interior Illumination of the Motion Picture Theater**  
LOYD A. JONES  
A determination of the maximum value of general illumination allowable so as not to cause appreciable diminution of contrast of the projected picture. Theory, fundamentals, and characteristics of the subject are given together with a description of an experimental installation and the results obtained from the experiment. p. 83

**Continuous Motion Picture Machines** C. FRANCIS JENKINS  
A historical discussion of the subject and a discussion of some types of projectors. p. 97

**Further Measurements of Illumination in Motion Picture Projection**  
W. E. STORY, JR.  
The method previously described has been improved and applied to the measurement of the total illumination obtained on the screen with different source sizes and condenser systems compared to the maximum obtainable with the given source bril-

liancy and given objective diameters. A comparison of the photo-electric measurements with the measurements obtained using an optical photometer for condensers of different absorption, and sources of two slightly different brilliancies shows the ratio of the photo-electric cell readings to the photometer readings to be independent of color through the range considered. Uniformity of screen illumination is also taken up in a general way by the application of direct observation of the screen to the automatically drawn curves registering total illumination. p. 103

### Report of the Optics Committee

The effect of color in a picture on clearness, contrast, brightness, naturalness, and mood. p. 118

## NO. 11, OCT. 11-14, 1920, DAYTON, OHIO

- President's Address** H. A. CAMPE  
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- Extracts from Minutes of the Fifth Annual Meeting** p. 14
- Report of the Advertising Committee** p. 25
- Report of the Committee on Progress**  
Includes a description of a new arc lamp, arc control, and camera motor. p. 27
- Papers Committee Report** p. 29
- Report of Committee to Consider Correspondence Course for Projectionists** p. 32
- Extracts of Action Taken at Board of Governors Meeting** p. 34
- History of the Motion Picture** C. FRANCIS JENKINS  
The author discusses and illustrates the history of motion picture projection and early types of machines and methods. p. 36
- Report of the Optics Committee**  
A continuation of the discussion on the effect of color in projection and a tabulation of the results on brightness, clearness, and contrasts for various film tints. p. 50
- Reducing the Fire Hazards in Film Exchanges** GEORGE A. BLAIR  
Description of tests to determine methods of fire prevention and methods now used to reduce hazards. p. 54



**Reflection Characteristics of Projection Screens**

LOYD A. JONES AND MILTON F. FILLIUS

A comprehensive paper describing methods and apparatus used in the test and materials examined. Results obtained are shown in graphic and tabular forms on 36 samples. These results are classified and suggestions on the selection of screens are given.

p. 59

**Absorption and Reflection Losses in Motion Picture Objectives**

HERMANN KELLNER

The author shows where the losses occur and the amount of these losses for various combinations of lenses.

p. 74

**The High Power Arc in Motion Pictures** PRESTON R. BASSETT

The author discusses the brilliancy of various sources of light and compares them. He shows an application of the new high intensity arc to searchlights and tells how results are obtained by increasing the brilliancy of the arc. A new projection lantern involving a new arc is described and test data in comparison with other arcs are given.

p. 79

**Design of Power Plant and Electrical Distribution in Large Studios**

JAC. R. MANHEIMER

This paper contains many new ideas on the subject and fully describes the power plants and electric distribution, designed and installed in the studios and laboratories of the Famous-Players-Lasky Corp., in Long Island City, N. Y., and the Fox Film Laboratory, New York City.

p. 93

**Portable Power Plants for Motion Picture Studios** H. F. O'BRIEN

Several types of portable plants with engine driven equipments are discussed and the features of the design and equipment together with the necessary elements for portable plants are given.

p. 122

**NO. 12, MAY 9-12, 1921, WASHINGTON, D. C.**

President's Address	H. A. CAMPE	p. 13
Meeting of the Board of Governors		p. 16
Report of Educational Committee		p. 18
Report of the Advertising Committee		p. 20
Papers Committee Report		p. 21
Report of Committee on Electrical Devices		p. 23

**Tentative Report of Optics Committee** p. 25

**Motion Picture Nomenclature** p. 34

**A Review of the Material Pertaining to Motion Picture Engineering**  
R. P. BURROWS

A classified compilation of published material on motion picture engineering and allied subjects with synopses of each article.  
p. 39

**Light for Motion Picture Theaters** J. L. STAIR

Lighting in the motion picture theater differs from that of the legitimate theater in that the problem is one of securing correct gradation of light and color rather than of securing a proper and sufficient intensity. The exterior, for example, should be lighted to a high intensity with special effects to attract patrons. The illumination intensities for the entrance, lobby, foyer, auditorium, and screen should gradually decrease in the order named, from about 8 to 9 foot-candles to that obtaining for stray light on the screen. Two intensities of illumination are required for the auditorium, dim lighting during the performance—and the brighter intensity for intermissions. Indirect lighting from suspended fixtures and coves and provision for a variety of color effects in conjunction with dimmers are suggested. Lighting is just as essential as the seats, decorations, *etc.*, and warrants the cooperative efforts of theater owner, architect, and contractor.

p. 52

**Motion Picture Cameras** CARL LOUIS GREGORY

Detailed descriptions of various types of cameras including the Akeley, Russell, Pittman, Wilart, Universal, Bell & Howell, and others. Their special features are discussed.

p. 73

**The Absorption of Light by Toned and Tinted Motion Picture Film**

LOYD A. JONES AND C. W. GIBBS

Since toning and tinting film increases the light absorption and may require an increase in the projection lamp current in order to produce a satisfactory picture, a measure of the absorption characteristics of colored film is of practical importance. Quantitative measurements of the amount of light absorbed were made with a specially designed integrating flicker photometer. Transmission data in numerical form are given on a variety of samples of dye tinted and toned film. Dye tinting produces

no appreciable change in photographic quality with fairly high transmissions; dye toning results in the slight distortion of photographic quality and chemical toning produces a similar result in the direction of enhanced contrasts. p. 85

### Condenser Lenses for Theater Motion Picture Equipments

CARL E. EGELER

Quantitative and visual test data on screen illumination show no appreciable difference in the amount of light obtainable with commercial types of plano-convex and prismatic condensers used with 30 ampere 28-32 volt Mazda C lamps. Prismatic condensers give better results in service due to ease of setting the mirrored reflector and to the smaller sacrifice in evenness in screen illumination when the optical elements are accidentally moved. Slide holders should not be left in position with plano-convex condensers when moving pictures are being projected. High grade No. 2 objectives project twice as much light as do No. 1 objectives with no sacrifice in the quality of the projected picture. p. 104

### Address

F. W. STRATTON

Nearly all improvements in projection devices are based on the application of some scientific principle. The Bureau of Standards can be of great assistance in a number of fields, physics (weights and measurements), electricity, heat and temperature, optics, chemistry of materials, *etc.*

Motion pictures will have increasing application in education, and improvements especially in portable apparatus will extend their application in the home. p. 124

### Continuous Motion Projector for the Taking of Pictures at High Speed

C. FRANCIS JENKINS

Certain undesirable features of the prismatic lens described in a previous paper have been overcome by the use of two rotating glass disks mounted so that their peripheries curve in opposite directions. Apparatus using the new rings permits greatly increased speeds, possibly 100,000 pictures per minute. A demonstration was made of film photographed at 850 pictures per second (51,000 pictures per minute). p. 126

### Color Photography

F. E. Ives

A brief discussion of a type of color cinematography wherein

pictures are produced on ordinary positive stock, single coated, the advantages of single coating being lesser cost of the stock and the reduced liability to damage. In experiments by the author a camera was used which made the two negative images simultaneously instead of successively, in rotation, thereby eliminating the effect of unpleasant color fringing caused by the superimposed images being out of position in the case of rapidly moving subjects.

A detailed account of the process is given in the discussion of the paper. p. 132

**Building a Non-Theatrical Film Library** L. E. DAVIDSON

There is great need for a well organized non-theatrical film library to supply the demand by professional and private groups or parties for instructional films of interest.

Many difficulties attend the gathering together of such a library; these are outlined, as well as past failures and successes, the success of many non-theatrical libraries being attributed to the adoption of the Safety Standard by the Society. p. 139

**Submarine Photography** J. E. WILLIAMSON and CARL L. GREGORY

Paralleling the marvelous achievements of the air, the riddle of the deep is about to be solved by submarine photography, which will expose a world of untold adventure and wonders.

An interesting discussion and description is given of the problems involved, of the methods used in taking submarine movies and of certain films that have been produced. p. 149

**The Motion Pictures of Tomorrow** HENRY D. HUBBARD

An idealistic insight of the future of the motion picture and its applications, the key note of which is the word "automatic." From handy pocket projectors to theaters of perfected convenience and design we are to have a superlative type of entertainment ultra modern in every degree, supplemented by ideal viewing conditions.

Highly developed instructional films with auxiliary devices and consequent projective apparatus will revolutionize educational methods and teaching of the arts.

A camera is featured which is the combination of all present day dreams, a camera which is truly an eye.

The article is an outline of a highly imaginative goal. p. 159

**New Developments in Mazda Lamp Projection for Motion Pictures**

C. A. HALVORSON, JR.

Presentation in detail is given of the characteristics and development of the present lamp for motion picture projection and of the optical system used in conjunction with it. The merits of the plano-convex and prismatic condensers are considered along with the selection of the proper size objective lens for each. A description is given of the apparatus and equipment and the importance of proper adjustment.

The application of Mazda lamp equipment and its limitations are discussed as well as the possibility of correcting present undesirable conditions. p. 168

**Talk and Demonstration of Action of Various Chemicals on Arc Lamp Cores**

W. R. MOTT

An illustrated lecture and discussion of the effect of putting chemicals in the arc. The flame arc was recommended for aperture and studio lighting and discussion was given of the proper carbon selection and ensuing efficiencies p. 184

NO. 13, OCT. 31, NOV. 1-3, 1921, BUFFALO, N. Y.

**President's Address**

H. A. CAMPE p. 15

**The Illumination with Small and Large Condensers**

W. E. STORY, JR.

A detailed account of the tests and results of tests to determine the comparative efficiencies of small and large condensers on a basis of the maximum amount of light obtainable, with a discussion of the practical limits attending the use of the smaller condensers. p. 19

**Optical Glass**

H. N. OTT

In its essential constituents, optical glass does not differ from ordinary glass; the difference is in the mechanical treatment and arrangement of the constituents. Some of the problems of making a greater variety of glasses and of eliminating defects have been but recently solved.

Following a history of the development of optical glass making abroad and in this country, a detailed account is given of the present process of manufacture. p. 39

**A Point Light Source for Laboratory Use**

C. A. B. HALVORSON, JR., AND S. C. ROGERS

The term "point light source" is purely hypothetical and unattainable but one approaching this definition has been developed and found to be practical from a laboratory standpoint. The use of this lamp and a comparison of the intrinsic brilliancies of this and other lamps is presented. p. 48

**Industrial Mechanigraphs**

HARRY LEVEY

Answering the demand of a public educated to continually expect something better in the way of motion pictures, the animated mechanical drawing was developed, a drawing which moves in the same manner as the machine or whatever else was represented, and which has now given way to the more advanced "mechanigraph," differing from the animated mechanical drawing in the engineering skill behind it, in the refinement of details, and care and thoroughness by which it is made.

An interesting illustrated discussion is given of the subject matter and versatile application of the mechanigraph. p. 55

**Analysis of Motion**

C. P. WATSON

Following a short history of the development of the "Novagraph" camera, various uses of "Analysis of Motion" or slow motion photography are outlined. p. 65

**100,000 Pictures per Minute**

C. FRANCIS JENKINS

Information upon many important problems can only be obtained by photographic divisions of time at a high rate, and therefore the development of high speed photography is very worth while. Many difficulties were met; a discussion of these and their subsequent remedies is given. p. 69

**The Use of Artificial Illuminants in Motion Picture Studios**

LOYD A. JONES

A general treatise outlining the fundamental relations between the various factors of the problem which divides itself into two main parts: a consideration of the characteristics and response of photographic materials to the radiation of various intensities and qualities emitted by the light sources available; and the human eye, its characteristics and the possibility of injury to any part resulting from extreme intensities or the quality of radiation emitted by the sources used.

A complete list of the terminology, nomenclature, and units which enter into a study of this kind is listed, followed by a discussion of photographic units, relative efficiencies of illuminants, transmission of photographic lenses and calculation of the illumination required. p. 74

**Actinic Measurements in the Exposing and Printing of Motion Picture Film**

W. E. STORY, JR.

This discussion first describes the use of the "telactimeter" in measuring the actinic power of the light from an object regardless of the color of the object or of the incident light, with the aim of determining the correct exposure time, and secondly deals with the necessity for correctly timed printing and a method of arriving at this by means of the photo-electric cell. p. 106

**The Need for Improvement in Present Practice as Regards Film Reels**

F. H. RICHARDSON

The use of old, bent up, mutilated reels and the subsequent needless damage to films is derided here, and some of the faults of new and old style film reels are listed. A proposed standard design is outlined as a remedy for the present defects. p. 116

**Protection of Inventions**

THOMAS HOWARD

Most applications for patents on new inventions are prosecuted so poorly that the fundamental principle of the invention is lost sight of in half the cases, and hence the invention is given to the public. A number of cases are cited, followed by a general discussion and an outline of the proper procedure to take after making an invention. p. 123

**Testing and Maintaining Photographic Quality of Cinematographic Emulsions**

ALFRED B. HITCHINS

Following the listing of the characteristics and composition of negative and positive emulsions, an extensive discussion is given of the process of their manufacture and the equipment used and of the method of testing the product. p. 136

**The High Intensity Arc Lamp**

A. D. CAMERON

The development of the light source used in motion picture projection did not keep step with the remarkable engineering progress of the industry until the introduction of the High Intensity arc using very small electrodes, the positive having a highly mineral-

ized core. The present use of this arc and an outline of future possibilities are presented.	p. 152
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### NO. 14, MAY 1-4, 1922, BOSTON, MASS.

President's Address	L. C. PORTER	p. 18
The Care and Preservation of Motion Picture Negatives		

GEORGE A. BLAIR

In view of the enormous increase in the production of motion pictures during the past few years and of the great financial investment represented in the negatives which it is desirable to preserve in best physical conditions for the future use, it is necessary that the utmost care be exercised in processing, printing, and storage of such negatives. The best methods known for the preservation of motion picture negatives are given.

p. 22

### Constant Potential Generators for Motion Picture Projection

A. M. CANDY

This paper discusses the development of the constant potential generator and of one which with its control equipment has been perfected so that several lamps can be operated from the same generator, using different current values in the various lamps without producing any visible flicker or decrease of illumination of pictures on the screen.

p. 28

### Film Splicing

J. H. McNABB

A brief historical synopsis of the art, including the development of the film splicing machine with comparative results of various methods of splicing both the negative and positive film and the results in printing spliced film. An endeavor is made to prove greater longevity of film spliced by machine methods as compared to hand splicing.

p. 40

### Projection and Its Importance to the Industry

F. H. RICHARDSON

The ultimate success of any production depends to a very great extent on the impression received by the audience. Imperfect projection reduces the value of any production. Neither pro-



ducer, directors, nor players make any protest against poor projection. p. 55

### **Prismatic Rings**

C. FRANCIS JENKINS

This paper discloses the progress made in the grinding and polishing of the prismatic glass rings and mechanisms employing them. The paper also cites new applications for these rings which have been discovered since the matter was last brought to the attention of the Society. p. 65

### **A New Transparent Rotary Shutter**

W. OSBORNE RUNCIE

A description of the new form of rotary shutter for intermittent motion picture projection apparatus. The idea is based on the principle of optical admixture of the three primary colors or of a complementary pair in order to produce the sensation of white. Scientific application of the above principle has resulted in increased screen illumination and a decided reduction of flicker. The theory involved and its practical application are fully dealt with. p. 74

### **Negative Test Method as an Aid in Condenser Design**

J. T. BEECHLYN

A new method is outlined for testing the performance of a projecting system including light sources, condensing, and projecting lenses. The usual conditions are reversed, the light source being replaced by a dark target possessing identical dimensions and surrounded by a lighted area. Under such conditions perfection of adjustment is indicated by a uniformly dark screen. Any departure from correct adjustment is indicated by the presence of light patches. The effect upon screen brightness of various factors is discussed. p. 80

### **Some Applications of Aspherical Lenses in Motion Picture Work**

HERMANN KELLNER

The use of aspheric condensers and the subsequent elimination of spherical and chromatic aberrations are discussed, in view of the possibility of increasing the speed of the lenses. p. 85

### **The Motion Picture Theater of the Future and the Equipment Probably Required**

S. L. ROTHAFEL

The writer believes that the motion picture theater of the future will be comparable to the greatest opera houses of the world and that the future of the motion picture holds great promise of

rivaling grand opera. Improvements in projection and lighting are to be expected and the contour of the theater will also undergo a change to accommodate new developments in the acoustical equipment. p. 100

### **Graininess in Motion Picture Negatives and Positives**

ARTHUR C. HARDY AND LOYD A. JONES

An instrument which measures the graininess of the photographic material is described. It is shown that the readings of the instrument represent the true graininess as understood by the photographer. The instrument has been used in a study of the various steps in the preparation of the motion picture positive to determine the conditions for the minimum graininess in the finished print. p. 107

### **Can the Movies Teach?**

ROWLAND ROGERS

This paper contributes some information upon the subject of the meaning, advantages, and limitations of visual education through motion pictures. It evaluates the motion picture as a visual aid to instruction. p. 125

### **Color Photography**

C. E. K. MEES

A discussion of color photography which divides the subject into two processes: namely, the additive, which involves the production from the original subject of three negatives, each made by means of one of the three primary colors; and the subtractive process in which the three negatives are printed in such a way that colored images can be produced, each positive being printed in a color complementary to that of the filter through which the corresponding negative was taken. Owing to commercial considerations the subtractive process, in which only two colors are used instead of three, has been developed furthest. p. 137

### **Studio Lighting from the Standpoint of the Photographic Director**

ALVIN WYCKOFF

The need is expressed for a studio lighting unit which will burn constantly, as the Cooper Hewitt, and that can be used in place of the arc and take up no more room, a powerful and compact light which does not require the constant attention of an experienced operator. When such equipment is made available the demand will be enormous. p. 157

<b>Color Toning of Cine Films</b>	F. E. IVES
This paper outlines a new method by which color toning is possible with unlimited choice of hues and perfect control of depth of tone at a negligible cost.	
	p. 160
<b>Note on New Continuous Projector</b>	FRANK N. STEWART
A brief description of a projector employing the principle of continuously moving film which has given satisfactory results.	
	p. 162
<b>Report of Camera Committee</b>	p. 164
<b>Report of the Committee on Films and Emulsions</b>	p. 166
<b>Report of the Nomenclature Committee</b>	p. 170
<b>Report of Committee on Progress</b>	p. 171
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<b>Report of the Safety Committee</b>	p. 183
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<b>Report of the Theater Committee</b>	p. 190

### NO. 15, OCT. 9-12, 1922, ROCHESTER, N. Y.

<b>Presidential Address</b>	L. C. PORTER	p. 18
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#### **Accurate Methods for Expressing the Performance of Lenses.**

W. B. RAYTON

An attack upon faulty and careless description of the qualities or characteristics of lenses. Accurate methods of comparison are presented.

p. 21

<b>Pedagogical Motion Pictures</b>	CARL ANDERSON
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A plea for organized production and circulation of films for use in the school class room, films which will parallel the text book. The term "Educational Film" as used today is misleading; very few of such films can be considered as truly educational and adapted for school use.

p. 30

<b>Film Waxing Machine</b>	J. G. JONES
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The writer believes the difficulty in projecting film due to the friction caused by the collection of small deposits of emulsion or gelatine upon the film guides can be overcome by a machine which applies a small line of wax along the edge of the film, ap-

proximately in the center of the perforated margin, the wax forming a lubricant, thereby reducing the coefficient of friction.

p. 35

**A Method of Using Miniatures or Models for the Introduction of Extra Detail in Motion Pictures**

ALFRED B. HITCHINS

Any object intended to be stationary during the taking of a scene, and in front of which no action is to take place, can be modeled in miniature or painted upon plate glass and blended into the main scene so that results, when projected, are convincingly realistic. The miniature is placed between the camera and scene to be photographed, the distances depending upon the relationship of size, place, and perspective.

p. 41

**A Motion Analyzer**

HERMANN KELLNER

This paper discusses a projection apparatus for use in machine shops showing moving parts of machinery in operation, the projected images being apparently at a standstill.

p. 47

**Problems in Motion Picture Laboratories**

M. BRIEFER

Attention is focused upon problems which bear some relation to the more important phases of motion picture film processing. Examples are given from experiences in actual practice and indicate the means whereby related problems may be solved. Much space is devoted to a consideration of temperature and humidity and the principles of their relations are explained. Film splicing is treated fully. Formulas for film splicing cements are given in detail. A convenient and efficient type of cement bottle is described.

p. 51

**Effect of Distance of Projection and Projection Angle upon the Screen Image**

F. H. RICHARDSON

This paper discusses the distortion of the screen image through too large a projection angle and the poor image definition accompanying very long projection distances, with the subsequent remedies, that is, the proper location of the projection booth.

p. 67

**A Demonstration Model for Showing Lens and Condenser Action in the Motion Picture Projector**

SANDER STARK

A method of analyzing lens action is outlined, the purpose of which is to show comparatively the difference in action between a spherically uncorrected condenser and a spherically corrected

one and to show that the spherically corrected condenser is a more efficient lens in projecting a beam of light through an aperture. p. 79

**A New Sensitometer for the Determination of Exposure in Positive Printing** LOYD A. JONES AND J. I. CRABTREE

In order to eliminate the personal equation in selecting the proper exposure time for printing, a sensitometer is employed for conveniently and simply making trial prints using exposures corresponding to the various light change steps of the printing machine. p. 89

**Printing Exposure and Density in Motion Picture Positives**

LOYD A. JONES

Any simple method whereby the correct printing time for the production of satisfactory prints from motion picture negatives may be predetermined without the necessity of making trial prints would be of considerable value in the printing laboratory.

This paper presents the results of a preliminary survey of a statistical character and yields information relative to the characteristics of motion picture positives accepted as of satisfactory quality by the practical worker. p. 102

**Motion Picture Work in the Philippine Islands** O. S. COLE

An interesting historical account of the showing of motion pictures in the Philippines, of the local problems of projection, and of the whims of the Filipino audience. p. 112

**The Alabama Polytechnic Institute** ALBERT L. THOMAS

A brief discussion of the part played by this University and its graduates in the motion picture industry. The University boasts an accredited course in Motion Picture Projection. p. 116

**Motion Pictures in the U. S. Army** ROGER M. HILL

An outline of the Army Motion Picture Service and of the projection equipment used. p. 119

**Motion Picture Activities of the Canadian Government** R. S. PECK

Canada uses motion pictures in an extensive advertising program, sponsored by the Publicity Bureau of the Department of Trade and Commerce. One reel series, called the "Seeing Canada" films are produced which give information concerning Canada

from various angles, such as the travelogue type, scenic beauty, and Canadian manufactures. p. 122

### Demonstration and Description of the Widescope Camera

JOHN D. ELMS

Description of a camera employing two lenses, one centered above the other with a mechanism to focus them in unison. In this manner an extended view is obtained having twice the visual angle of a single lens camera. The picture is taken on two standard films and is synchronized in one wide picture when projected on the screen with two standard projectors. p. 124

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Report of the Safety Committee	p. 146

## NO. 16, MAY 7-10, 1923, ATLANTIC CITY, N. J.

President's Address L. C. PORTER p. 18

The Place of the Motion Picture in Education ERNEST L. CRANDALL

A general discussion of the effectiveness of the motion picture as a teaching tool, as a substitute for direct sense experience. For example, its application to the study of geography is considered. Certain practical problems of engineering significance must be overcome, especially the item of cost. p. 22

High Speed Motion Pictures without an Especially Designed Camera J. H. McNABB

Many problems attend the producing of a high speed intermittent movement camera capable of withstanding the severe strain upon its mechanism without impairing its normal operation. The problems involved and the development of a satisfactory mechanism are fully discussed. p. 32

Cine Light DOUGLAS E. BROWN

Deals with lighting effects, and the moulding of a scene and action

through the use of proper lighting. A discussion of different effects obtainable is made, with the means of obtaining them. Quality and brightness of illumination are dealt with. Relation of visible intensity to photo brightness is considered, illustrated by spectral distribution curves. p. 40

### **Mazda Lamps for Projection**

J. A. SUMMERS

"A steady, solid light source of high brilliancy evenly distributed over a small area and having a high candle-power with little heat and which is simple and easy to operate and control on either alternating or direct current"—this is an ideal light source. While the incandescent lamp does not fulfill all of these requirements, it has many of these desirable qualifications.

A discussion of the use of Mazda lamps is given together with lamp characteristics and nomenclature. The importance of operating lamps at their rated voltage is stressed. p. 54

### **The Phonofilm**

LEE DEFORREST

An extensive discussion of the possibilities and development of a talking motion picture employing the photography of sound waves. p. 61

### **Radio Photographs, Radio Movies, and Radio Vision**

C. FRANCIS JENKINS

This paper presents a short history of the attempt to transmit pictures electrically, followed by a general discussion of the development of apparatus for sending and receiving pictures by radio, and its theory and operation. The entire apparatus is comparable to a camera with its lens in one city and with its photographic plates in innumerable other cities. A broadcasting program is discussed. p. 78

### **Photographic Recording and Photoelectric Reproduction of Sound**

J. TYKOCINSKI-TYKOCINER

The principles underlying the production of reproducible sound records by means of photography are discussed, and methods of investigation of adaptability of luminous discharges in gases and mercury vapor are described. Diagrams are given of methods to modulate various forms of luminous discharges by means of sound controlled audio- and radio-frequency circuits. Description and photographs are included illustrating the apparatus

developed by the author for talking motion pictures and for testing photographic sound records. p. 90

### **Problems of the Film Finishing Laboratory**

W. R. ROTHACKER AND JOSEPH ALLER

The laboratory is undoubtedly one of the most important factors in motion picture construction. It is very necessary that the negative be properly developed. The proper making and handling of prints is discussed. p. 120

### **Testing Motion Picture Machines for the Naval Service**

LIEUTENANT COMMANDER C. S. GILLETTE, U. S. N.

The increasing importance of motion pictures from an educational standpoint has led the government to supply projection equipment to its ships. With regard to the peculiar requirements of the service demanded by the Navy an investigation and test of commercial material were necessary. A discussion of the nature of the service demanded by the Navy and of tests made is given. p. 126

### **Heat Protection of Motion Picture Film**

E. D. TILLYER

All motion picture films contain organic materials which are destroyed or damaged by excessively high temperatures. This paper discusses the effect of various parts of the spectrum upon the film with and without heat absorbing filters. p. 137

### **Efficiency in Carbon Arc Projection**

W. R. MOTT AND W. C. KUNZMANN

The light production efficiency of the projection arc is dependent upon the intrinsic brightness per unit of surface of the crater, and upon the effective area of the crater. Following a table of the intrinsic brightness of different light sources, the paper considers the relation of current, the optical system, and flame materials to projection efficiency. p. 143

### **A Preliminary Note on the Uniform Development of Motion Picture Film**

F. F. RENWICK

A report upon an experiment in which a number of lengths of film free from irregularities in the thickness of its sensitive coating were exposed as uniformly as possible to a moderately wide range of light intensities and then developed in several different commercial laboratories and photometered upon their return. p. 159



**The Development of Motion Picture Film by the Reel and Tank Systems**

J. I. CRABTREE

This paper discusses the handling of motion picture film by the reel and trough, and rack and tank systems during the operations of developing, fixing, washing, and drying, with descriptions of the apparatus, developing solutions, process of developing negative and positive motion picture film, timing of the negative, rinsing, fixing, washing, and drying.

p. 163

**A Split Aspheric Condensing Lens**

FRANK BENFORD

Discussion of the split aspheric lens as a means of getting uniformity of screen with use of the incandescent lamp and yet obtaining a maximum screen brightness. The characteristics and operation of this lens are analyzed.

p. 212

**The Beacon Portable Motion Picture Projector**

J. R. MITCHELL

A review of the possibilities for portable projectors is followed by a discussion of the considerations in their design and the specifications and description of the mechanism of the Beacon projector.

p. 225

**The Discrola**

C. FRANCIS JENKINS

The Discrola is a home motion picture projection machine having the continuous motion type of mechanism and employing a picture record consisting of a plurality of paper disks. A description of the machine and its operation is presented.

p. 234

**A Combined Motion Picture Camera and Projector**

AUGUSTUS R. DE'TARTAS

Following an exposition upon the scope and principles of motion picture apparatus as applied to the amateur and the home, or for use in industrial, scientific, and educational work, a description and photographs and drawings are presented of the principal features of this apparatus, designed to embody compactness, simplicity, lightness, practicability, and economy.

p. 239

**The Cine Kodak and Kodascope**

C. E. K. MEES

A general description of the mechanism and operation of a camera and projector for home motion picture application.

p. 246

**A New Substandard Film for Amateur Cinematography**

C. E. K. MEES

This article discusses the nature and features of a new standard

film of 16 mm. width for use in amateur motion picture cameras,  
and a new process for finishing the film. p. 252

**The Spirograph**

CHARLES URBAN

This machine is a motion picture projector employing a disk film for the inexpensive production of miniature motion pictures for use in the home or wherever the cost of production is of primary importance. A description of the mechanism and of its operation is given. p. 259

**The Motion Picture a Practical Feature of the Home** A. F. VICTOR

A consideration of the reversal film, which eliminates the necessity of printing a positive as a remedy to the prohibitive cost of film for home projection. p. 264

**Description to Accompany Demonstration of Pathescope**

WILLARD B. COOK

A general description of a portable projector employing 28 mm. film. p. 266

**Report of Committee on Electrical Devices** p. 267

**Report of the Committee on Films and Emulsions** p. 269

**Report of the Nomenclature Committee** p. 278

**Progress Report** p. 283

**Report of Papers Committee** p. 288

**Report of Theater Committee** p. 291

**Report of Film Perforations Committee** p. 303

**Report of Laboratories Committee** p. 309

**Report of Committee on Standards** p. 314

**Report of Committee on Reciprocal Relations** p. 323

**NO. 17, OCT. 1-4, 1923, OTTAWA, CANADA**

**Presidential Address** L. C. PORTER p. 17

**Light and Shadows** J. SEARLE DAWLEY AND OSCAR LUND

A résumé of the development and possibilities of the motion picture with a discussion of color motion picture photography. p. 23

**A Study of the Markings on Motion Picture Film Produced by**

**Drops of Water, Condensed Water Vapor, and Abnormal Drying Conditions**

J. I. CRABTREE AND G. E. MATTHEWS

A general discussion of the factors influencing the formation of moisture markings. Moisture spots and marks are classified and a description given of the manner of their formation. p. 29

**The Motion Picture Engineer and His Relation to the Industry**

ALFRED B. HITCHINS

No industry can operate smoothly, successfully, and economically without the services and knowledge of the engineer. The need of engineering in the preparation of dope for celluloid, in casting celluloid, in emulsion making and coating, in studio work and picture projection, in finishing the film, in the manufacture of equipment, and in theater construction, is stressed in this article. p. 46

**Film Sprocket Design**

J. G. JONES

A comprehensive, illustrated discussion of the proper sprocket design and shape of teeth is presented. Formulas are given. p. 55

**Motion Picture Camera Taking 3200 Pictures per Second**

C. FRANCIS JENKINS

A brief discussion of the camera used and description of some of the action photographed. p. 77

**Recent Progress in the Transmission of Motion Pictures by Radio**

C. FRANCIS JENKINS

A general discussion of new developments in the process of sending radio photographs and radio motion pictures is given with a description of the processes. p. 81

**Thermal Characteristics of Motion Picture Film**

LOYD A. JONES AND EARLE E. RICHARDSON

A report on the influence of certain factors upon the magnitude of the heating effect upon the film, with a description of the methods and apparatus used and a discussion of the heat absorbed by film in passing through a projector. p. 86

**Importance of Synchronizing Taking and Camera Speeds**

F. H. RICHARDSON

A general discussion of the need for projection speed being the same as the speed at which the picture was taken in order to have the projected scene identical with the scene taken. p. 117

- Relation of Objective Lens to the Efficiency of the Optical System** R. E. FARNHAM  
 A plea for a larger diameter objective lens with resultant better utilization of light through the optical system used in conjunction with Mazda lamp projection equipment. p. 124
- Can the Efficiency of the Present Condensing Systems Be Increased?** HERMANN KELLNER  
 The factors involved in the proper design of optical equipment for projection are related and certain recommendations given. p. 133
- The Cost Elements of a Motion Picture** DOUGLAS BROWN  
 An analysis of the various elements entering into the cost of making the photoplay, together with the scope of the studio staff. p. 141
- Stereoscopic Pictures** WM. V. D. KELLY  
 The difference between ordinary motion pictures and stereoscopic motion pictures is described as well as the theory of stereoscopic projection. A review of different processes is given. p. 149
- A Motion Picture Densitometer** J. G. CAPSTAFF AND N. B. GREEN  
 To supply the need for an instrument capable of measuring the small areas of density in motion picture images a densitometer was developed and is described. p. 154
- Erbograph Machine** ROSCOE C. HUBBARD  
 A friction feed machine for developing, fixing, washing, tinting, and drying of the film is described. An illustrated discussion is given of its mechanism and operation. p. 163
- Sprockets and Splices** EARL J. DENISON  
 A history of the methods, materials, and equipment used in splicing film, from the time when splicing was given no consideration to the present day realization of its importance. p. 179
- Report of Progress Committee** p. 185
- Report of Papers Committee** p. 191
- Report of Educational Committee** p. 193
- Report of Reciprocal Relations Committee** p. 194

## NO. 18, MAY 19-22, 1924, ROSCOE, N. Y.

**Presidential Address** LOYD A. JONES p. 15

**The Progress of Arc Projection Efficiency** P. R. BASSETT

A comparison of various light sources used for the projection of motion pictures is made, comparative values of intrinsic brilliancy for screen illumination being given. The author demonstrates by graphic methods the efficiency of various types of optical systems showing that the reflecting condenser utilizes a much higher percentage of the available flux than any system of lens condensers. The Stellarc-Automatic-Reflector lamp is described in detail and values of screen lumens per ampere for various types of arc lamps are given. p. 24

**Colored Glasses for Stage Illumination** H. P. GAGE

The introductory paragraph deals briefly with the principles of color mixture and discusses the production of color by selective absorption. The selectively absorbing characteristics of a large number of colored glasses manufactured by the Corning Glass Works are described and illustrated graphically by spectrograms. The glasses mentioned represent practically the entire range of color available in these materials. p. 37

**Stereoscopy and Its Possibilities in Projection** HERMANN KELLNER

The fundamental visual processes involved in stereoscopic vision are stated and discussed in detail. The various attempts which have been made to produce stereoscopic effects by projection are mentioned and one particular form of apparatus described in detail. Several patent citations are mentioned. p. 54

**Effect of Humidity upon Photographic Speed** F. F. RENWICK

Data are given which show the relative speed of various photographic materials at different relative humidities. These indicate that speed is practically independent of humidity from relative humidities between 0 and 40 per cent. When the humidity is increased to 80 per cent an appreciable variation is found in some materials. p. 69

**The Straight Line Developing Machine** R. C. HUBBARD

A detailed description of a processing machine in which the film moves continuously through the various processing solutions. Means for controlling the time during which the film remains

in each solution are described. Methods for removing superfluous moisture from the film before entering the drying chamber are described and the construction of the drying chamber itself is considered. The discussion of this paper contains a very interesting contribution by Mr. Vinten who described various forms of continuous processing machines used in England and on the Continent. p. 73

**Difficulties Encountered in the Attempt to Standardize Theater Screen Illumination** F. H. RICHARDSON

The factors involved in the standardization of screen illumination are discussed. It is pointed out that standardization of screen illumination does not constitute a solution of the problem since screen brilliance is dependent upon many factors other than screen illumination. The effect upon screen brilliance of the quality and intensity of illumination incident upon the screen and of the amount of general illumination present in the auditorium are also discussed. The author concludes that it is almost hopeless to attempt to arrive at any standardization of this factor. p. 93

**The Effect of Scratches on the Strength of Motion Picture Film Support** S. E. SHEPPARD AND S. S. SWEET

A method and instrument for measuring the strength of motion picture film support is described. Data are given showing the effect of various types of scratches on the strength factor. The conclusion is drawn that the chief effect of a scratch upon strength is due to the depth of the scratch affecting the thickness of the support at a given point. p. 102

**Requirements of the Educational and Non-Theatrical Entertainment Field** W. W. KINCAID

The author outlines the work which is being done by the standardization committee of the Motion Picture Chamber of Commerce, non-theatrical, in the instruction of non-professional operators. The object of this instruction is to raise the standard of projection, especially in the case of portable outfits used extensively in non-theatrical work. p. 111

**Theory of Mechanical Miniatures in Cinematography** J. A. BALL

The fundamental physical relationships between the size and strength factors of miniatures in production of motion pictures

are outlined. In order that the time factors of motion as reproduced in this work conform with the time factors involved in an actual full scale scene, it is necessary to take at enhanced speed. The author shows that all linear dimensions of the miniatures must be magnified as the square of the time magnification. The relationship of the strength of the materials used in the construction of such miniatures to other factors, such as time magnification and linear magnification, are discussed. p. 119

### **The Filmo Automatic Cine-Camera and Cine-Projector**

J. H. McNABB

A description of the camera and projector manufactured by the Bell and Howell Company using 16 mm. film. This equipment is designed for amateur or home use. Various unique features are described in detail. p. 127

### **A Method of Comparing the Definition of Projection Lenses**

S. C. ROGERS AND L. OLSEN

The use of certain types of test objects which may be placed directly in the gate of the projector is proposed. The images of these objects formed on the screen in the usual way are then studied and from an analysis of the peculiarities, information relative to the quality of the projection lens may be obtained. p. 136

### **Results Obtained with the Relay Condensing System**

HERMANN KELLNER

The author describes the practical results obtained by using the relay condenser system, the installation referred to being in the Eastman Theater at Rochester, N. Y. The relay system used is described in detail in a previous paper (No. 17 (1923), p. 133). One of the chief advantages mentioned is the uniform color of the illumination over the entire screen due to complete mixing of radiation from all portions of the positive carbon. p. 143

### **Is the Continuous Projector Commercially Practical?**

LESTER BOWEN AND HERBERT GRIFFIN

Mention is made of various methods which have been proposed for use in the construction of projecting machines in which the film travels continuously at a uniform linear velocity. The quality of the screen image from the standpoint of screen illumination, steadiness, and definition is considered. The paper

concludes with a statement of the requirements which should be imposed on a machine of this type. p. 147

### **The Standardization of Film, Camera, and Projector Dimensions**

W. C. VINTEN

The great inconvenience and economic loss entailed in the lack of standardization of film dimensions is emphasized. The author makes a strong plea for international agreement on dimensions not only of film but of machine parts. Certain definite proposals as adopted by the English committee on standardization are given. p. 153

### **Improvements in Motion Picture Laboratory Apparatus**

J. I. CRABTREE AND C. E. IVES

New and improved devices for use in the motion picture laboratory are described. These include the title cameras, title card holders, title cards, the continuous viewing machine for the inspection of film, a semi-automatic sensitometer for the determination of correct printing exposure, and a film inspection and assembly table. The paper is illustrated by many photographs and diagrams showing the construction of the instruments. p. 161

### **Physical Properties of Motion Picture Film** M. BRIEFER

An analysis of the physical properties of motion picture film is attempted. The significance of the various factors involved in the tests and their relations, one to the other, are discussed. Some effort is made to relate the tensile strength of film base with its strength in motion picture film projection. Theoretical consideration is given to the relations existing between the plasticity of film base and the viscosity of solutions. The effect of different conditions upon projection strength forms an important part of the work. Practical interpretation and application of the principles involved are included in the study. p. 177

### **Panoramic Motion Pictures** GIOVANNI C. ZILLOTTO

A special form of motion picture camera is described in which the ratio of height to width of picture included is different from that in the case of the standard camera. The superiority of the composition obtainable by using such a camera in the case of certain types of scenes is emphasized. p. 206



**Constant Current and Constant Potential Generators for Motion Picture Projection** A. M. CANDY

The voltage-current characteristic curve of the constant generator mentioned is given. This machine is designed in such a way that two projection arcs operated in series at each lamp receive the same current. The merits of various types of arc generator equipment for specific purposes are described and wiring diagrams showing complete connections in all cases are given. p. 215

**The Making of Motion Picture Titles** J. I. CRABTREE

The paper deals with the various problems encountered in making motion picture titles. The author classifies titles and then deals with the problems involved in the case of the various types. p. 223

**Report of Standards and Nomenclature Committee** p. 236

**Report of Publications Committee** p. 267

**Report of Progress Committee** p. 270

**NO. 19, SEPT. 29-OCT. 2, 1924, CHICAGO, ILL.**

**Progress in the Motion Picture Industry** p. 7

**The Foreign Situation** JOSEPH DANNENBERG

Various motion pictures which are being produced in foreign countries are briefly discussed. p. 23

**The Effects of Non-Standardization of Projection Machines**

W. C. VINTEN

Some of the troubles are pointed out arising from lack of standardization in dimensions of camera and projector parts and film perforations. p. 25

**Investigations on Photographic Developers. Sulfide Fog by Bacteria in Motion Picture Developers**

MERLE L. DUNDON AND J. I. CRABTREE

The cause of fog occurring in some cases in tanks of MQ developer was found to be due to the presence of sulfide resulting from bacterial action. Such tendency to give sulfide fog can be eliminated by the addition of lead acetate. p. 28

**The Handling of Motion Picture Film at High Temperatures**

J. I. CRABTREE

The effect of temperature and humidity on the characteristics of photographic materials is discussed. Conditions under

which motion picture film should be kept previous to and subsequent to exposure are outlined. Directions are given for developing negative and positive film at temperatures between 75°F. and 85°F. Where film must be processed at temperatures as high as 95°F. special treatment must be given. The drying of film at high temperatures and the storage of the finished product at high temperatures are discussed. p. 39

**Reducing the Appearance of Graininess of the Motion Picture Screen Image** J. H. POWRIE

It is pointed out that the appearance of graininess in the projected picture can be lessened by using lower magnifications. For a screen picture of fixed size this can be accomplished only by using a larger film in the projector. The decrease in graininess obtained in this manner is illustrated by photographs. p. 49

**Discussion on Report of Standards and Nomenclature Committee** p. 58

NO. 20, SEPT. 29-OCT. 2, 1924, CHICAGO, ILL.

**Presidential Address** LOYD A. JONES p. 11

**Phonofilm Progress** LEE DEFORREST

A brief description of recent improvements in the reproduction of sound as an accompaniment to the motion picture. p. 17

**Means for the Preservation of the Eyesight of the Projectionist** G. C. EDWARDS

Attention is called to the eye strain resulting from the extremely high brightnesses of the "spot" on the projection machine and also the arc crater as viewed through the window of the lamp-house. The author suggests that some means should be found for the complete elimination of these evils. p. 20

**Effective Theater Lighting and How to Get It** G. G. THOMPSON

The article deals with the equipment, such as rheostats, remote control switches, dimmers, *etc.*, now available for controlling the theater illumination. The desirable requirements of an up-to-date theater lighting and control installation are summarized. p. 23

**The Projection Room Expense Account** F. H. RICHARDSON

The author emphasizes the distribution, from the standpoint

of increased box-office receipts, of the highest possible perfection in projection. He takes the attitude that the image on the screen is the thing for which the public pays. He points out that this should be as perfect as possible and emphasizes the necessity of good equipment in the projection room, proper location of the projection room, freedom from distortion, and clean unscratched film. p. 43

### **Translucent Shutters**

LESTER BOWEN

A report of very careful tests made to determine the performance of various translucent projection machine shutters. Illustrations are given which show definitely the loss of definition and contrast produced by such elements. The author concludes that, while such shutters may appreciably reduce flicker and increase screen illumination, the quality of the screen image from the standpoint of definition and brightness contrast is so badly damaged as to make their use inadvisable. p. 53

### **The Use of Motion Pictures in Education**

F. N. FREEMAN

The author refers to the various efforts being made at present to produce motion pictures suitable for educational purposes. The various groups engaged in the study of the problem of applying motion pictures to educational purposes are noted. The question of efficient methods of distribution and the divergent needs of various types of educational institutions are discussed. The author concludes that while motion pictures are undoubtedly of great value as an educational tool they can not be regarded as capable of replacing other methods of education and at present the data are too meager to indicate precisely what subjects can be efficiently taught by the aid of motion pictures. p. 65

### **Practical Tests of Cinematographic Lenses**

EDWIN C. FRITTS

The paper outlines various simplified methods by means of which lenses, both camera and projector, can be tested. The interpretation of results obtained is discussed in detail. p. 75

### **A New Unit for Professional Projection with Tungsten Filament Lamps**

ROGER M. HILL

Description of an improved form of projector using a tungsten lamp as a source. The improvements consist largely in the

mechanical details of lamp holder and reflector construction and in the optics of the projecting system. p. 82

**NO. 21, MAY 18-21, 1925, SCHENECTADY, N. Y.**

**Radio Movies**

C. FRANCIS JENKINS

In the introductory paragraphs the author gives a brief résumé of the evolution of the motion picture. Following this a method for radio transmission of motion pictures is described. The method involves the use of annular glass prisms so arranged and operated that the entire surface of a picture being transmitted is analyzed in one-sixteenth of a second. This analysis is accomplished by causing every surface element of a picture to act upon a light sensitive cell which in turn modulates the radio current from the sending station. At the receiving station an apparatus also containing revolving annular glass prisms is used. The radio impulses received are amplified and vary the brightness of an incandescent lamp filament. The rotating prismatic rings cause the image of this filament to sweep back and forth over the picture area so as to completely cover this area sixteen times per second. The fluctuations in the brightness of the filament image and its movement over the picture surface built up a counterpart of the image at the sending end. p. 7

**How Theaters Should Be Ventilated**

F. R. STILL

The requirements of satisfactory ventilation of motion picture theaters are discussed in detail. Some of the results obtained by the Research Laboratory of the American Society of Heating and Ventilating Engineers relating to the atmospheric conditions required for comfort are given. The influence of humidity and velocity of air motion upon the comfort of the audience at various temperatures is discussed and some statistical values are given. The problem of air washing and the removal of odor from the air is also discussed. Some data relative to the cost of installing ventilating, humidifying, air washing, and refrigerating systems are given. p. 13

**The Artistic Utilization of Light in the Photography of Motion Pictures**

WIARD B. IHNEN AND D. W. ATWATER

The article deals with the utilization of light in the motion picture studio for the production of naturalistic and artistic effects. Illustrations are given showing the way in which artificial light

is utilized in the studio. The greater realism produced by using light as compared with scenes painted on flat surfaces is also illustrated. A large number of illustrations of the points discussed is given. Diagrams showing the relation of the set, the characters, lighting units, and camera are given. p. 21

**The Use of Color for the Embellishment of the Motion Picture Program**

L. M. TOWNSEND AND LOYD A. JONES

In the opening paragraphs the authors discuss briefly the latent possibilities in the use of color for the production of emotional effects and for the creation of a desired dramatic atmosphere. The physical nature of color is then dealt with and the terms used in relation to color are defined. Following this the physical peculiarities of various light sources are discussed and the laws of color mixture stated. A description is given of a two-color additive projection lantern used for obtaining mobile color effects on the screen or upon the screen surroundings. In this, selectively absorbing filters of variable hue are used in conjunction with pattern plates complementary either in form or in form and tone. A composite filter of variable color constructed by using the three subtractive primaries in the form of wedge filters is described. Various types of pattern plates complementary in form and also complementary in tone are illustrated. An improved stereopticon spot and flood light is also described. Illustrations are given showing the various effects that can be produced therewith. p. 38

**Static Markings on Motion Picture Film. Their Nature, Cause, and Methods of Prevention**

J. I. CRABTREE AND C. E. IVES

The authors describe the physical nature of static charges, their cause, and methods for elimination. The influence of atmospheric conductivity and humidity upon the magnitude of static effects is discussed. A classification of static markings based upon their shape and visual appearance is given. Various means for the prevention of static in the camera are proposed. The occurrence of static in the film finishing laboratory is also dealt with and numerous illustrations show various types of static marks. p. 67

**An Improved Sector Wheel for Hurter and Driffield Sensitometry**

M. BRIEFER

The improvement consists in utilizing a larger proportion of the

total angular dimensions of the rotating sector wheel in making the longest exposure. In this way a somewhat greater range of exposure times can be obtained.

p. 85

### **The Manufacture of Tungsten Incandescent Motion Picture Lamps**

ROBERT S. BURNAP

This paper describes the manufacture of incandescent motion picture lamps and points out some of the manufacturing variables affecting lamp performance.

p. 90

### **A New Reflectometer**

FRANK BENFORD

The theory of illumination between two parallel planes was used by Nutting in the development of his reflectometer, but the deviations of the instrument from the simple theory were so large as to destroy its usefulness. It is an instrument of the greatest simplicity and durability and is ideal where portability is desired. The present reflectometer, which is wedge shaped, is the result of a series of investigations looking to an instrument of good accuracy and at the same time maintaining the extreme simplicity and durability of the older instrument. The theory of illumination by a limited plane is touched on, and some of the details of specular reflection are examined. One form of a wedge reflectometer has been specially designed for direct vision, and has good accuracy for the particular angle of view fixed by the construction of the instrument. The second form of the instrument reads in a manner that is independent of the process of reflection and therefore gives accurate results for all types of diffuse or specular surfaces.

p. 101

### **Color Photography Patents**

WM. V. D. KELLEY

The author has undertaken a classification and critical discussion of the various patents relating to methods of producing color in photography. In this paper those falling under classification I—Double Coated Positives, Division A, are given with brief descriptions.

p. 113

### **Report of the Papers Committee**

p. 120

NO. 22, MAY 18-21, 1925, SCHENECTADY, N. Y.

### **Student Psychology and Motion Pictures in Education**

M. BRIEFER

A discussion of the usefulness of motion pictures as a teaching

medium. The subject is approached from a psychological standpoint and the factors involved analyzed in detail. p. 9

**Infra-Red Photography in Motion Picture Work** J. A. BALL

The author points out that pictures made by long wave-length radiation in which the sky appears very dark and the green foliage relatively light are ideal for the production of moonlight effects. Illustrations of pictures made on motion picture film sensitive to the extreme red using a deep red filter are shown. p. 21

**Incandescent Tungsten Lamp Installation for Illuminating Color Motion Picture Studio** LOYD A. JONES

The lighting installation consists of forty-five 3000 watt tungsten lamps. Three such units are mounted together on a suitable rack for convenient handling. These triple units are supported by small hoists operating in longitudinal slots located in the supporting gridiron. Polyhedral mirror reflectors are used to obtain high utilization of the emitted flux. The article contains detailed description of the various mechanical and electrical features of the installation. p. 25

**Machine Development of Negative and Positive Motion Picture Film** ALFRED B. HITCHINS

The article describes a machine for the continuous processing of motion picture film. The machine is duplex in principle and operates at a speed of from 15 to 30 feet per minute giving a total output of from 30 to 60 feet per minute. Illustrations showing the various parts together with detailed description are given. p. 46

**A Museum of Motion Picture History** T. K. PETERS

A plea for the establishment of a museum in which the early mechanisms used in the production of motion pictures may be preserved. The author gives some interesting reminiscences of the early days of the motion picture industry. p. 54

**What Happened in the Beginning** F. H. RICHARDSON

A long and detailed treatment of the very early history of the development of the motion picture mechanisms is given. Signed statements from several of the pioneers in the field are given tending to establish the part played by various individuals in the development of motion picture machines. Many interesting illustrations are shown of early forms of cameras and projectors.

Portraits of many individuals are also given. The article is a valuable contribution to the history of the motion picture industry. p. 63

- Control of Series Arc Generator Sets** J. H. HERTNER  
 A technical treatment of arc generator design. The relative merits of various types of generator windings are discussed in detail and the characteristic performance curves of certain types are given. p. 115
- Report of Standards and Nomenclature Committee** p. 127
- Report of the Publication Committee** p. 145

NO. 23, OCT. 5-8, 1925, ROSCOE, N. Y.

- Presidential Address** LOYD A. JONES  
 The future growth and development of the Society. p. 9

**Progress in the Motion Picture Industry 1924-1925 Report of the Progress Committee**

A very complete review of the publications in the field of motion picture engineering for the period covered. It contains brief abstracts of 139 references covering all phases of activities. p. 17

**The Prefocusing Base and Socket for Projection Lamps**

R. S. BURNAP

The paper describes a special lamp base and a special socket for projection lamps. The lamp filament position is set accurately during the basing operation so that lamps are interchangeable without adjustment after installing in the projection equipment. p. 39

**An Exhibitor's Problems in 1925**

ERIC T. CLARKE

The author discusses some of the problems confronting the exhibitor of motion pictures. Mr. Clarke is the manager of the Eastman Theater, Rochester, N. Y., and deals with these problems from the standpoint of the large theater executive. The make-up of the program is discussed in detail and the schedule of time which may be most advantageously allowed for the overture, act, comedy, and feature picture is taken up. Some of the reasons why pictures fail are mentioned and suggestions are made for improving the quality of the average feature picture. p. 46



**Washing Motion Picture Film**

K. C. D. HICKMAN

The three factors, diffusion, agitation, and renewal, which enter into the removal of hypo from the developed film are discussed. It is shown that the rate at which the hypo leaves the film is an exponential function. The ideal washing conditions are defined and the calculation of rate of removal is illustrated by numerical examples. Curves showing the rate at which the hypo may be removed from the film under certain specified conditions of washing are shown. Various types of washing equipment are discussed. p. 62

**A New Camera for Screen News Cinematographers**

J. H. McNABB

A description of a light portable motion picture camera manufactured by Bell and Howell using standard width film. Its unique features are discussed and its advantages for press work explained. The camera is driven by a spring motor of sufficient capacity to handle 35 or 50 feet of film. A table showing its characteristics as compared with the average standard outfit is given. p. 77

**Telephone Picture Transmission**

HERBERT E. IVES

A description of the method and equipment developed by the Bell Telephone Laboratories, Inc., for the transmission of pictures over the wires of the existing telephone system. p. 82

**Importance of the Village Theater**

F. H. RICHARDSON

The immense influence of the motion picture theater in a small town is emphasized and a plea is made for an improvement in the quality of the pictures shown therein. Such improvement, in the author's opinion, should be made not only in the quality of the film but in the projection system and the general tone of such theaters as evinced by the architectural, ventilating, and lighting conditions. The desirability of introducing motion pictures into rural communities for educational and recreational purposes is mentioned. It is suggested that this cause is sufficiently worthy to warrant the support by public funds. p. 85

**Reflector Arc Projection—Some Limitations and Possibilities in Theory and Practice**

SANDER STARK

An exhaustive treatment of the geometrical optical problem involved in the design of the reflector arc lamp. The curves showing the magnitude of aberrations in spherical, parabolic,

and elliptical reflectors when used either singly or in various combinations with condenser lenses are given. The advantages and disadvantages of these systems are discussed. The paper closes with a complete bibliography of the subject. p. 94

NO. 24, OCT. 5-8, 1925, ROSCOE, N. Y.

Report of Standards and Nomenclature Committee p. 5

Report of Proceedings of International Congress of Photography,  
Section IV, Cinematography p. 29

**The Questionable Educational Value of Motion Pictures**

ALFRED W. ABRAMS

The use of motion pictures as a means of instruction in the class room is discussed. After discussing fundamental pedagogical principles the short-comings and virtues of the motion picture method are pointed out. The author believes that the value of motion pictures for this purpose has been overestimated and inclines to the belief that other visual aids, such as still projection, are more valuable especially when considered from the standpoint of the cost involved. p. 50

**Movies for Teaching—the Proof of Their Usefulness**

ROWLAND ROGERS

The importance and value of pictures as an efficient means of conveying ideas is stressed. The paper contains a report of the author's survey relative to the value of motion pictures for teaching purposes. This was made by visiting a large number of schools in the principal cities of the United States. He concludes that there is a real place in our present educational system for the motion picture and its use holds out three promises: to teach efficiently, to save the time of both pupil and teacher, to save some cost of teaching. The results of a questionnaire relative to this subject circulated among a selected group of educators are given. p. 66

**The High Intensity Arc**

FRANK BENFORD

The paper treats comprehensively all phases of the high intensity arc. Various forms of craters are illustrated and discussed in detail and several different arc mechanisms of the automatic, semi-automatic, and mechanically operated types are described. Photographs showing the arc in operation and curves showing

the distribution of the flux emitted are given. The electrical characteristics of arc operation are also discussed and illustrated graphically. Spectrographs showing the spectral distribution of the emitted radiation are given. Spectrophotometric curves showing the distribution of energy at various wave-lengths for the plain carbon arc, the high intensity arc, and the blue flame arc are shown. p. 71

#### **Rack Marks and Airbell Markings on Motion Picture Film**

J. I. CRABTREE AND C. E. IVES

The authors discuss the causes which result in the appearance of rack marks of various types on motion picture film during processing. Photographs are given which indicate that in some cases these are due to the local spreading of the reaction products of development. Various forms of processing racks are shown and instructions are given for using these in such a way as to minimize the danger of rack markings. Markings due to the presence of airbells on the film during processing are also discussed and various forms illustrated by photographs. p. 95

#### **A High Power Spotlight Using a Mazda Lamp as a Light Source**

L. C. PORTER AND A. C. ROY

A new type of spotlight for use in theaters and motion picture studios is described. The light source used is a thousand watt monoplan tungsten incandescent lamp. Values of beam candle-power as compared with other types of spotlights are given and photographs showing the spotlight assembly and mechanism as well as the various forms of illumination which may be produced in the theater are shown. p. 113

#### **The Effect of Scratches and Cuts on the Strength of Motion Picture Film**

S. E. SHEPPARD AND S. S. SWEET

The paper contains further data on the subject previously discussed by the authors (No. 18 (May, 1924), p. 102). The previous conclusion that superficial scratches have very little effect upon the strength of the film is confirmed. It is only when the scratch becomes comparatively deep so that the actual cross section of the film is appreciably reduced that the strength of the film band is decreased. p. 122

#### **The Importance of Proper Splicing**

EARL J. DENISON

The author has conducted an elaborate series of investigations

on the evils resulting from improper splicing. He points out that different kinds of splices may differ slightly in actual strength but differ enormously in uniformity, flatness, and register. His observations lead him to recommend the full hole splice having the width of 0.156 inch. The paper is illustrated by photographs showing good and bad splices and the troubles caused when improper splices are passed through the projector mechanism. p. 132

**The Pathex Camera and Projector** W. R. DANIEL

A short technical description of the substandard motion picture camera projector manufactured by the Pathé Company. p. 147

**Color Photography Patents** WM. V. D. KELLEY

A continuation of a previous contribution which consists of a systematic classification of patents relating to color photography. p. 149

**NO. 25, MAY 3-6, 1926, WASHINGTON, D. C.**

**Progress in the Motion Picture Industry** p. 11

**The Jenkins Chronoteine Camera for High Speed Motion Studies**  
C. FRANCIS JENKINS

The camera described takes 3200 pictures per second on standard 35 mm. film. The film moves continuously through the camera and a rotating crown of lenses, carrying 48 matched objectives, travels in synchronism with the film. The projection of the film at normal speed, 16 pictures per second, provides a time magnification of 200. It is stated that bright sunlight illumination or its equivalent gives adequate exposure. Examples, to which this type of photography is applicable, are mentioned. p. 25

**The Publix Theater Managers School** JOHN F. BARRY

A brief description of the organization and aims of this school which has been established to provide training for men who hope to become motion picture theater managers. The training extends over a period of six months and is given in the theater-auditorium of the school. The schedule includes about 700 hours of formal instruction, given by many experts in various lines. p. 31

**Scoring a Motion Picture**

VICTOR WAGNER

A brief description of how the orchestra leader proceeds in adapting music to the motion picture program which is made up of various types, including the feature, news reel, comedy, *etc.*

p. 40

**The Public and Motion Pictures .**

WM. A. JOHNSTON

A general review of the exhibition problem. The author urges that the program for any particular theater should be made up specifically to please a definite type of theatergoer, and further suggests that classification of the available material from the standpoint of locality and spectators, is much better than to make up the program indiscriminately. Relation of the vaudeville act to the motion picture program is discussed.

p. 44

**Display Enlargements from Single Frame Motion Pictures**

K. C. D. HICKMAN

The highest quality enlargement obtainable from a single motion picture frame cannot be secured unless the following precautions in descending order of importance are taken: (1) the light source must be highly diffused; (2) the last diffusion screen must be as near as possible to the negative; (3) the negative must be placed between glasses quite free from defects and dust; (4) the negative may be embedded in a liquid of the same mean refractive index. The paper describes methods of sandwiching the film with glycerin or xylol between glasses before placing in the projector.

p. 49

**Some Developments in the Production of Animated Drawings**

J. A. NORLING AND J. F. LEVENTHAL

A technical paper dealing with the apparatus and methods used in making animated cartoons. The animated drawing goes back in conception to the time of the early Romans and hence is much more nearly like the original motion picture than those made by photography. Various pieces of apparatus used in making drawings and the photographic copies are illustrated.

p. 58

**The Effect on Screen Illumination of Bubbles, Seeds, and Striations in the Bulbs of Projection Lamps**

L. C. PORTER AND W. S. HADAWAY

Types of defects inherent in the glass used in the manufacture of incandescent lamp bulbs are discussed and illustrations given

which show the consequences of such defects on the screen illumination. p. 67

**Subtractive Color Motion Pictures on Single Coated Film** F. E. IVES

Discusses briefly the methods which have been proposed for obtaining pictures in natural color on a single surface of the film. Various patents concerned are referred to and the possibilities of future progress in this line are predicted. p. 74

**Problems of a Projectionist** LEWIS M. TOWNSEND

Deals with various phases of projection room work, and lays emphasis on the prevalence of scratched film received from exchanges. This injury to film is attributed to the use of reels having small hubs, high speed rewinds, and worn magazine valves. Describes an automatic electrical rewind which facilitates the rewinding of film. p. 79

**The Useful Life of Film** F. H. RICHARDSON

A plea for greater care in the handling of film in order that a more nearly perfect picture, free from scratches, dirt, and other defects, may be placed on the screen of the theater. An attempt is made to give a quantitative estimate of the loss in revenue traceable to defective film and poor projection. p. 89

**Trick Photography** CARL LOUIS GREGORY

Describes many different methods of producing unusual effects on the motion picture film. Among these may be mentioned the abnormal taking speed which produces time magnification or the reverse, modification of the shape of picture, reverse taking, stock camera and substitute, fade and dissolve, multiple exposure, scenes painted in miniature on plate glass, simultaneous double exposure by means of mirrors and prisms, and double printing both by contact and projection. p. 99

**The Staining Properties of Motion Picture Developers**

J. I. CRABTREE AND M. L. DUNDON

When developing positive motion picture film by the rack and tank system it is frequently necessary to discard a developer which is otherwise satisfactory on account of the formation of stain. This stain is usually in the nature of dichroic fog having a metallic silvery appearance, and is not oxidation stain, since the quantity of sulfite in the average elon-hydroquinone developer is sufficient to prevent the accumulation of staining

oxidation products. It has been shown that the silver stain is a result of the presence of both hypo and sodium sulfide in the developer. Hypo accumulates as a result of insufficient washing of the racks after fixing, while the sulfide is formed by the reduction of the sulfite and hypo present in the developer by bacteria or fungi. The remedy consists in using water-proof racks so as to prevent the transference of hypo, and in sterilizing the tanks before filling with developer. p. 108

**Cleaning Motion Picture Positive Film** TREVOR FAULKNER

A short description of a machine for cleaning film after it has become oil spotted and dirty in going through the projector. The article deals entirely with the mechanical details of the machine. p. 117

**Motion Picture Theater Progress in Smaller Towns and Rural Communities** HARRY E. HOLQUIST

A short review of the recent expansion and development of the small theater field. p. 124

**Internal Developments in the Motion Picture Industry**

CARL E. MILLIKEN

States that out of a rather chaotic condition in the motion picture industry order is gradually being evolved. Emphasizes the recent tendency toward much more stable financial conditions in motion picture production and exhibition. Also the dramatic quality of the pictures produced has been much improved. The article deals largely with the correlation between the various organizations interested in the production and exhibition of motion pictures. p. 129

**Note on the Strength of Splices** S. E. SHEPPARD AND S. S. SWEET

Proper film splicing should be done automatically. It was found that there is no difference in strength between the 0.156 inch and the 0.078 inch splice. The use of a proper scraper with a square edge is recommended. Time increases the strength of splices, but this effect may be replaced largely by heat. Excess use of cement should be avoided, as it causes buckling and warping. p. 142

**The Effect of Projection Lens Flare upon the Contrast of a Motion Picture Image** LOYD A. JONES AND CLIFTON TUTTLE

A study is made of the relative characteristics of a motion picture

positive and its screen image. It is concluded that: (1) The veiling brightness due to flare is directly proportional to the average transmission of the projected positive; (2) the flare-forming characteristics of a lens may be expressed as the ratio of the flare brightness to the average brightness of the picture; (3) the effect of flare upon the contrast characteristics of the picture can be computed from a knowledge of certain characteristics of the positive; (4) the effect of lens flare on quality of tone reproduction is to warp the shape of the reproduction curve and depress the contrast.

p. 153

#### **A New Cinematograph Film for a Limited Field**

This is an announcement by the Pathé Cinema Company of a new substandard film having a width of 17 $\frac{1}{2}$  mm. designated also as Pathé-Rural. The film can be made by splitting in half standard 35 mm. film. The images are 9.5 mm. by 13.5 mm., the projector gate having dimensions of 9.0 mm. by 13 mm. The perforations are square with rounded corners and are spaced one per frame.

p. 167

### **NO. 26, MAY 3-6, 1926, WASHINGTON, D. C.**

#### **Film Mutilation**

JOHN M. JOY

A report of an investigation carried out by the Motion Picture Producers and Distributors of America, *Inc.*, on the causes of film mutilation. The work includes a study of about 500 theaters in the Atlanta district. The causes of mutilation reported are classified as sprocket damage, scratches, mutilation of the end of the film for signal purposes, and fire damage to film. An analysis of each class is given. Inspection systems in vogue are discussed and, in conclusion, recommendations for reduction of film mutilation are made.

p. 5

#### **Early History and Growth of the Motion Picture Industry**

OTTO NELSON

A very brief historical résumé of the early development of motion pictures and motion picture equipment. Interesting photographs of early apparatus are given and a comparison of the early methods with those in present use is made.

p. 28

#### **The First Use of Stereoscopic Pictures in Motion Picture Theaters**

J. F. LEVENTHAL

The great difficulties in the way of producing stereoscopic motion



pictures are mentioned and a brief description of the Televue and Anaglyph systems is given. The presentation of the paper was supplemented by demonstration of motion stereoscopic effects obtained by the Anaglyph method. p. 34

### **Syphons and Measuring Devices for Photographic Solutions**

K. C. D. HICKMAN

The author describes a number of devices for the automatic replenishing of photographic solutions as they become exhausted during the processing of film. These are applicable largely to continuous developing machines, silver recovery equipment, *etc.* The devices described are for the most part of the syphon type not involving mechanical valves which usually are a source of considerable annoyance on account of the ease with which they get out of order. p. 37

### **A Twelve-Year Trial of Educational Films** FRED W. PERKINS

An account of the work which the United States Department of Agriculture has done during the past fourteen years in educational motion pictures. During this period, the department has produced more than 300 subjects, of which 230 are now in circulation. The method of producing and exhibiting these is outlined. The experience of the department leads to the conclusion that educational films are extremely effective and that this field contains enormous possibilities which may exceed even the use of the film for entertainment. p. 48

### **The Use of Motion Pictures for Governmental Purposes**

RAYMOND S. PECK

The way in which motion picture film has been used and may be used by national governments for purposes of propaganda is discussed. The use of films by the Canadian Government is described in detail. p. 55

### **The National Bureau of Standards and Its Possible Technical Relations to the Motion Picture Industry** GEORGE K. BURGESS

In this paper the director of the National Bureau of Standards calls attention to the many ways in which the Bureau may be of service to those working on technical motion picture problems. In order to emphasize the importance of the service which may be rendered, many instances of the Bureau's work in serving other industries are given. p. 61

**Silver Recovery from Exhausted Fixing Baths**

J. I. CRABTREE AND J. F. ROSS

A discussion of the silver content of the average fixing baths together with the cost of recovery, shipping, and refining. Several practical methods of recovering silver are discussed, including precipitation with sodium sulfide, zinc, sodium hydro-sulfite, and electrolytic methods. For recovery on a large scale precipitation with sodium sulfide is the most economical.

The possibility of utilizing the desilvered hypo for photographic purposes has been investigated carefully but it was concluded that no saving whatever was effected by utilizing a desilvered and revived hardening fixing bath. p. 70

**The Handling of Motion Picture Film under Various Climatic Conditions**

ROBERT J. FLAHERTY

The author's wide experience, including the making of *Nanook of the North* and *Moana in the South Seas*, and in connection with various geological explorations in the Arctic regions, makes him particularly qualified to discuss the subject. Various phases of the work, such as transportation difficulties and the manipulation and processing of film under Arctic and tropical conditions, are discussed. A detailed description of the equipment taken to Samoa and the manner of working there is given.

p. 85

**Lighting by Tungsten Filament Incandescent Electric Lamps for Motion Picture Photography**

E. W. BEGGS

In the early part of the paper, the author discusses the requirements of studio lighting and draws attention to the advantages of using tungsten lamps for this purpose. The latter part of the paper is devoted to careful cost analyses involved in the use of various elements such as tungsten lamps, mercury vapor arcs, high intensity arcs, and ordinary hard-cored carbon arcs. These cost analyses are worked out for ordinary orthochromatic and panchromatic films. p. 94

**Pointers on Theater Design and Construction**

H. ROBINS BURROUGHS

The general problem of theater construction involving the erection of fireproof, semi-fireproof, and non-fireproof buildings is discussed with a consideration of the materials available. The position of the projection room in the conventional motion

picture theater design is criticized and it is stated that in the new Roxy theater, the projection booth is to be placed at the front of the balcony, thus making it possible to obtain almost ideal projection conditions. p. 107

### **Investigations on Photographic Developers. Part III The Effect of Desensitizers in Development**

M. L. DUNDON AND J. I. CRABTREE

With modern high speed panchromatic materials the best dark-room illumination that can be devised gives only a narrow margin of safety. By using a desensitizing dye either in the developer or as a preliminary bath the dark-room illumination can be increased somewhat without danger of excessive fog. Several dyes which may be used for this purpose have been studied. Of these Pinakryptol Green was found to give a satisfactory degree of desensitization and can be used with some developers without the impairment of photographic quality. Directions for using this dye have been given. p. 111

### **Lighting and the Cameraman**

HARRY FISHBECK

The great importance of light in producing the desired picture quality is emphasized. Many illustrations are given showing the application of light in the studio for obtaining the desired effect. p. 143

### **Apparatus for Time Lapse Motion Picture Photography**

HOWARD GREEN

A technical description of an apparatus constructed in the Department of Agriculture for making pictures at predetermined time intervals. The control of timing and operation is obtained by the use of an eight-day spring clock movement. This clock work actuates the motion picture camera to take one picture. By changing gears the intervals at which the picture is taken can be varied over wide limits. Various constructional details are given. p. 147

### **Report of Papers and Publications Committee**

p. 152

**VOLUME X, NO. 27, OCT. 4-7, 1926, BRIARCLIFF, N. Y.**

### **Presidential Address**

W. B. COOK

p. 5

**Report of the Progress Committee, October, 1926**

This report abstracts briefly practically all of the papers appearing during 1926 relative to motion picture engineering and closely allied subjects. It is a valuable résumé and the seventy references serve as a convenient bibliography covering this period. p.7

**Report of Standards and Nomenclature Committee**

This report deals at considerable length with the subject of film sprockets and dimensional standardization. Recommendations are made but no definite action taken.

The proposed standard dimensions for narrow and wide splices were given the final approval by the Society. The question of standardized camera cores is mentioned but no definite proposals made. p. 20

**Remarks on the Standardization of Motion Picture Sprockets**

H. JOACHIM

This is a valuable contribution to the subject of sprocket design and standardization which appeared originally in *Science et Industries Photographiques*, Oct. 1, 1926. The author analyzes the problem involved in moving perforated film by tooth sprockets and shows the conditions under which destructive interference between film and sprocket tooth takes place. The formula is derived by means of which sprocket dimensions may be computed for film of any perforation pitch. A comparison is made between standard dimensions adopted by different organizations and congresses. The author emphasizes the necessity of computing sprocket dimensions for different cases involving sprockets having different numbers of teeth, and in cases where different numbers of teeth are desired to be in contact. p. 30

**Technical Advance**

MARTIN J. QUIGLEY

The subject is discussed from the standpoint of the non-technical observers and it was suggested that the Society should form some sort of a central bureau to furnish technical information and guidance to the industry at large. The author believes this would be valuable in promoting prompt adoption of technical improvements and also in covering the published information as to the latest developments in the industry. p. 42

**An Exhibitor's Problems in 1926**

ERIC T. CLARKE

The author points out that the main object of the motion picture

theater is to please its patrons in order to draw full houses. He discusses at some length the problems involved in intelligently choosing pictures which will please the average theater patron. He points out that it is impossible in some cases to show the pictures which, from dramatic and photographic standpoints, may be considered as best and emphasizes the fact that the theater manager must show the picture which pleases the average rather than the most intelligent person. He also discusses at some length the construction of the program with respect to the balance of its various components, such as the musical presentations, vaudeville, comedy, news reel, and feature picture. p. 46

**The Little Theater Movement in the Cinema** SYMON GOULD

The author points out that the public may not at the present time be ready for the best available motion pictures. He calls attention to the fact that history indicates that the public must be convinced of the merit of new things. The object of the little theater movement is to revive and keep alive interest in the classics of the cinema as well as those productions which are of outstanding merit and which contribute most toward the greatness of the motion picture art. The author outlines the methods which will be followed for the accomplishment of this end. p. 58

**Recent Developments in "The Phonofilm"** LEE DEFORREST

In his introductory remarks the author states seven points which he considers to be essential considerations in the design of a sound film technic. These relate to width of film, speed of film movement, characteristics of recording and reproducing devices, and type of sound record. He then proceeds to analyze each of these points in detail and to point out how the desired specifications have been met in the Phonofilm technic. Problems met with in the recording studio are discussed briefly. The technic of reproduction is considered also from the standpoint of methods which will produce the maximum degree of illusion. The author concludes his paper with remarks relative to the attitude of the public toward the desirability of sound accompaniment for motion pictures. p. 64

**The Speed of Projection of Film** RICHARD ROWLAND

The author expresses the opinion that he doubts the possibility of arriving at any definite standard for the projection of film. He points out that in the making of motion picture productions

the tempo is one of the most powerful tools in the hands of the director for obtaining the desired effect. Some films are made, therefore, to be run slowly and some at greater speed. He feels that the solution of the problem is to mark each reel with the speed at which it should be projected. p. 77

#### **Preservation of Historical Films**

FRED W. PERKINS

This is largely an earnest plea for greater attention to the preservation of films of great historical and dramatic interest. He advocates that this be put in the hands of the federal government rather than any commercial organization. He mentions the proposal of President Coolidge for the construction of film vaults having the capacity of 20,000,000 feet in the new archives in Washington. He then discusses the "life" of film and the various processing factors which must be considered in order to insure durability, emphasizing the necessity of rewinding and inspecting these films at intervals, such as every two years. p. 80

#### **Some Considerations in Spotlighting**

J. H. KURLANDER

The author discusses the optical theory of the spotlight projector giving equations and curves showing the relation between axial candle-power and the optical and electrical characteristics of the equipment. He then describes a new spotlight projector equipped with many convenient attachments for producing effect lighting. p. 86

#### **Sources of Light**

P. R. BASSETT

The author discusses briefly and in a rather non-technical style various sources of light which are available for use in motion picture work. These include those used both in the studio and for projection of pictures in the theater. p. 109

#### **The Effect of Motion Pictures on the Eyes**

GUY A. HENRY

In the author's opinion motion pictures do not cause eye trouble but do frequently reveal the existence of such defects. Under carefully adjusted conditions of projection and observation no appreciable visual strain is encountered. It is important, however, that care be taken in providing good projection, clean film, and steady pictures. He reviews briefly the recommendations made by the Illuminating Engineering Society of London for the provision of visual comfort in motion picture theaters. The necessity for properly adjusting house illumination is em-

phasized and it is suggested that some more simple and convenient means for measuring the illumination should be provided.

p. 116

### **Trick Photography**

WM. V. D. KELLEY

The Handschiegl process for making trick shots is described. This involves the making of two negatives, one against a non-actinic background. This is then printed into a negative carrying other objects which it is desired to associate with the first. Several variations of this general scheme are described. The Williams patent for obtaining the same results is mentioned.

p. 128

### **Panchromatic Negative Film for Motion Pictures**

LOYD A. JONES AND J. I. CRABTREE

A comprehensive summary is given of the sensitivity of the eye and of the common photographic materials to radiation of various wave-lengths. The characteristic of selective absorption and the consequent color of various materials is discussed. The spectral composition of radiation from the common illuminants is shown in its relationship to the photographic reproduction of tone of colored objects. Practical instructions are given for the correct use of panchromatic motion picture film and filters so that good tone reproduction will result. Under the head of development the following subjects are discussed: dark-room illumination, developers for panchromatic film, and the use of desensitizers.

p. 131

## **VOLUME X, NO. 28, OCT. 4-7, 1926, BRIARCLIFF, N. Y.**

### **Reflection Characteristics of Projection Screens**

LOYD A. JONES AND CLIFTON TUTTLE

Data showing the distribution of reflected light by a number of commercial projection screens are given. Suggestions for using these data in the selection of a screen surface adapted to particular auditorium conditions are made.

p. 183

### **Motion Photomicrography**

GEORGE E. STONE

The author discusses the use of a microscope with the motion picture camera to obtain photographs of very small objects. The equipment required and the magnifications suitable for various types of work are discussed. For relatively low power work, Stone uses a microscope of the ordinary form or a single

lens of suitable focal length. For higher power work he recommends the use of the supermicroscope which is a form of a double compound instrument. The use of an ocular provided with a beam splitting device, so that the field can be viewed while taking, is also recommended. p. 196

### **The Duplication of Motion Picture Negatives**

J. G. CAPSTAFF AND M. W. SEYMOUR

An ideal duplicate negative is defined as one which will give "prints identical in every respect with those obtainable from the original." The characteristics of a printing material required to yield such a duplicate negative are discussed. The authors conclude that the usual positive and negative materials available do not meet these requirements and point out that a fine grained emulsion combined with yellow dye more nearly meets the requirements. The technic of making duplicate negatives using Eastman Duplicating film is discussed in detail. p. 223

### **Why Slide Film?**

ROWLAND ROGERS

Description of the small projectors which are made for projecting still pictures from standard 35 mm. positives. The advantages of such a projector, over the usual lantern slide projector, are stated to be low cost, simplicity, portability, and freedom from breakage. p. 230

### **Imbibition Coloring of Motion Picture Films** WM. V. D. KELLEY

A brief description of producing color films by a stenciled process. The "color plates" or stencils are made by hand, this operation requiring much time and very careful work since each individual frame must be worked up separately. The dye is then transferred to the positive by an imbibition or printing method. The "color plates" are said to be very durable, permitting the production of a practically unlimited number of prints. The negative is usually taken in a two-color camera. A black and white print is made from the red filter record and the color from the various stencils corresponding to the color separations desired is printed on this by imbibition. The color printing is done by suitable machines which must be constructed with great precision. p. 238

### **A Daylight Optical Reduction Printer**

O. B. DUPUE

Description of a projection printer of the step-by-step type



adapted for the printing of standard 35 mm. film. The machine may also be used for reduction or enlargement printing. A light control attachment which is operated instantaneously is a part of this printer. The mechanism is constructed so that it may be operated in a lighted room. p. 242

#### **Printing Motion Picture Film**

ROScoe C. HUBBARD

The article describes different types of printing machines including those of the continuous, step-by-step, and projection types. Some of the printers described are duplex, handling two strips simultaneously. Considerable space is devoted to the light change mechanisms for automatically setting the intensity of the printing light. The question of voltage control on the printing light is also discussed and a description given of a suitable motor generator set for this purpose. A sensitometer for the determination of correct exposure time is illustrated and its use in obtaining "key tests" described. p. 252

#### **The Telephoto Lens in Wild Bird and Animal Photography**

NORMAN McCLINTOCK

The author discusses the question of lenses suitable for telephoto work, and emphasizes the necessity of extremely rigid mounting when telephoto lenses are used. The drive of the camera by means of a flexible shaft is recommended. The necessity of interchangeable mountings for the telephoto lenses and some method for quickly focusing is emphasized. A focusing device suitable for this type of work is described. p. 279

#### **The Supervisor of Projection**

F. H. RICHARDSON

The author suggests that owners and operators of large chains and groups of theaters should employ some one to supervise projection in their theaters. He points out that the quality of projection is one of the most important things in presenting the motion picture to the public and that this work should be in charge of a well trained and competent individual. The duties of such a supervisor are outlined and it is suggested he be given ample authority to enforce his decisions and be made responsible for the quality of projection. p. 287

#### **Film in Good Condition for All Theaters**

TREVOR FAULKNER

A short note calling attention to various factors which may injure the film, resulting in poor projection and unsatisfactory presentation of the picture. p. 294

**The Business of International News by Motion Pictures**

EMANUEL COHEN

The author points out some of the advantages of motion pictures as a means of disseminating news, and describes the organization which is maintained at present by many of the newspapers for obtaining pictures, both still and motion, of current events. Specific cases illustrate how quickly events of interest are photographed and how rapidly the negative is developed, prints are made, and positives circulated. The manner in which the motion picture of the Smyrna fire was obtained and released in New York just fourteen days after its occurrence is described in detail.

p. 296

**Instruction in Motion Picture Photography** CARL LOUIS GREGORY

Attention is called to the lack of organized training of satisfactory quality in motion picture technology. It is suggested that an endowed school in this field would provide a satisfactory supply of technicians for the industry. Attention is called to the fact that, in contrast to the motion picture industry, practically all other large industries which are based on the application of scientific principles draw a continuous supply of highly trained technicians from the established engineering and scientific schools. It is suggested that such a school would also be a satisfactory place in which to make educational films.

p. 303

**The Future Policy of the Society of Motion Picture Engineers**

K. C. D. HICKMAN

The author analyzes the growth and development of the Society and discusses its present and future needs. He points out that the Society should have not only contributions covering the latest developments in the field, but should also pay some attention to presentation of older information for the benefit of the newer members.

p. 309

**Stereoscopic Cinematography**

E. J. WALL

The paper consists almost entirely of classification of patents claiming methods of producing stereoscopic motion pictures. In a short introduction, the author discusses the subject briefly and explains the classification which he uses in the presentation of his patents and patent abstracts.

p. 326

**Report of Papers and Publication Committee**

p. 345

## VOLUME XI, NO. 29, APRIL 25-28, 1927, NORFOLK, VA.

**Progress in the Motion Picture Industry****April, 1927, Report of the Progress Committee**

This is the annual report of the Progress Committee and gives in abstract form references to some 150 publications which have appeared during the past year bearing on subjects of interest to the motion picture engineer. The material is well classified, and is an excellent résumé of the progress in this field. p. 5

**Report of Advertising and Publicity Committees** p. 29

**Report of Publications Committee** p. 31

**Report of Membership Committee** p. 32

**Hollywood and the Motion Picture Engineers** K. C. D. HICKMAN

The author discusses the relationships existing between the Society of Motion Picture Engineers and the motion picture industry as concentrated in Hollywood. He mentions the contributions of value which the Society can make to the industry. The paper is largely a plea for a much closer relationship between the Society and the personnel of the industry actually engaged in the production of pictures. The opinion is expressed that some of the meetings should be held either in or within reach of the Hollywood members. p. 34

**Radio Movies and the Theater** C. FRANCIS JENKINS

A paper of a very general nature discussing the wide applicability of radio movies to the theatrical field. p. 45

**A Dissolving Shutter Mechanism for Motion Picture Cameras**

D. L. MISTRY

The construction and operation of a dissolving shutter mechanism which can be attached to amateur motion picture cameras is described with detailed drawings. p. 53

**A New Light Source for Mazda Projection Lamps** H. I. WOOD

A new form of tungsten lamp is described in which the filaments are composed of doubly coiled (coiled-coil) tungsten wire. This gives somewhat better concentration of light. The data presented indicate that this type of filament construction results in an appreciable increase (34 to 59 per cent) in efficiency in the case of the 110-volt projection type lamp, efficiency being computed on the basis of available screen lumens. p. 56

**Illusions in Cinematography**

FRED WALLER

The author describes in detail the methods used for obtaining illusory effects in motion picture work. Four particular examples: a storm scene, magazine illustrations coming to life, delirium scene, and Cinderella's coach going through the gates of heaven are dealt with in detail.

p. 61

**Some Faults Demanding Attention**

F. H. RICHARDSON

The author points out the disagreeable effects due to undue graininess in projected positives. Objectionable effects resulting from unduly great projection angles are also emphasized.

p. 72

**Graininess of Motion Picture Film**

J. I. CRABTREE

The nature of graininess in a motion picture film is explained as a non-homogeneity resulting from clustering of the silver bromide grains of the emulsion. Any noticeable graininess is objectionable but film manufacturers have found it possible to produce fast emulsions which exhibit little graininess.

Other factors which tend to exaggerate this defect are as follows: when film is stored for a long period, especially at high temperature, before development an increased graininess is produced. High density in negatives, particularly if development is contrasty, also leads to excessive graininess. Graininess is also minimized by using contrasty lighting in the studio and developing to a low gamma in a special fine grain developer.

Graininess in duplicate negatives will be a minimum if duplicating film is used for making the master positive and duplicate negative.

p. 77

**Why Is Make-Up Compulsory in the Movies?**

V. A. STEWART

The subject of make-up is dealt with almost entirely from the standpoint of motion picture photography on orthochromatic film. The author points out the necessity of covering up cutaneous imperfections which in many cases seem to be exaggerated by the photographic processes. The evolution of make-up is traced from the very early days of the legitimate stage down to the present time. The author points out that many of the practices used by the motion picture actors are survivals of methods developed under quite different conditions. The author strongly advocates the use of enamels rather than grease paints.

p. 93

**Some Facts concerning Projection Lenses** WILBUR B. RAYTON

It is stated that practically all projection lenses may be classified in two types: the Petzval portrait lens, and the triplet construction due to H. Dennis Taylor. Diagrams are given illustrating these two forms. The desirable and undesirable features of each type are discussed in detail. The author points out that when extremely wide apertures are demanded there must necessarily be some sacrifice in the definition, depth of field, and freedom from aberrations.

p. 101

**A Polygonal Floodlighting Mirror**

FRANK BENFORD AND M. W. PALMER

The reasons that make it desirable for the motion picture studio to employ large floodlighting units are the high levels of illumination required for high speed photography, and the peculiar sensitivity characteristic of the photographic film. These two factors indicate the use of a high intensity arc, and there is a natural tendency to take the high intensity searchlight just as it has been developed for military service and by refocusing get a beam of wide spread. The defects of this method are illustrated and it is shown that a more suitable optical arrangement is to use a polygonal mirror rather than a paraboloid. The method of computing the dimensions of the polygons is given along with data on a photometric comparison of the two types of reflectors.

p. 109

**VOLUME XI, NO. 30, APRIL 25-28, 1927, NORFOLK, VA.****Light Filters, Their Characteristics and Applications in Photography**

LOYD A. JONES

Following a discussion of the fundamental laws of reflection, absorption, and transmission of light by filter materials, their application to the determination of filter characteristics is illustrated. The theory of filter factor measurement is discussed, attention being called to the sensitometric characteristics of photographic materials, the spectral distribution of energy in the illuminant, and the absorption characteristics of the filter upon which the multiplying factor of a filter depends. Light filters for use with panchromatic materials are classified as (a) those used for obtaining orthochromatic reproduction of the brightness factor of color, and (b) those used for obtaining dis-

torted reproduction of the brightness factor. It is shown that the absorbing characteristics of an orthochromatic filter depend only upon the spectral sensitivity of the photographic material and the visibility of radiation. General rules are given for using contrast filters for the distortion of tone reproduction. p. 135

**The Conservation Program of the Motion Picture Producers and Distributors of America, Inc.**

HICKMAN PRICE

The paper deals with the conservation activities of the Motion Picture Producers and Distributors of America, Inc. These activities are classified under four headings, namely: (1) New buildings—the replacing of old structures with modern, fire-proof buildings. (2) Field service—rendered to the motion picture exchanges of the United States and Canada. (3) Relationship with those national bodies that have to do with making of laws and ordinances that protect both the public and the industry. (4) Investigation of the mechanical aspects of devices having to do with safety. p. 182

**Effect Lighting in Theaters**

J. H. KURLANDER

The paper deals with methods and devices for obtaining lighting effects for the embellishment of the motion picture program. The so-called effect lighting is classified in three broad divisions, namely: (1) projection of animated scenic effects, (2) projection of colored effects, (3) projection of simple masks, cut-outs, and special lantern slides. The article gives a detailed description of the method and equipment used for obtaining these various effects. The paper is profusely illustrated with photographs and diagrams of the various types of equipment, including a very interesting special triple projection lantern for obtaining a wide variety of color effects. The article closes with a lengthy and interesting list of animated effects in common use. p. 188

**The Motion Picture in Science**

J. W. COFFMAN

The author points out that motion photography had its conception in an effort to solve a scientific problem—the determination of the leg movements of a trotting horse. Various other applications of motion pictures to scientific problems such as the magnification or diminution of the time factor in the occurrence of events, the recording of microscopic phenomena, application to medical problems (such as the observation of rhythmic

muscular wave occurring in certain neuro-muscular diseases), and the making of educational and scientific motion pictures are mentioned. p. 208

**Something More about Progress in Subtractive Process Color Cinematography** F. E. IVES

Supplementary to a paper previously presented by the author (No. 12, May, 1921, p. 132). This paper deals with certain modifications tending toward simplification and increase in speed of production. The author mentions a new beam splitting device utilizing a dichroic reflector and also the use of two films run through a Bell and Howell camera with the emulsions face to face between a glass plate and pressure device. One of these emulsions is a special transparent green sensitive film. The remainder of the paper deals with the production of prints although but few actual details of procedure are given. p. 211

**Motion Photomicrography with the Cine Kodak** CLIFTON TUTTLE

For the use of the Cine Kodak for photomicrography, two auxiliary pieces of apparatus are desirable: (1) A view finder which can be used while pictures are being made with the microscope. (2) A driving mechanism which will operate the camera at various taking rates from one picture in three minutes to two or three times normal speed. The problems in optics, mechanics, and photography encountered in the design of such apparatus are discussed. The relation between magnification and resolution for the case of Cine Kodak pictures is of particular importance. A number of examples of motion photomicrography are presented. p. 213

**The Examination of Film by Projection on a Continuous Processing Machine** WM. V. D. KELLEY

This describes an optical system which can be attached to a processing machine so as to show on a screen the motion picture in its usual form. This is useful in inspection of the quality of a product. p. 224

**Better Popular Pictures** JOHN GRIERSON

The author analyzes the requirements of good pictures from several standpoints, including dramatic quality, literary merit, and box-office appeal. He discusses in detail a large number of the well-known pictures and attempts to isolate those factors which have made for their success or failure. It is concluded

that a picture to be successful in general should be cheerful and that pessimistic and gloomy themes are not received well by the American public. National peculiarities in picture type are discussed, as well as the various categories into which these individually may be divided. Attention is called to the merits and demerits of these various classes for different purposes. p. 227

#### **Film Care in the Tropics**

HERFORD TYNES COWLING

The paper deals with the precautions which should be taken in handling motion picture film in climates where it is subjected to high temperatures and humidities. The treatment of the subject is divided into four phases: (1) care in shipping and before opening the original container, (2) care after opening previous to exposure, (3) exposures in the camera, (4) treatment after exposure and previous to development. Some very useful information relative to shipping regulations and customs regulations pertaining to raw motion picture film is given. It is recommended that film should not be rewound before using in the camera and it should be repacked with black paper and sealed with adhesive tape in the original container as soon as possible after exposure and without rewinding. Previous to the packing the original container should be thoroughly dried out over the flame of a candle. The author states that it is better to utilize delayed development rather than to attempt field development with motion picture negative film. p. 250

#### **A New Process for Developing and Printing Photographic Sound Records**

J. B. ENGL

The author reviews very briefly the general methods which are used in photographic reproduction of sound. It is pointed out that since the relation between density and exposure is not linear, it is impossible in general to obtain a linear relation between amplitude and transmission in the negative. The author's object is to devise a special development procedure which will result in a linear relation between amplitude and photo-electric response when the positive is reproduced. Curves are given showing the effect produced by various development technics and one particular method is shown to give an almost perfect straight line relation between the two factors. p. 257

#### **A New Camera Pull-Down Mechanism**

GEORGE A. MITCHELL

This is a very brief description with illustrations of a new claw



type of pull-down mechanism. Pilot pins are used for positioning the film. p. 267

- A Pneumatic Film Squeegee** J. I. CRABTREE AND C. E. IVES  
The most satisfactory method of removing excess moisture from motion picture film after washing is to impinge a blast of air on both sides of the film. Pneumatic squeegees accomplishing this are in general use on processing machines but they have not been adopted by smaller laboratories using the rack and tank system, because of the non-adaptability of the conventional squeegee for the purpose. An apparatus is described for blowing the water from the film during transference from the film rack to the drying reel. A special filter for removing dirt and oil from the air supply is also described. p. 270

#### **Cleaning Liquids for Motion Picture Film**

J. I. CRABTREE AND H. C. CARLTON  
The ideal material for cleaning film should dissolve fats and mineral oils, should not harm the gelatin, silver image, or film base. It should be volatile, stable, non-combustible, and non-toxic. Carbon tetrachloride is in general very satisfactory although it has slight toxic properties. Residual salts left behind by the water evaporating from film during processing can be removed from the support side by rubbing with a mixture of water, ammonia, and ethyl or isopropyl alcohol. Brittleness due to excessive dryness can be overcome by bathing in a mixture containing a small amount of water, carbon tetrachloride, and a large proportion of tertiary butyl alcohol. p. 277

- Some Technical Aspects of the Vitaphone** P. M. RAINEY  
The Vitaphone system consists of a sound record similar to a phonograph record which is run in synchronism with the motion picture projector. The paper deals with the technical aspects of the problems involved, such as the construction of a motion picture studio which is satisfactory from the acoustical standpoint for making of sound records simultaneously with the production of the photoplay. The electrical problems involved in the amplification of the microphonic response, the conversion of these amplified impulses into mechanical energy, and cutting the record in wax disks are discussed. Curves are given showing the efficiency with which reproduction is obtained throughout the audible frequency range. The electrical equipment used

is that made by the Western Electric under the name of "Public Address System." The mechanical details of the magnetic recorder are given, and the paper constitutes an excellent treatment of the entire subject. p. 294

#### **Physiological Effects of Light**

MERRILL J. DORCAS

The author discusses some well-known effects of radiation, such as the production of Klieg eye, by high intensities of relatively short wave radiation. Some data on the light absorbing characteristics of various glasses and other well-known materials are given, also data showing the amount of radiation in various spectral regions for sunlight and artificial light sources including the high efficiency Mazda lamp and various types of arcs. Attention is called to the possibility of injury due to high concentrations of the long wave radiation, this being similar to a sun-stroke effect. No data are given, however, to show that any such injurious effect has ever been noticed in the motion picture studio. p. 318

#### **Some Patents for Trick Photography**

E. J. WALL

This paper consists almost entirely of references to patents relating to the making of composite pictures. The author shows that some of the methods used at the present time in trick photography have been known for many years. p. 328

#### **Air Conditioning as Applied in Theaters and Film Laboratories**

D. C. LINDSAY

The paper consists of a very comprehensive treatment of the problems involved in maintaining proper conditions of temperature, humidity, and air purity in motion picture theaters. The early part of the paper deals with the more general phases of the subject, and in the latter part the particular equipment manufactured by the Carrier Engineering Corporation is discussed in detail. The article is illustrated with diagrams and photographs which show clearly the construction and functions of this equipment. Among the subjects treated are those of refrigeration, air conditioning, air filtration, dust filters, air washers, and humidifiers. The problems as related to the condition of air in motion picture studios and laboratories are mentioned briefly. p. 334

#### **Visible Radiation from the Low Pressure Mercury Arc**

FRANK BENFORD

In this paper no attempt is made to give a complete analysis of the low pressure mercury lamp, but attention is confined to a few of the characteristics that are of most importance to the user of the lamp. A brief description of the physical construction of lamps used in the test work is followed by a spectrophotometric determination of the energy distribution in the spectrum. Data on tube brilliance and on causes of depreciation are given in their relation to photometric outputs, and some typical figures for tube life are discussed. The photometric distribution curves of both a. c. and d. c. lamps are given, both as bare tubes and as units complete with reflectors. The section on electrical characteristics gives some recent test data, and several of the most important reactions of the tube to ambient temperature are used to call attention to the factors to be watched during photometric tests. The concluding section gives briefly some of the conflicting phenomena that have contributed not a little to the present uncertainty about the reactions of the human eye under this light.

p. 365

#### **Preliminary Report of the S. M. P. E. Special Committee on Studio Lighting, December 15, 1926**

This is a report of preliminary work done by the Committee and deals with the subject almost entirely from the standpoint of injurious effects of radiation upon the human eye. The literature of the subject was carefully analyzed and the conclusions drawn are based upon all of the available information. The evidence indicates that there is very little danger of eye injury provided all arc lamps are screened with some kind of glass. Practically all glass absorbs the injurious wave-lengths. It is pointed out that extremely high illumination levels may be injurious quite apart from the wave-length effect, but this danger is not serious.

p. 396

#### **Report of Papers Committee**

p. 401

#### **Report of the Standards and Nomenclature Committee**

The report deals chiefly with the proposals for standardization of motion picture projector sprockets. The Committee's recommendations of dimensions for intermittent and take-up sprockets for 35 mm. practice were adopted by the Society. The Committee's recommendations relative to projector apertures were referred back to the Committee.

p. 402

**VOLUME XI, NO. 31, SEPT. 26-29, 1927, LAKE PLACID, N. Y.****Presidential Address**W. B. COOK  
p. 423**Progress in the Motion Picture Industry****September, 1927, Report of the Progress Committee**

This is the semi-annual report of the Progress Committee. It contains an excellent résumé of the publications relating to motion picture engineering. Some 127 articles are abstracted covering all phases of activities.

p. 425

**Report of the Standards and Nomenclature Committee**

The report presents for the second and final consideration dimensional standards relating to film sprockets. They were given the final approval by the Society. The report contains also a preliminary discussion of camera and projector speeds especially as related to photographic sound reproduction.

p. 443

**An Exhibitor's Problems in 1927**

ERIC T. CLARKE

The make-up of the program is discussed at some length, consideration being given to best methods of mingling good, mediocre, and poor films to make a balanced program. The place of vaudeville and stage presentations in the motion picture theater is also discussed.

p. 450

**Some Technical Aspects of the Movietone**

EARL I. SPONABLE

Various technical problems involved in sound recording and reproduction by photographic methods are discussed. The methods of sound proofing the recording studio are described, together with methods which must be adopted for preventing reverberation or echo within the studio itself. Diagrams and photographs are shown illustrating the dimensional characteristics of the present practice in Movietone film as well as the various mechanical and optical accessories employed in the recording of sound by the Movietone method. The reproduction phase is treated rather briefly.

p. 458

**The Rendering of Tone Values in the Photographic Recording of Sound**

ARTHUR C. HARDY

The various methods which may be used for making photographic records of sound are described, these methods being divided into the "variable density" and "variable width" types. The

mechanism involved in making records of these types is discussed briefly. The theoretical requirements for correct reproduction of sound are outlined, a graphic solution being given for translating the characteristics of photographic materials into sound reproduction curves. It is concluded that for theoretically perfect reproduction by either method, the product of negative by positive gamma should be equal to unity. The author states, however, that the allowable departure from this condition is somewhat greater in the case of the variable width record than with variable density. p. 475

### **Tachometers for Use in Motion Picture Work**

NICHOLAS M. TRAPNELL

Desirable characteristics of tachometers for use with motion picture equipment are specified, these including small size, lightness, low power consumption, precision, reliability, and convenience of reading. The merits and demerits of various types, including mechanical, hydraulic, magnetic, and electrical tachometers are discussed. The constructional details and characteristics of a magnetic tachometer are given. p. 492

### **Why Expert Knowledge and High Grade Intelligence Is Essential in the Theater Projection Room**

F. H. RICHARDSON

Enormous damage may be done to film during projection due to improper lubrication, excess oil on the film, and lack of mechanical adjustment of the projector. The quality of the screen picture, therefore, and its appeal to the public is directly dependent upon the projectionist. It is obvious, therefore, that the projectionist should be a well trained and intelligent man. The use of unskilled and careless labor in the projection room may, on the aggregate, cause an enormous loss to the industry. p. 500

### **An Improved Condenser System for Motion Picture Projection**

LEWIS M. TOWNSEND

A condenser combination consisting of two components, one a plano-convex, and the other a meniscus with one spherical and one parabolic surface is described. This combination collects the light flux from the source within a solid angle of  $75^\circ$ . It may be used either directly or in combination with the relay system. Data are given showing that for a given current con-

sumption in the high intensity arc an increased screen brightness is obtained. p. 512

### **The Lubrication of Motion Picture Film.**

J. I. CRABTREE AND C. E. IVES

If the motion picture positive is not lubricated an accumulation of hardened gelatin collects on the projector gate resulting in friction which may damage or even stop the film. The present lubricating practice consists of applying a thin line of wax along each edge of the film. This is in general satisfactory, but sometimes too much wax is applied which may spread and cause blotchiness or, under certain conditions, may cement the film in the gate of the projector. These objections may be overcome by applying a solution of wax dissolved in carbon tetrachloride to the entire surface of the film and followed by buffing. This gives sufficient lubrication and film thus treated is impervious to the effect of oil. p. 522

### **An Experiment in the Development of Classroom Films**

T. E. FINEGAN

The factors which have prevented the general adoption of motion pictures for teaching are lack of film suitable for classroom work, cost, unfamiliarity of the teacher with motion picture equipment and the possibilities of this educational tool. The paper continues with an account of the work done by the Eastman Kodak Company in the making of film suitable for use in the classroom and of the plan outlined for obtaining definite quantitative evidence relative to the value of these films in teaching. A list of the films thus far produced is given and considerable attention is devoted to a discussion of the desirable characteristics of teaching films and scenarios on which they are built. p. 545

### **The Photographic Reflecting Power of Colored Objects**

LOYD A. JONES

The theoretical phases of the question are first considered. It is shown that the value of the visual reflection factor depends upon the spectral distribution of energy of the light source, the visibility function of the human eye, and the selective absorption characteristics of the surface in question. Similarly, the photographic reflection factor depends upon the spectral distribution of energy of the light source, the sensitivity of the photographic material used to radiations of different wave-

lengths, the selective absorption characteristics of the object in question, and the selective absorption of the image forming system. The practical photographic-photometric method of measuring reflection factors is discussed and the values obtained for twenty-five typical color panels are given, the measurements being made on photographic materials of different color sensitivity and with different light sources. p. 564

**The Tungsten Lamp Situation in the Studio** PETER MOLE

This is a short discussion of the growth of the Mazda lighting in the production of motion pictures, describing briefly some of the equipment manufactured commercially for utilizing high wattage Mazda lamps. p. 582

**Factors Which Affect the Contrast of a Lens Image in the Motion Picture Camera** CLIFTON TUTTLE AND H. E. WHITE

An image which duplicates the contrast of the object is desirable in photography. Such a condition makes for a clear, sparkling picture, but if the lens image contrast differs greatly from that of the object, the quality of the photographic reproduction will suffer. In motion picture photography, a number of causes, such as lens flare, camera interior reflections, diffusion, and light leaks may result in lowered image contrast. The seriousness of these various factors and the possible remedies for some of them are discussed. Especial attention is given to the practical value of lens shades in preventing the entrance of extraneous light. p. 591

**Animated Technical Drawings** J. A. NORLING

The great value of animated technical drawings for the illustration, by means of motion, of the operation of devices and machinery is emphasized. The author stresses the desirability of making such treatments sufficiently comprehensive. The general plan of outlining such a production is given with detailed explanation. p. 601

**A Compact Motion Picture Densitometer**

J. G. CAPSTAFF AND R. A. PURDY

A portable densitometer was designed to measure the small densities occurring in motion picture images. An automobile headlight lamp is used both to furnish the comparison and to illuminate the density to be measured. The intensity of the density beam is reduced by a known amount by a photographic

wedge. The comparison beam is of constant brightness. By an arrangement of mirrors the comparison field is constructed to give a photometric field which is viewed with a low-powered eyepiece. The instrument is capable of measuring densities from 0 to 3.0. The scale reads directly in densities. p. 607

## VOLUME XI, NO. 32, SEPT. 26-29, 1927, LAKE PLACID, N. Y.

### Framing the Projected Picture with Colored Borders

LEWIS M. TOWNSEND

A large stereopticon having a condenser system 8 inches in diameter is used to project the desired border of colors and designs. A 5 inch by 7 inch slide, the mat of which is 4 inches by  $6\frac{1}{2}$  inches is, used. A high intensity 75 ampere arc provides the light and good illumination is obtained with projection distance of 160 feet, thus giving an image approximately 24 feet by 35 feet. Due to the relatively large area of the slide little trouble is experienced with overheating and cracking.

p. 623

### A Few Practical Needs in the Field of Projection

 ARTHUR H. GRAY

Attention is called to certain practices which result in damage to film, among which are mentioned careless handling during packing and shipping, the use of damaged shipping reels, and careless inspection of splicing in the exchanges. The necessity for extreme precision in the intermittent movement of the projector, and the necessity of careful focusing when wide aperture projection lenses are used, are discussed. p. 628

### Acoustics of Motion Picture Theaters

 F. R. WATSON

Obtaining satisfactory acoustical characteristics in an auditorium is discussed. Data are given relative to the sound absorbing coefficients of materials used in the construction of theaters. The problem of reverberation and its control is dealt with. Tables are given showing the relation between volume of the auditorium and optimum reverberation time, and methods of computing the amount of sound absorbing material required in any case are illustrated. The desirable characteristics for recording studios are also discussed briefly. p. 641

### Improvements in Laboratory Practice

 VICTOR A. STEWART

Several accessory devices are described including an improved



film rewind, misframe detector, and a cutting and scraping block for splicing. Several other convenient methods for use in projection room and laboratory are suggested. p. 651

#### **The Needs of a Trick Photographer**

FRED WALLER

The author points out the need in some cases for a very high intensity single source for producing realistic sunlight effects, light sources which do not flicker for use in making glass shots, greater depth of focus in lenses used for certain direct shots, faster film, and slow motion cameras having longer periods of exposure for each frame. p. 663

#### **The Structure of the Motion Picture Industry**

WILLIAM A. JOHNSTON

A statistical analysis of the motion picture industry showing the three economic divisions, namely, producer, distributor, and exhibitor. Figures are given showing the distribution of production costs among the various items and the total number and value of photoplays produced annually. The structure of the distributing mechanisms is described and the various problems involved in the distribution and exhibition are discussed. p. 667

#### **Some Psychological Aspects of Natural Color Motion Pictures**

L. T. TROLAND

The author discusses the desirability of adding color to the motion picture from the standpoint of its contribution to the illusion of reality. In dealing with this various psychological and physiological aspects of the problem are mentioned. The author concludes that good color rendition is a desirable addition and that, while there may be some disturbance during the transition stage from black and white to color, the picture in color ultimately will be a more effective means of dramatic expression than one without color. p. 680

#### **Automatic Silver Recovery from Hypo**

K. HICKMAN AND D. HYNDMAN

The article describes a new apparatus used for the recovery of silver using sodium sulfide as the precipitant. The sodium sulfide is added in correct proportions to the solutions containing the silver, this addition being accomplished by the action of automatically operating syphons. Drawings are given showing in detail the construction of these syphons. p. 699

**Behavior of Gelatin in the Processing of Motion Picture Film**

S. E. SHEPPARD

The swelling and shrinking of gelatin, since they affect the durability of the finished print and, to a certain extent, the character of the image, are of great importance. This phenomenon may be regarded from two points of view involving the total expansion and the partial expansion resulting in temporary or permanent deformations. In solutions of varying acidity or alkalinity gelatin shows a point of minimum swelling termed the iso-electric point. On one side swelling increases with alkalinity, on the other with increasing acidity. By proper adjustment of acidity swelling can be reduced to a minimum. Swelling may also depend on the past history of the gelatin. In the case of film, since the film is carried on a base which changes in dimension but little with water content, it can swell only in a direction perpendicular to the film base, except under exceptional conditions when it may become detached from the base and frilling results. For optimal results processing conditions should be adjusted to produce the minimum of swelling and shrinking. p. 707

**Oil Spots on Motion Picture Film**

G. E. MATTHEWS AND J. I. CRABTREE

Various oil spots were produced on motion picture film by applying different oils to several typical films before and after exposure and with different conditions of storage. The nature of the markings produced is independent of the nature of the emulsion and usually of the kind of oil. The spots are more pronounced if the oil is applied before exposure. Some types of oil produce fog during a contact of several weeks. With exposed film the most noticeable effect is that which results from the oil acting as a resist during development and causing light spots and streaks. The most satisfactory way of removing oil from the surface of motion picture film is by cleaning with benzene or carbon tetrachloride. p. 728

**A Trial and Error Method of Preparing a Motion Picture Sensitometer Tablet**

C. E. IVES AND J. I. CRABTREE

A set of uniform flash exposures is made on the printer using positive motion picture film. When this strip has been given proper development ( $\gamma = 1.0$ ) the densities produced on it will be a measure of the exposure given by the several light change

settings. These determine the density range of the required tablet. The desired densities can then be selected from flashed and developed positive film and assembled in a tablet of suitable dimensions. The tablet should be illuminated uniformly when in use and the illumination level chosen to permit accurate time of the exposure. p. 740

**Micro-Cinema in Medical Research** HEINZ ROSENBERGER

The equipment used at the Rockefeller Institute for making photomicrographs of medical and biological subjects is described. This has been used to show the growth of cultures of various animal tissues, cell division, and phagocytosis. p. 750

**Narrow-Casting** JOHN B. TAYLOR

This is a very brief account of a lecture given by the author demonstrating the transmission of sound over a beam of light. At the transmitting station an oscillograph mirror is caused to vibrate by means of an electro-magnetic pick-up in contact with a phonograph record. The vibration of the mirror so changes the direction of the reflected beam that it is allowed to pass or be partially intercepted by an opaque diaphragm at the receiving end. The light thus modulated is received by a photoelectric cell from which the current passes to an amplifier and thence to the loud speaker. p. 759

**Report of Papers Committee** p. 761

**Report of Publications Committee** p. 762

**Report of Membership Committee** p. 763

**Open Forum**

This is a discussion of the various problems confronting the Society. p. 764

**Symposium of New Motion Picture Apparatus**

This consists of brief technical descriptions of new motion picture equipment as follows:

*A Reflector Arc Dissolving Stereopticon*, J. H. Kurlander, Brenkert Light Projection Co.

*Duplex Optical Printers*, A. B. Hitchins, Duplex Motion Picture Industries, Inc.

*The Dworsky Film-Renovating Machine, Polishing Machine, and Film Rewind*, A. S. Dworsky, Dworsky Film Machine Corp.

*The Model B Kodascope*, Eastman Kodak Co.

*Recent Developments in the Prefocused Bases and Prefocusing Sockets for Projection Lamps*, R. S. Burnap, Edison Lamp Works of General Electric Company.

*Improved Motor Generators*, Hertner Electric Co.

*An Important Improvement in Power's Projector Mechanism*, Herbert Griffin, International Projector Corporation.

*Carbons for Use with Panchromatic Film*, E. R. Geib, National Carbon Co.

*Mazda Lamps for Motion Picture Photography*, R. E. Farnham, National Lamp Works.

*The Model 3 Victor Cine Camera*, Victor Animatograph Co.

p. 768

**VOLUME XII, NO. 33, APRIL 9-14, 1928, HOLLYWOOD, CALIF.**

**Presidential Address**

W. B. Cook

p. 13

**Speeches Presented at the Banquet Given by the Academy of Motion Picture Arts and Sciences in Honor of the Society of Motion Picture Engineers**

The following speakers participated: Mr. Douglas Fairbanks, Mr. Fred Niblo, Mr. W. B. Cook, Mr. Max Mayer, Dr. C. E. K. Mees, Mr. Cecil B. DeMille, Mr. Fred W. Beetson, Mr. Daniel Clark, Mr. L. A. Hawkins, Mr. Milton Sills.

p. 16

**The Academy of Motion Picture Arts and Sciences** FRANK WOODS

"The Academy of Motion Picture Arts and Sciences is an interesting experiment in organization engineering. It is an attempt to combine in one unified body the members of several associated but diversified creative arts, on a basis of friendly coöperation for the common good." It is divided into five divisions: (1) actors, (2) directors, (3) producers and producing executives, (4) technicians, and (5) writers. A brief outline is given of the activities of the academy and the various things it is planning to do for the industry.

p. 25

**Hollywood and the 16 Mm. Film** JOHN BEARDSLEE CARRIGAN

The possibilities of the 16 mm. field and the probable reaction which the development of the amateur motion picture will have upon the professional field are discussed. It is the author's opinion that developments in the 16 mm. field can only react

beneficially upon the professional and that the experiments which are bound to occur among the amateurs will produce new technics and methods which will be a valuable contribution to the professional studios.

p. 33

#### **American Motion Pictures Abroad**

NATHAN D. GOLDEN

About seventy-five per cent of the total motion picture footage is of American origin, and in 1927 over two hundred and thirty million feet of the finished motion pictures were exported from this country, Europe being our best customer. The paper continues with an analysis of the various foreign markets and foreign productions, and closes with a brief account of the activities of the motion picture section of the Bureau of Foreign and Domestic Commerce.

p. 41

#### **Scenario Writing**

CAREY WILSON

This is a discussion of the scenario writer's point of view, especially with regard to the technical equipment and processes involved in the making of a motion picture. Suggestions are made of new devices which might give the writer greater latitude in the construction of a screen play.

p. 58

#### **Some Problems of the Art Director**

JAMES MITCHELL LEISEN

The author traces the art director's contacts and duties throughout the making of a motion picture production. The importance of his being entirely familiar with all phases of the work, including the scenario, the director, the actors, and the technicians, is stressed.

p. 71

#### **The Operation of a Central Casting Bureau**

FRED W. BEETSON

The free employment bureau, owned and operated by the members of the Association of Motion Picture Producers, keeps on file a full personal description and photograph of each registered extra. The producing organizations call upon the casting bureau whenever extras are needed and those of proper qualifications are recommended.

p. 81

#### **A System of Motion Pictures with Sound**

H. B. MARVIN

This is a somewhat non-technical description of a method developed by the Research Laboratories of the General Electric Company for the reproduction of sound by photographic means. The various parts of the equipment are described and illustrated. This method produces a photographic record of the variable

width type, the sound being reproduced by means of a photo-electric cell in connection with an amplifier and a bank of cone-type loud speakers. p. 86

**Some Remarks on the Acoustical Properties of Rooms** J. B. ENGL

In order to reproduce perfectly the auditory sensations arising from binaural perception it is necessary to make two independent sound records and to reproduce these separately through loud speakers having the proper separation relative to the auditor. In recording rooms great care must be exercised to reduce reverberation. Ideal recording can be done outdoors where reverberation does not exist to any extent. In certain cases reverberation is necessary in order to produce the desired effect. The rooms in which the sound is reproduced must also be treated carefully from the standpoint of reverberation adjustment. The position of the loud speaker (horn or cone) relative to the screen and to the characters which are supposed to be speaking must be carefully considered. p. 103

**Pantomime Pictures by Radio for Home Entertainment**

C. FRANCIS JENKINS

In sending, a series of lenses is mounted in a circle on a rotating disk. Each lamp in succession images a source of light onto a standard motion picture film. The film moves continuously and this combination forms effectively a scanning device. A receiver of the drum type is used, a source of light being located in its axis of rotation. This light travels through tiny holes arranged in a plurality of helices on the circumference of the drum. Quartz rods are used to prevent divergence of the light, thus conserving energy. With this arrangement a picture 3 inches square is obtained from the second stage of a two-stage audio amplifier. Further details of the method are given. p. 110

**Perspective Considerations in Taking and Projecting Motion Pictures**

ARTHUR C. HARDY AND R. W. CONANT

The theory of correct perspective reproduction as related to the focal length of the taking lens, magnification, focal length of the projecting lens, and length of throw is discussed. A formula is derived from which it is concluded that the correct distance for viewing a motion picture production is obtained by multiplying the projection distance by the ratio of the focal length of the taking camera to the focal length of the projector. The paper

is illustrated with examples showing correct and incorrect perspective. p. 117

### **Theater Management**

HAROLD B. FRANKLIN

The qualifications and duties of a theater manager are set forth. He should be a man of versatile capabilities with a complete knowledge, not only of the business phases of his work, but also of the technical problems involved in placing a motion picture of high quality on the screen of the theater. p. 126

### **The Reproduction of Mobility of Form and Color by the Motion Picture Kaleidoscope**

LOYD A. JONES AND CLIFTON TUTTLE

A description is given of an instrument constructed for making motion pictures of kaleidoscopic patterns by the two-color process. This consists essentially of a standard Bell and Howell camera to which is added a holder for the taking filters, a kaleidoscopic prism, and a transparent pattern plate with means for driving the various elements in synchronism. p. 140

### **Motion Photomicrographs of the Progress of Development of a Photographic Image**

CLIFTON TUTTLE AND A. P. H. TRIVELLI

The technic of making high power motion photomicrographs of developing silver bromide grains is described. One-grain layers coated on microscope cover glasses were used and the developer was placed on the substage condenser. p. 157

### **Aerial Cinematography**

HARRY PERRY

An account is given of the various problems involved in the photography of *Wings*. The best planes for aerial work were found to be DeHaviland with Liberty motor having a cockpit set well back from the wings and allowing generous spread from the end of the wings to the rudder, and the Martin bomber having the front cockpit between the motors and well forward. Gun turret mounts were found useful for mounting the camera. Using panchromatic film, the Wratten minus blue filter gave good haze cutting, the K3 beautiful cloud effects, and the alpha filter night effects from daylight shots. p. 162

### **Still Photography in Motion Picture Work**

FRED R. ARCHER AND ELMER FRYER

Still pictures made during the progress of the production of a motion picture are used for advertising the production, marketing the production, reference work, and in connection with the

trick photography involved. Before production starts copies must be made from pictures showing costumes, buildings, properties, *etc.* Still pictures are also used for maintaining constancy of make-up from day to day. The desirable characteristics of the equipment to be used for making stills are described.

p. 167

### The Technical Status of the Film Laboratory

LEIGH M. GRIFFITH

This is a comprehensive discussion of the construction and equipment of a desirable and up-to-date processing laboratory. It is of prime importance to have equipment of ample capacity for bringing to proper temperature the humidity of the air in the rooms in which the film is handled. The laboratory must have an ample supply of water of satisfactory purity. Care must be exercised in controlling the chemical composition of the various baths used in processing, and up-to-date silver recovery equipment should be installed. The author deals with many other phases of the work, including drying rooms, cutting rooms, assembly rooms, projection rooms, *etc.*

p. 173

### A Negative Developing Machine

C. ROY HUNTER

This is a detailed description of an improved Spoor-Thompson machine installed in the Universal Laboratories. It is electrically driven. All turning parts are mounted in ball bearings, and no corrosive metal comes in contact with any of the solutions. The solutions are circulated continuously by means of a pump. The film is dried in the cabinet supplied with properly conditioned air.

p. 195

### Large Aperture Lenses in Cinematography

JOSEPH A. DUBRAY

Objectives of great aperture permit the use of less light energy in the photography of interior scenes, and also make it possible to obtain passable results outdoors under adverse lighting conditions. It is stated that an  $f/1.8$  objective does not permit the reduction of illumination to the extent indicated by computation on the basis of theoretical reasoning. It was suggested that this may be due to the increased thickness of glass or to the greater loss of illumination at the surfaces. The necessity of specially good color correction computed specifically to fit the spectral sensitivity of panchromatic film is emphasized.



The relation of the size of the disk of confusion to requisite definition is discussed. p. 205

#### **An Amateur Studio Picture**

J. S. WATSON, JR.

The making of an amateur film with relatively little equipment is discussed, the aim in this case being to create a mood or feeling rather than the story. Free use is made of "effect scenes" obtained by means of distorting mirrors or prisms, exaggerated shadows, and distorted perspectives. The article is illustrated with drawings of some of the sets. p. 216

#### **Artificial Sunlight for Photographic Sensitometry**

RAYMOND DAVIS AND K. S. GIBSON

A liquid filter composed of two parts, when used with a tungsten lamp operating at a specified efficiency (color temperature), transmits radiation of spectral quality approximating that of noon sunlight. One visual candle-power of this is proposed as a primary unit of photographic intensity for use in sensitometry. Formulas for making up filters to be used with lamps at different temperatures are given and data showing the exact composition of radiation obtained are presented. p. 225

#### **Motion Picture Photography at High Altitudes**

J. NOEL

The problems involved in this type of photography are discussed, including the effects of high altitude on the human body and mind, and on the motion picture equipment. In the cameras for this type of work there must be no friction on the film and no velvet pads in the camera or in the light traps of the magazine. Static becomes serious at high altitudes. Hand held spring driven cameras are of great utility. p. 237

### **VOLUME XII, NO. 34, APRIL 9-14, 1928, HOLLYWOOD, CALIF.**

#### **Standards Adopted by the Society of Motion Picture Engineers**

This is a summary of the dimensional standards and recommended practice officially adopted by the Society of Motion Picture Engineers up to the present time. These standards have also received the official approval of the American Engineering Standards Committee. The standards are presented largely in the form of dimension charts. p. 247

#### **Report of Standards and Nomenclature Committee**

In this report the Standards Committee presents to the Society,

for the first time proposals for standard dimensions on 16 mm. sprockets, camera and projector apertures, film splice dimensions, and film track width. These were discussed and received the initial approval by the Society. p. 258

### **Progress in the Motion Picture Industry**

This is a review of the technical publications appearing during the recent months on motion picture engineering and allied subjects. One hundred and eleven articles are referred to in abstract. Special attention is given recent progress in studio illumination, talking pictures, and television. p. 267

### **Some Mechanical Problems of a Director** IRVIN WILLAT

Some difficulties in achieving continuity of action between scenes are discussed. The director is responsible for securing the correct directional impressions. p. 285

### **Motion Picture Directing** CECIL B. DEMILLE

The author describes some of the problems which the director must meet, showing the responsibility which rests on him, and the quickness of thought which is sometimes required of him. p. 295

### **Systematic Control in the Production of Motion Pictures**

\* ROGER NAUMAN

The author discusses the value of reflecting power measurements for the materials used in sets. Such values are determined by photo-electric measurement of value in setting the exposure. Quantitative methods throughout the whole process of picture production are desirable. p. 310

### **Dramatic Cinematography** KARL STRUSS

The use of the camera to express moods and thoughts in the production of *Sunrise* to a large extent replaces titles. p. 317

### **A Line Screen Film Process for Motion Pictures in Color**

JOHN H. POWRIE

The process is described in considerable detail. A bichromated gelatin film is applied to the base. A print is made through an opaque line negative formed on the back of the support. Parallax is used to print one-third of the lines at a time. Successive mordanting and dyeing produces a series of tri-color lines closely contiguous and absolutely parallel. There is no light-scatter by the color elements such as occurs in the starch grain process. p. 320

**Camera Lenses for Motion Picture Photography** W. B. RAYTON  
Short focal lengths and the pictorial character of motion picture work have made high speed lenses possible. No new methods of design have been discovered in the past twenty years.

Focal lengths of the taking lens influence the perspective of the projected picture, introducing falsity which at times becomes serious.

Spectral absorption of the lens does not affect the photicity relations above 350  $m\mu$ . Very little shift of focus is found with different light sources and different color sensitivity of emulsions.

There is no foundation for the belief that poorer definition results from the use of tungsten lamps. p. 335

### **Some Novel Projected Motion Picture Presentations**

LEWIS M. TOWNSEND AND WM. W. HENNESSY

The occasional use of very large screens has been tried in the Eastman Theater, Rochester, N. Y., thereby achieving some striking effects. Projection on gauze drops to furnish scenery for prologue acts has been used effectively. p. 345

### **The Importance of Good Projection to the Producer**

F. H. RICHARDSON

A plea to the producer to show more interest in projection. p. 355

### **The Measurement of Pulsating Currents**

W. NELSON GOODWIN, JR.

The characteristics of alternating, direct, and pulsating currents are described and graphically illustrated. The various types of measuring instruments are listed and the characteristics and use of each are noted. p. 364

### **Silverless Motion Picture Positive Film** JOE W. COFFMAN

It is claimed that Alfred Weingarten's process of making sensitive bichromated gelatin positives reduces print cost, increases durability, and minimizes distortion by heat. p. 379

### **Notes on Making Duplicate Negatives** C. E. IVES AND E. HUSE

The master positive should be as perfect as possible. A minimum density of 0.5 is necessary but overexposure should be avoided. Contrast of the master positive should be controlled by the use of violet filters. Development should be complete but not excessive. Machine development is preferable because of the great uniformity obtainable. Contrast adjustments should

not be made in the negative if they can be made in the master positive. The printer and duplication work should give perfect uniformity of exposure. A 100-watt lamp with an efficient relay condenser system or a 300- to 400-watt lamp without condenser will permit printing at approximately 15 feet per minute.  
p. 382

**Moisture in Motion Picture Film** V. B. SEASE

The effect of moisture content on various physical characteristics of film shrinkage, stress-strain, flexibility, and capacity for static has been quantitatively determined.  
p. 390

**A Spring-Driven Cinematograph Camera** A. S. NEWMAN

A description of the problems met by the author in designing a new camera which holds 200 feet of film and will run 160 to 180 feet at one winding of the spring motor.  
p. 397

**The Magnascope** H. RUBIN

The use of a large projected picture for novelty effects has been tried in the Rivoli Theater, New York.  
p. 403

**Projectors with Optical Intermittents** J. F. LEVENTHAL

A criticism of a previous paper (No. 18 (1924), p. 147). The author shows the desirability and practicability of continuous projection. Mechau's projector is cited to refute some of the previous arguments.  
p. 406

**A Pull-Down Mechanism for Motion Picture Cameras** A. S. NEWMAN

This deals with the conditions that a claw pull-down must fulfill and gives the theoretical and practical considerations of the path of the claw. Early difficulties with pull-down design before perforations were standardized are discussed.  
p. 410

**An Optical Printer for Trick Work** CARL LOUIS GREGORY

This describes an optical printer with micrometric movements for exact work in optical printing, multiple exposures, duplicate negatives, altered magnification, speeding up and slowing down action, *etc.*  
p. 419

**Photographic Characteristics of Motion Picture Studio Light Sources** LOYD A. JONES AND M. E. RUSSELL

The relative photographic efficiencies of various motion picture illuminants on Eastman Motion Picture Panchromatic film have

been determined. The luminous efficiencies of the various units have likewise been tabulated. The ability of the film to photograph color has been studied and the photographic reflecting powers of various spectral colors for the different light sources included. p. 427

### **Incandescent Tungsten Lighting in Cinematography**

RESEARCH COMMITTEE OF THE AMERICAN SOCIETY OF CINEMATOGRAPHERS

An investigation of a practical nature was conducted to determine actinic values of tungsten in comparison with other sources, physiological effects of tungsten illumination, pathological effects from this source, and the practicability of the use of tungsten lamps.

The quality of photographic color rendition with incandescent tungsten showed a marked improvement over white flame arcs. Less "penetration" in the blacks was noted with tungsten. Excessive heat proves to be a disadvantage. Spotting could not well be accomplished. No harmful effect of the radiation could be discovered. A number of factors were found to be in favor of the tungsten lamps from the point of view of convenience, economy, and cleanliness. p. 453

### **The Effective Application of Incandescent Lamps for Motion Picture Photography**

R. E. FARNHAM

Many advantages of incandescent tungsten lighting are mentioned. The requirements as to reflector design, location of units, and intensity for various purposes are treated in detail. p. 464

### **Notes on the Characteristics of Tungsten and Tungsten Lamps**

FRANK BENFORD

The first part of this paper deals with the characteristics of pure tungsten wire in vacuo. Differences between tungsten and the black body are explained. Progress in the manufacture of tungsten lamps and physical characteristics of the commercial products are discussed. p. 484

### **Characteristics of Flame Arcs for Studio Lighting**

D. B. JOY AND A. C. DOWNES

The white flame arc and the Panchromatic "O" arc with an ordinary glass diffusing screen and with a special glass screen

form a flexible group of sources for studio photography. The results of a photographic study of these combinations are given.  
p. 502

### **The Use of Incandescent Equipment in Motion Picture Photography**

PETER MOLE

Comparative data as to the cost of arc and tungsten lighting are given. Various types of new reflector units are described. Several illustrations of these units in use on actual sets are included.  
p. 521

### **Trick Photography**

FRANK WILLIAMS

Effects are often obtained by inserting action into backgrounds by the traveling matte method. Some of the photographic difficulties of the method are described.  
p. 537

### **Open Forum**

This is a discussion of the various problems confronting the Society.  
p. 541

### **Report of Theater Lighting Committee**

This is a preliminary report of work being done by the committee in making a survey of the illumination conditions existing in the motion picture theaters at present. It is proposed, when sufficient data have been collected, to draw up a code of recommended practice in this field.  
p. 549

### **Report of Papers and Publications Committees**

p. 551

### **Report of Advertising Committee**

p. 552

### **Report of the Publicity Committee**

p. 553

### **Report of the Membership Committee**

p. 553

### **New Motion Picture Apparatus**

The following apparatus is described:

*A New and Advanced Idea in Tripod Heads*, Fred Hoefner.

*Cooper Hewitt Neon Lamps*, L. J. Buttóloph, Cooper Hewitt Electric Co.

*Moviola Film Viewing Machines*, I. Serrurier.

*Long Life Photographic Carbons and the Panchromatic Light Transformer*, E. A. Williford, National Carbon Co.

*A Light for Use in Amateur Motion Picture Photography*, Edward C. Richardson, Mole-Richardson, Inc.

*A 16 Mm. Film Reel That Requires No Threading*, Eastman Kodak Co.

*Kodalite*, Eastman Kodak Co.

*An Automatic Film Rewinding and Splicing Machine*, W. F. McLoughlin.

*An Improved Control Panel for Multiple Arc Type Motor Generator*, C. C. Dash, Hertner Electric Co.

*An Emergency Theater Lighting System*, C. C. Dash, Hertner Electric Co.

p. 555

**VOL. XII, NO. 35, SEPTEMBER 24-28, 1928, LAKE PLACID, N. Y.**

**Presidential Address** W. B. COOK p. 583

**Presidential Acceptance** L. C. PORTER p. 585

**Progress in the Motion Picture Industry. September, 1928—  
Report of the Progress Committee**

A summary of progress in the motion picture industry from April to September, 1928. p. 588

**Early History of Sound Pictures** TERRY RAMSAYE

Early sound and picture synchronizing experiments of Edison, Dickson, and Lauste are described. The Lauste system, patented in 1906, closely resembles modern photographic sound reproduction methods. p. 597

**The Reaction of the Public to Motion Pictures with Sound** MORDAUNT HALL

The actor must not forget to act, the technician must avoid sound exaggerations, and the producer must find good stories if the public is to be pleased with sound pictures. p. 603

**The Public and Sound Pictures** WILLIAM A. JOHNSTON

The public demands sound pictures. The exhibitors face new problems—interchangeability of various record types and the difficulty of cutting sound features to suit the small theater programs. p. 614

**The Entertainment Value of the Sound Movie** H. B. FRANKLIN

The author predicts that a place will remain for the silent picture, and that sound will bring a new literature to the screen. p. 620

**The Sound Motion Picture Situation in Hollywood** FRANK WOODS

The activities of the Academy of Motion Picture Arts and Sciences are described. A system of awards for meritorious service to motion pictures has been instituted. p. 625

- The Quality of Speech and Music** JOHN C. STEINBERG  
The mechanism of speech is described. Pressure-frequency charts showing the range of audibility are presented. A short bibliography is given. p. 633
- The Physical Characteristics of Music and Speech** DAYTON C. MILLER  
An apparatus for photographing and one (the "Phonodeik") for demonstrating sound vibrations are described. The harmonic components of a complex wave form are shown. p. 647
- General Principles of Sound Recording** E. C. WENTE  
Various types of distortions, non-linear distortion of a sine wave, resonance effects, and high frequency attenuation, and extraneous noise are discussed. The amplitude accommodation of the ear places extraordinary requirements on the recording mechanism. p. 657
- Western Electric Sound Projecting Systems for Use in Motion Picture Theaters. Part I** E. O. SCRIVEN  
The Western Electric sound projection equipment is described. Diagrams of the disk reproducer, projector optical system, and photo-cell-amplifier circuit are shown. p. 666
- Western Electric Sound Projecting Systems for Use in Motion Picture Theaters. Part II.** H. B. SANTEE  
The installation and operation of the Western Electric equipment is explained. Faults of theaters, such as too great a reverberation time or overdamping, are discussed, and remedies for the various defects are pointed out. Calibration of the theater and training of the projectionists are important problems. p. 679
- Synchronization and Speed Control of Synchronized Sound Pictures** H. M. STOLLER  
Speed control circuits for a. c. and d. c. motors are described and the Michalke interlocking "electrical gear" is explained. In this device, 3-phase, 60 cycle current is used in rotors and stators of the interlocked motors. A phase displacement in one rotor results in a flow of current in the interconnected rotor leads. The resulting torque tends to make both rotors assume the same relative positions. p. 696
- Recent Advances in Wax Recording** HALSEY A. FREDERICK  
The various steps involved in recording and reproducing sound with wax records are studied in detail. p. 709



**Sound Recording with the Light Valve** DONALD MACKENZIE

The light valve and the optics of the recording system are explained. The photographic requirements of variable density recording are discussed. An over-all gamma product of unity for positive and negative should be maintained with a tolerance of  $\pm 0.2$ . Frequency-intensity characteristic curves for reproduction are given. p. 730

**Kerr Cell Method of Recording Sound**

V. ZWORYKIN, L. B. LYNN, AND C. R. HANNA

A variable density recording system employing the Kerr cell is described. A rather complete theoretical and experimental treatment of the cell is given. The Kerr cell has the advantages of low power requirement and no moving parts. p. 748

**The Optics of Sound Recording Systems** ARTHUR C. HARDY

The paper is concerned with the light gathering characteristics of the recording systems used with the glow lamp, the Kerr cell, the light valve, and the oscillograph. A simple equation for calculating the intensity resulting from the use of an optical system is given. p. 760

**An Electrical Synchronizing and Resynchronizing System for Sound Motion Picture Apparatus** WILLIAM H. BRISTOL

An electrical interlocking device of the Michalke type is described in which the field of one of the "synchronizers" can be manually rotated, thereby adding or subtracting to the number of complete revolutions made by one of the rotors. p. 778

**A Study of Ground Noise in the Reproduction of Sound by Photographic Methods** OTTO SANDVIK

The purpose of this investigation is to determine some causes of ground noise and to measure its growth with the increase in the number of times which the film has run through the projector. The results show that the amount of ground noise present on clean film base is imperceptible under average conditions and that no appreciable increase in the noise level is introduced at the various stages of manufacture. There is, however, a considerable increase in the noise during processing, and on several samples of film repeatedly run through the projector the noise increases linearly with the number of times run. p. 790

- Sound Film Processing** JOE W. COFFMAN  
Sensitometry and machine processing are important with sound-on-film. Care must be exercised not to introduce "hum" noises in printing or developing. p. 799
- The Acoustics of Sound Recording Rooms** PAUL E. SABINE  
Reverberation and wall insulation are discussed. Absorption and insulation data are presented for different materials and different types of construction. p. 809
- Acoustics of Auditoriums** PAUL R. HEYL  
Methods of eliminating echoes and dead spots and for providing the correct amount of reverberation in auditoriums are discussed. p. 823
- Acoustic Linings for Soundproof Motion Picture Stages and Sets**  
FRANK S. CROWHURST  
Absorption coefficients are given for about fifty different materials used in building. These coefficients are compared with that of an open window. Use of such data in calculating reverberation is indicated. p. 828
- Recent Development in Dynamic Loud Speakers**  
JOHN MINTON AND I. G. MALOFF  
The frequency response of a commercial dynamic speaker is described. p. 836
- Re-Vocalized Films** EDWIN HOPKINS  
The duplication or omission of frames in the picture part of a film allows synchronization of a record not recorded at the time the picture was taken. p. 845
- Measuring the Quality of Sound Reproduction** J. B. ENGL  
Laboratory tests for testing the elements of a reproducing system are described. p. 853
- Some Thoughts about Motion Pictures with Sound**  
L. T. ROBINSON  
The approach to reality in the reproduced sound is the true test of a recording and reproducing system. Physical measurements should be compared with the results of intelligent listening tests. p. 856
- Some Problems in the Projection of Sound Movies** H. RUBIN  
The author points out the need for a good light-reflecting, sound-

transmitting screen. He describes an improved method of obtaining registration in the change-over of projectors. p. 867

#### **The Effect of Sound Synchronization upon Projection**

F. H. RICHARDSON

The author feels that sound pictures will improve the quality of projection. p. 872

### **VOL. XII, NO. 36, SEPTEMBER 24-28, 1928, LAKE PLACID, N. Y.**

#### **Report of Standards and Nomenclature Committee**

Suggested standards regarding 16 mm. feed and take-up sprockets, projector and camera apertures, splices, and film track width were given final approval by the Society. Dimensional drawings showing the present practice of various sound-on-film systems are included as a part of the report but no definite proposal for standardization in this field is made. p. 899

#### **The Transmission of Movies by Radio** C. FRANCIS JENKINS

The activities of the Jenkins Laboratory in radio broadcast of silhouette movies are described. These include an attempt to interest a large number of amateur radio fans in this field, the supplying of a radiovisor kit at low cost, advertising through a series of syndicated articles, and fitting up broadcast stations with simple transmitters. p. 915

#### **Characteristics of Photo-Electric Cells** LEWIS R. KOLLER

A brief history of the development of the photo-electric cell is given. Illustrations showing several different forms of photo-electric cells and certain steps in their manufacture are shown. Typical photo-electric cell circuits are illustrated. Characteristic volt-ampere curves for both vacuum and gas-filled cells are given, also a graphic representation of the relation between wave-length and sensitivity for a potassium cell. p. 921

#### **The Kodacolor Process for Amateur Color Cinematography**

J. G. CAPSTAFF AND M. W. SEYMOUR

The optics and equipment for the Kodacolor process are described. This process involves the use of a film, the base side of which is embossed to form cylindrical lenses disposed longitudinally with respect to the film. The embossed surface of the film faces the camera objective. The curvature of these

cylinders is such that a stigmatic image of the color filter placed before the camera objective is formed on the photographic emulsion. The film after being subjected to a reversal process is projected through a similar optical system, thus giving on the screen a three-color reproduction of the original. p. 940

**The Three-Electrode Vacuum Tube as Applied to the Talking Motion Picture**

EDWARD W. KELLOGG

The paper outlines the conditions necessary for proper functioning of amplifier tubes. The relative merits of transformer and resistance coupling are discussed. Circuit diagrams of various types of amplifiers are shown and the grid potential method for control of volume is illustrated. p. 948

**Dye Toning with Single Solutions** J. I. CRABTREE AND C. E. IVES

By utilizing the mordanting power of silver ferrocyanide it is possible to retain enough basic dye in solution in the mordant bath to tone film. Such a bath must be slightly acid and a satisfactory formula has been devised which contains acetic acid, potassium ferricyanide, and a basic dye. A solvent such as acetone is added to aid in keeping the dye in solution. p. 967

**Composite Photography** C. DODGE DUNNING

The process which eliminates the necessity of a silhouette mask in double exposure photography is described. This involves the making of a double image transparent print from the negative of the desired background scene. The double image print is loaded into an intermediate magazine on the camera and passes through in front of the regular unexposed negative film used for photographing the foreground action. A blue backing is placed behind the foreground set. The light reflected from this background serves to print in the material shown on the double image transparency, thus giving a complete composite negative which may be developed and printed in the usual manner. p. 975

**Voltage Regulators for Laboratory and Studio Service** F. A. BYLES

Curves illustrating the effect of variable voltage on the light emitted by Mazda lamps are given and the need for constant voltage in many commercial installations is emphasized. Circuit diagrams of several different forms of voltage regulators are given and described. These are divided in general into two classes, namely, the vibrating contact type and the rheostatic

regulator. The virtues and disadvantages of each are discussed at some length. p. 980

### **Effect Lighting in Theaters**

J. H. KURLANDER

The Universal Effect projector described in this article consists essentially of two independent projecting systems, each of which is equipped with shutters, framing devices, masks, effect holders, *etc.* Each projector is equipped with four different projection lenses mounted in a turret. Its various accessories are so constructed that they can be preset, locked into adjustment, and removed from the projector until required. A simple cue sheet illustrating how the entire color accompaniment may be predetermined is given. Photographs showing a few possibilities in effect lighting with this projector are shown. p. 998

### **Visible Radiation from the Neon Hot Cathode Arc**

FRANK BENFORD AND L. J. BUTTOLPH

This light source consists of a glass tube filled with neon gas and provided with a hot cathode. Curves are given showing the spectral distribution of radiation, light intensity variation as a function of current and voltage, and the angular distribution of light. Its life characteristics are also discussed and curves showing the rated depreciation are given. p. 1010

### **Some Preliminary Experiments in Medical Photography**

CLIFTON TUTTLE AND C. A. MORRISON

At the instigation of Mr. Hays, President of the Motion Picture Producers and Distributors Association, the Eastman Kodak Company has undertaken experimental work in connection with motion pictures of medical subjects. This paper reports the results of some of the preliminary experiments. The quantity, quality, and direction of lighting for surgical pictures has been considered and some new experimental lighting units have been built. p. 1022

### **A Projector for Stereo, Color, and Standard Films** GEORGE LANE

A projector is described in which adjacent frames are projected simultaneously by means of two lenses. A single frame pull-down is used and when color or stereo pictures are projected the filters are alternated on the lenses. p. 1034

### **Illumination in Motion Picture Printing**

CLIFTON TUTTLE

Experimental evidence shows that a simple exponential relation

exists between the electrical input and the photographic intensity of tungsten lamps. This relation is given for six various lamps representative of types commonly used in printing. p. 1040

#### **A Photometer for the Measurement of Low Illuminations**

LOYD A. JONES AND E. M. LOWRY

The instrument described in this paper was constructed specifically to meet the special requirements of dark-room photometry. Observations are made with unobstructed binocular vision under the same conditions which exist when some task is being performed. p. 1054

#### **Heat Absorbing Glass**

H. P. GAGE

Quantitative data are given showing the relation between thickness and light transmission for various heat absorbing glasses. Similar data are also given showing the relation between thickness and heat transmission. Spectrophotometric curves are given which show the relation between wave-length and transmission of these materials. The materials in question are very efficient for the removal of heat from the light beam. p. 1063

#### **A New Optical Compensator**

J. F. LEVENTHAL

A non-intermittent projector with rotating plane parallel plates for keeping the image stationary on the screen is described. Curves are given showing the projection with which this compensation is attempted. These indicate that through a large part of the cycle compensation is quite good although at the extreme ends of the cycle the departure from perfect results is appreciable. p. 1068

#### **Plant Life through the Lens and Microscope**

A. C. PILLSBURY

Apparatus for taking motion pictures and motion photomicrographs of plant life is described. For motion photomicrography the author recommends the use of two microscopes in tandem. He also emphasizes the necessity for absolute rigidity in mounting the equipment. p. 1076

#### **Undersea Motion Picture Photography**

FLOYD D. CROSBY

The author describes a water-tight housing for a camera used for undersea photography. p. 1083

#### **Automatic Focusing Devices for Title and Cartoon Cameras**

J. A. NORLING

The essential factors to be considered in the design of an auto-

matic focusing device are considered after which two general types of mechanisms are described. One consists of a rack attached to the bed of the camera stand meshing with a small pinion which through a worm and worm wheel rotates through a focusing screen. The other is a cam mechanism in which the cam is cut to fit the requirements of the particular lens to be used. p. 1088

#### **A Horizontal Tray Type of Continuous Processing Machine**

H. J. JAMIESON

A developing machine which has the advantage of accessibility and ease of inspection is described. p. 1093

#### **The Fogging Properties of Developers**

MERLE L. DUNDON AND J. I. CRABTREE

Total fog present after development may be due to several sources, such as emulsion fog, aerial fog, chemical development fog, solvent fog, fog from vapors or gases, or light fog. The paper deals with the amount of fogging produced by these various factors under a wide variety of operating conditions. One section of the paper deals with the use of anti-fogging agents and another with the use of desensitizers for the prevention of aerial fog. A rather complete bibliography of the literature is given. p. 1096

#### **Future Developments in the Sixteen Millimeter Field**

HERBERT C. MCKAY

Improvements in 16 mm. apparatus are suggested. The author believes there is an urgent demand for many refinements which will enable the operator to make lap dissolves and double exposures. Dissolving shutters are also required. In fact in his opinion the 16 mm. camera should be able to duplicate in every way the most modern and refined 35 mm. cameras. p. 1115

#### **Applicability of Stereoscopy to Motion Pictures**

LEWIS W. PHYSIOC

A review of the principles of stereoscopic vision. p. 1121

#### **Open Forum**

A discussion of various problems confronting the Society. p. 1128

#### **Report of the Secretary**

p. 1142

#### **Annual Report of the Treasurer**

p. 1145

#### **Report of Advertising Committee**

p. 1148

<b>Report of the Membership Committee</b>	p. 1150
<b>Report of Papers and Publications Committee</b>	p. 1150

### **New Motion Picture Apparatus**

Brief descriptions of the following new apparatus are given: Akeley "Gyro" tripod, Improved High Intensity Motion Picture Projection Lamp, the Debie "G. V." High Speed Camera, the "Parvo" Debie Professional and News Camera, Machinery for Making Duplicate Negatives, the Eastman Business Kodascope, Movietone Field Projection Outfit, Improved Reflectors for Motion Picture Studio Side Carbon Arc Lamps, a Non-Intermittent Optical Projector, a New 125 Ampere Spotlight, the Mechau Projector, Electric Fire Control of Flares. p. 1159

## **VOLUME XIII, NO. 37, MAY 6-9, 1929, NEW YORK, N. Y.**

<b>Presidential Address</b>	L. C. PORTER	p. 21
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<b>Address of Welcome</b>	MAJOR EDWARD BOWES	p. 28
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### **Report of Standards and Nomenclature Committee**

Initial approval of the Society was given on 24 pictures per second as standard sound taking and projection speed, location of the scanning slit 14.5 inches below the picture gate, dimension and location of sound track area as illustrated in the report, and definitions of "teeth in contact" and "Safety Film." A glossary of technical terms is also included in the report. p. 29

<b>Report of Treasurer</b>		p. 65
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### **Report of the Progress Committee**

Three hundred and three references from current publications were cited in this report. p. 66

<b>Report of Constitution and By-Laws Committee</b>		p. 106
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<b>Report of Secretary</b>		p. 108
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<b>Report of the Journal Committee</b>		p. 111
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<b>Report of the Membership Committee</b>		p. 114
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<b>Report of Business Relations Committee</b>		p. 116
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### **Report of the Projection Committee**

The matter of distortion of the screen image resulting from projection at an angle are given careful consideration by the committee. A mathematical treatment of the problem is included.



- Design and ventilation of the projection rooms are among other matters considered. p. 117
- Report of the London Section** p. 128
- The West Coast** p. 130
- Talking Pictures and the Public** WARREN NOLAN  
The problem of how completely the public should be told the tricks of the trade and other general matters of public relations to the new sound film are discussed. p. 131
- The Motion Picture Camera in Sound Pictures**  
A. S. HOWELL AND J. A. DUBRAY  
A new silent camera and a high speed intermittent mechanism are described. Improved features of the camera are: use of formica gears alternated with metal gears, an endless fabric belt, and felt and rubber covered magazines. It is claimed that this camera may be used within 8 or 10 feet of the microphone without a housing. The new intermittent mechanism gives approximately constant acceleration. Accurate positioning of the film without high pressure is provided. The mechanism will run at 8 to 10 times normal speed. p. 135
- A Printer for Simultaneous Printing of Sound and Picture Negatives**  
OSCAR DEPUE  
In the continuous printer described automatic resistance controlled light change for both sound track and picture is provided. A  $\frac{1}{4}$  inch slit for the picture and  $\frac{3}{8}$  inch for the sound track are used and the printing speed is 85 feet per minute. The printer has not been given a very thorough trial on sound track printing. p. 150
- Typical Sound Studio Recording Installations** H. C. HUMPHREY  
General layout and acoustic treatment of recording studios, monitor rooms, cutting and review rooms (especially for wax records) are described. p. 158
- The Art of Monitoring** C. A. TUTHILL  
The qualifications of a good monitor man are discussed. He must be both engineer and artist and work in sympathy with the director and the actors. p. 173
- Patent Problems in Business** F. T. WOODWARD  
Problems of protection, rights, and validity are discussed for the benefit of the layman in legal matters. The services of a

skilled patent attorney in making an application are important because of the involved nature of patent problems. p. 178

### **Need for Improvement in Projection Equipment and Maintenance**

F. H. RICHARDSON

The indifference of the theater manager to the condition of projection equipment is lamentable. p. 190

### **Tinted Films for Sound Positives**

LOYD A. JONES

The tinted materials described in this paper are made by using dyes carefully selected to transmit the radiation required for the excitation of the photo-electric cell. The group includes seventeen colors distributed uniformly throughout the spectrum. The hue and saturation characteristics of the colors are adjusted particularly to make them of value in enhancing the beauty of the screen picture. Some suggestions are offered for the association of the various colors with various types of subject matter. p. 199

### **Machine for Cutting Master Disk Records**

L. A. ELMER AND D. G. BLATTNER

Mechanical filters to reduce variations in speed to 0.04 per cent are described. Details of construction of the "playback reproducer" and of the mechanical and electrical aspects of the recording arm are taken up. Mechanical properties of the system are evaluated in terms of an equivalent electrical circuit. Variations in response of the system do not exceed  $\pm 1.0$  decibel in the range from 200-7000 cycles, and  $\pm 2$  decibels at lower frequencies. p. 227

## **VOLUME XIII, NO. 38, MAY 6-9, 1929, NEW YORK, N. Y.**

### **A Reproducing Machine for Picture and Sound**

H. PFANNENSTIEHL

New Western Electric equipment adaptable to any standard projector head and available for both film and disk records is described. A valve-regulated motor previously described by Stoller furnishes the power, and mechanical filters to eliminate oscillation are employed. p. 253

### **Scoring, Synchronizing, and Re-Recording Sound Pictures**

K. F. MORGAN

The many transformations of the sound record during the com-

plete processes of scoring, synchronizing, and re-recording are described with the aid of schematic diagrams. The advantages of "dubbing" the sound record in providing a new master record with corrected volume variations and with the introduction of new effects are discussed. p. 268

#### **Public Announcement and Reinforcement Systems for Theaters**

J. B. IRWIN

Special applications of the theater reproduction equipment such as its use for announcing, reinforcing audible portions of stage presentations, and aiding in rehearsal are discussed. p. 286

#### **Servicing Sound Picture Projection Equipment in Theaters**

COKE FLANNAGAN

Thorough inspection of each individual part of the E. R. P. I. reproduction equipment is made at intervals of six months. The semi-annual inspection is supplemented by less thorough inspection at 10 day intervals. One qualification for an inspector is good hearing. The "audiometer," an instrument for measuring sound energy supplied to the ear at the threshold of audibility, is used in making aural records of the staff of inspectors. p. 293

#### **Typical Problems in Process Photography** CARROLL DUNNING

Typical examples of trick photography using the author's method of balanced transparencies are described. Some interesting special applications of models are also cited. p. 298

#### **The Universal Camera Crane**

FRANK O. GRAVES

A camera platform mounted on a 25 foot arm pivoted at the top of a 25 foot pillar on a truck is described. Four motions at variable speeds are possible: rotation of the camera platform, rotation of the pivoted arm about a horizontal or vertical axis, and movement of the truck. The crane was conceived by P. Fejos for the production, *Broadway*. p. 303

#### **Television Demonstration**

HERBERT E. IVES

In the television demonstration given at the Bell Telephone Laboratories for the Society it was possible for members of the audience to inspect details of transmitting and receiving apparatus. p. 308

#### **Seeing Sound and Hearing Pictures**

JOHN KLENKE

A short description accompanying a demonstration reel showing Walter Damrosch at the piano with the sound record simultaneously projected. d. 309

**The Mitchell Recording Camera Equipped Interchangeably for Variable Area and Variable Density Sound Recording** C. R. HANNA

A compact camera adaptable for news pictures uses a specially robust galvanometer with uniform response up to 5500 cycles for variable area recording and a Kerr cell for the variable density system. The over-all weight minus tripod is 70 pounds. p. 312

**The Pyrene Combination Automatic Projector Fire Extinguisher and Electric Cut-Off** R. B. DICKSON

A description of a device designed to extinguish fire originating in the projector or aperture head and to cut off the motor simultaneously. p. 318

**The Results of the Experiment with Eastman Classroom Films**

T. E. FINEGAN

A summary of the opinions expressed by teachers at the end of the experiment are: (1) that the films were highly effective in stimulating the interest of the children, (2) that they were stimulated in self-activity, (3) that the quality and quantity of children's reading was increased, (4) that they gained facility in reading and discussion, (5) that there was better correlation in interpretation of materials, (6) that the information disseminated was more complete and accurate, (7) that the films contributed to the ability to concentrate, and (8) that the range and accuracy of pupils' vocabularies were increased. p. 324

**The Studio Electrical Department and Its Relation to Picture Production** M. W. PALMER

Duties of the electrical staff in preparing for a feature production are described. p. 341

**Bulb Cleanser for Incandescent Lamps**

D. K. WRIGHT AND C. E. EGELER

Course crystalline tungsten powder introduced into large lamps by the manufacturer proves an effective method of cleaning. The mean light output during the 100-hour life period is raised from 61 per cent to 95 per cent of the initial value. p. 346

**Motion Picture Activities in the United States Army**

WALTER E. PROSSER

The value of motion pictures to the army for education and entertainment is brought out. Problems of film storage are discussed. p. 355

**Some Properties of Fixing Baths** J. I. CRABTREE AND H. A. HARTT

The hardening characteristics of acid-alum fixing baths are not related to the alum concentration alone but also are affected by the addition of acetic acid and sulfite. It is possible to compound fixing baths having any desired properties by referring to the series of curves which is presented. Practical recommendations are made relative to the use of plain acid and of acid hardening fixing baths.

p. 364

**Some Properties of Fine-Grain Developers for Motion Picture Film**

H. C. CARLTON AND J. I. CRABTREE

This paper describes experiments on exhaustion tests, methods of using the solution for machine development, variation of the developer components to satisfy special requirements, and methods of obtaining finer-grained negatives.

p. 406

**Borax Developer Characteristics** H. W. MOYSE AND D. R. WHITE

A sensitometric study of two developer formulas in which the concentration of each constituent was varied.

p. 445

**Dry Cell Batteries for Recording and Projecting** W. B. SCHULTE

The characteristics of dry cells, their testing, and use are discussed.

p. 453

**A Standard Micro-Cinematographic Apparatus**

HEINZ ROSENBERGER

Equipment consisting of an optical bench with microscope and light source, camera table with driving and timing mechanism, and a revolving shutter permitting intermittent illumination for high frequency work is described. Focusing may be adjusted during exposure.

p. 461

**Permeable Projection Screens for Sound Pictures** A. L. RAVEN

A form of projection screen consisting of louvers (openings oblique to the screen surface) transmits as much sound as would perforations covering 45 to 80 per cent of the area. It is claimed the louvers do not affect the appearance of the picture.

p. 465

**The Academy of Motion Picture Arts and Sciences** FRANK WOODS

Activities of the Academy since the last report (No. 35 (1928), p. 625) were concerned with the inauguration of a cultural course in motion pictures at the University of California, the bestowal of merit awards to actors and directors, and contributions to the Muybridge semi-centennial memorial.

p. 470

**Photographic Astronomy**

LESLIE E. CUFFE

Possibilities and difficulties of astronomical cinematography of a popular type are described.

p. 474

**Photographing with Multiple Cameras**

KARL STRUSS

Four or more cameras used simultaneously for taking a set at various angles and distances are valuable in saving time and in getting uniformity of sound and picture negative.

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# THE JOURNAL

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VOL. XIV, NO. 1, JANUARY, 1930

**A Milestone** J. J. CRABTREE p. 3

**Our Monthly Journal** LOYD A. JONES p. 7

**Sound Motion Pictures in Europe** NATHAN D. GOLDEN

The author, assistant chief of the motion picture division of the Bureau of Foreign and Domestic Commerce, has made an extensive statistical study of the present situation in Europe regarding both the production and exhibition of sound pictures. Great Britain and Germany have made considerable progress in the production of pictures and an attempt is being made to produce the same pictures in several languages. Other countries have not advanced far in production. All European countries are interested in sound picture reproduction and American exports of motion pictures have increased about 8 per cent over those of 1928. The smaller countries will apparently have to be satisfied with silent versions or with orchestrated films. p. 11

**The Early History of Wide Films** CARL LOUIS GREGORY

Before the days of standard film, a great number of different sizes of film, wider than standard, were on the market. The chaos existing in the early days of the industry is indicated by the fact that at one time film  $\frac{1}{2}$  in.,  $\frac{3}{8}$  in., 2 in.,  $2\frac{1}{2}$  in., and  $2\frac{3}{4}$  in. in width was in use. p. 27

**Rectangle Proportions in Pictorial Composition** LOYD A. JONES

The first part of the paper deals with the characteristics of rectangles regarded from the standpoint of pictorial composition and design. The results indicate that for the average content of a motion picture composition a rectangle appreciably wider (with respect to its height) than the present standard shape would be desirable. p. 32

**The Optical Problems of Wide Film Motion Pictures**

W. B. RAYTON

After discussing the need for wider pictures the author describes

the optical difficulties to be met in photography and projection. A new lens (Raytar) of 50 mm. focal length and with an aperture of  $f/2.3$  which will cover satisfactorily a picture 23 by 46 mm. is announced. For the projection of wide pictures an anastigmatic lens is required. One with a speed of  $f/2.2$  for a 23 by 46 mm. picture has been made. Cylindrical lenses may be advisable for condensers for wide picture projection. p. 50

### **Some Practical Aspects of and Recommendations on Wide Film Standards**

A. S. HOWELL AND J. A. DUBRAY

The authors have selected three possible film dimensions which they have named "Economic," "Spectacular," and "Extreme." The virtues of each of these sizes are implied in the name. Film widths for these pictures are, respectively, 46 mm., 52 mm., and 61.3 mm. The picture proportions are in all cases in the ratio of three to five. The position of the sound record is outside of the perforation. Perforation dimensions are the same as those now in use. A discussion of optical and economic problems to be met if any of the suggested sizes are adopted concludes the paper. p. 59

### **Acoustic Control of Recording for Talking Motion Pictures**

J. P. MAXFIELD

Acoustic perspective in a motion picture scene should be similar to the visual perspective in the same scene. In the making of sound pictures monaural hearing and monocular vision are used. How these factors may be controlled to give a convincing illusion is discussed. Change in intensity and change in the ratio of reverberation and direct sound are the two factors which are controllable. The use of a single microphone, the adjustment of reverberation with acoustic flats, proper placement of the microphone, and elimination of mixing give the best results. p. 85

### **Some New Aspects of Reverberation**

EDWARD W. KELLOGG

Reverberation has three effects upon sound: (1) the increase in the total sound volume; (2) mixing of various elements of the sound which tends to eliminate the auditor's sense of direction; (3) the overlapping of sounds. The first two effects are in general helpful. The third is detrimental with reproduced sound. The first two factors can be controlled artificially without the use of reverberation. The author's general conclusion



is that future auditoriums will be designed for maximum sound absorption. He adds some observations to the effect that theoretically truer rendition of original speech at any volume is possible in the damped auditorium, and points out some possible future developments of sound amplifying systems. p. 96

### Camera and Projector Apertures in Relation to Sound-on-Film Pictures

LESTER COWAN

An account is presented of the data gathered by a joint committee of the Technicians' Branch of the Academy of Motion Picture Arts and Sciences, the American Society of Cinematographers, the Society of Motion Picture Engineers, and the American Projection Society, relative to aperture dimensions employed in studios and theaters. The sound track on the film has changed the picture proportion and various methods are in use to restore the three to four proportion. It was recommended by the four societies that: (1) the camera focusing screen should be marked with a rectangle 0.620 by 0.835 inch in size; (2) theaters which make a practice of reestablishing screen proportions should use an aperture 0.600 by 0.800 inch.

p. 108

### Report of Standards and Nomenclature Committee (October, 1929)

Approved recommendations are as follows: (1) Taking and projection speed shall be twenty-four pictures per second. (2) The scanning slit shall be located 14.5 inches from the aperture. (3) The location of the sound track shall be as diagrammed in the report. (4) The number of teeth in contact shall be as shown. New proposals are concerned with a definition of "safety film" based on the time of burning for the material used, and with the position of the scanning line. Two items are included as recommended practice: (1) that a leader designating the framing of the picture shall be placed on each reel; (2) that the Society of Motion Picture Engineers approve the proposal of the joint committee relative to the size of projector and camera apertures for sound-on-film.

p. 122

## VOL. XIV, NO. 2, FEBRUARY, 1930

### Theater Acoustics for Sound Reproduction

S. K. WOLF

It was observed that theaters having the reverberation time advocated by W. C. Sabine and others were not entirely satis-

factory for reproduced sound. Ten per cent lower reverberation periods are advocated for reproduced speech and music, because of the increased intensity level. Theoretical and experimental evidence is given. p. 151

### **Loud Speakers for Use in Theaters**

D. G. BLATTNER AND L. G. BOSTWICK

Performance characteristics of baffle and horn speakers are discussed. With the best design there is no outstanding difference in quality. From the point of view of economy of operation and installation the horn type seems to be preferable because of its greater efficiency. p. 161

### **Art and Science in Sound Film Production** JOE W. COFFMAN

Many of the mysteries of technical expertness on the part of sound men in the studios are branded by the author as superstition and "hokum." Practical recommendations for better coöperation among the technical studio staff are given. Authority should center in the director. p. 172

### **Photographic Characteristics of Sound Recording Film**

LOYD A. JONES AND OTTO SANDVIK

A description of a number of different emulsions with tables of data and curves of their sensitometric and other mensurational characteristics (especially resolving power) is given. Among these emulsions are included groups particularly adapted for each sound recording process. The last part of the paper is devoted to a brief consideration of a group of other phenomena, such as contraction of the image and the growth of the image with exposure. p. 180

### **The Modern News Reel**

HARRY W. JONES

RCA Photophone portable equipment is described in a general way. The discussion following the paper centers around the matter of volume variation in news reels. p. 204

### **Film Perforation and Its Measurement** WALTER H. CARSON

A film perforation gauge on the vernier principle is described. The gauge is simple in construction and may easily be used by studio or laboratory men. p. 209

### **The Human Equation in Sound Picture Production**

TERRY RAMSAYE

This is another attack on the "hokum" of the sound technician. p. 219

**Progress in the Motion Picture Industry. (October, 1929, Report of the Progress Committee)**

This is a comprehensive classified compendium of advances in motion pictures and allied arts for the preceding six months' period. p. 222

**VOL. XIV, NO. 3, MARCH, 1930****The Surface Treatment of Sound Film**

J. I. CRABTREE, OTTO SANDVIK, AND C. E. IVES

Application of paraffin wax in carbon tetrachloride is superior to the application of solid or molten wax inasmuch as the wax does not flake off or encroach on the sound track during re-winding or projection. A special wax applicator and its use is described. In addition to lubricating sound prints, it is desirable to prevent the accumulation of scratches and dirt. A one per cent solution of cantol wax is effective for this purpose. Data on ground noise tests of variously treated films are included. p. 275

**Characteristics of High Intensity Arcs**

D. B. JOY AND A. C. DOWNES

The authors report the results of investigations of the candle-power and spectral energy distribution curves of high intensity carbon arcs limiting their measurements to the positive crater. Nine mm., 13.6 mm., and 16 mm. carbons were used. p. 291

**A Year of Sound**

HAROLD B. FRANKLIN

A summary of the experiences of the Fox West Coast Theaters with picture productions of 1929. p. 302

**The Optics of Motion Picture Projectors** ARTHUR C. HARDY

Photometric principles involved in the design of projection and optical systems are discussed by the author. The method of treatment is based on the conservation of energy principle. p. 309

**Multiple Exposure Cinematography in Sound Pictures**

WILLIAM STULL

Camera tricks such as fading-in and -out, lap dissolving, and double exposure have been applied successfully to sound pictures. p. 318

**The Illusion of Sound and Picture**

JOHN L. CASS

Problems involved in making sound tracks which will match the camera takes are considered. Artistic results which pre-

serve the desired illusion are to be obtained only by careful advance planning with coöperation between sound engineer, set designer, cameraman, and director. p. 323

**Film Numbering Device for Cameras and Recorders** M. W. PALMER  
An accessory for the motion picture camera and recorder for the exposure of footage numbers and other distinguishing symbols on the film edge is described. p. 327

**Water Cooling of Incandescent Lamps** N. T. GORDON  
Experimental water jacket units for high wattage lamps are described. By the use of water jackets approximately an inch thick 75 per cent of the energy may be dissipated with the loss of only 5 to 7 per cent of the useful light. p. 332

**The Development of Television and Radiomovies to Date**  
C. FRANCIS JENKINS  
Results of Television broadcast reception with the disk scanner are discussed. A new type of plate receiver with tungsten filament lamp elements is described. p. 344

**A New Method of Blocking Out Splices in Sound Film**  
J. I. CRABTREE AND C. E. IVES  
A patch made of thin black film cut to the desired shape and perforated on one edge is recommended for blocking out splices. With such patches, the theater projectionist is able to repair sound record film without introducing any noise into the record. p. 349

**A Light Intensity Meter** J. L. MCCOY  
A photo-cell photometer, developed by Westinghouse, is described. The apparatus makes use of a photo-cell and microammeter without amplification to determine the value of lighting on a motion picture set. The range is from 100 to 3000 foot-candles. Other possible applications of the meter are to negative timing and screen illumination measurements p. 357

**A New Synchronizing Apparatus for 16 Mm. Films with Disk Records** WM. H. BRISTOL  
A projector and turntable mechanism with synchronizing control is described. The projector is to be used at a speed of 16 pictures per second. Every third frame of standard 35 mm. sound film is removed in printing. p. 361

## VOL. XIV, NO. 4, APRIL, 1930

**Dimensional Analysis as an Aid to Miniature Cinematography**

C. F. HUTCHINS

An analytical treatment of the mechanical relations which exist between a model and its life-size counterpart. From this treatment the model designer and the photographer can determine the physical constants of the materials to be used in building the model and the taking speed for photographing the model in action.

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**Flexible Drive Shafts—Their Application to Sound Pictures**

J. C. SMACK

The uses of flexible drive shafts in motion picture photography and the mechanical properties of shafts which are on the market are discussed.

p. 384

**A Quick Test for Determining the Degree of Exhaustion of Developers**

MERLE L. DUNDON, G. H. BROWN, AND J. G. CAPSTAFF

The degree of exhaustion of developer can be quickly determined by dipping an exposed standard strip of film in the developer for a definite short time, and then immersing the strip in a solution which stops development.

p. 389

**Elimination of Commutator Ripple from Direct Current Generators**

O. K. BUCK AND J. C. ALBERT

An account of experiments by the Los Angeles Department of Water and Power to provide suitable impedances and capacities to be attached to the generator.

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**Radiation Characteristics of Two Mercury Arcs**

FRANK BENFORD

Data for the Cooper Hewitt "Uviarc Sunlamp" and for the General Electric tungsten-mercury "Sunlamp" are given.

p. 404

**A Method of Testing for the Presence of Sodium Thiosulfate in Motion Picture Films**

J. I. CRABTREE AND J. F. ROSS

A method of testing for the presence of sodium thiosulfate in motion picture film is described which consists of placing strips of processed films in a mercuric chloride-potassium bromide solution. It is possible to detect the presence of 0.05 milligrams of sodium thiosulfate (crystals) in motion picture film by this test. Some of the factors which determine the rate of fading of silver images have been outlined and the critical hypo content

and degree of washing necessary with negative and positive motion picture film is indicated. p. 419

#### **A New Sixteen Millimeter Motion Picture Camera**

JOSEPH A. DUBRAY

Mechanical characteristics and construction of the Filmo 70-D camera are described. p. 427

#### **The Academy of Motion Picture Arts and Sciences and Its Service as a Forum for the Industry**

FRANK WOODS

Establishment of the technical school for studio employees, Sept. 17, 1929, was greeted with great success. The Academy library is growing. p. 436

#### **Theater Lighting**

The report of the Theater Lighting Committee, November, 1929, describes briefly the results of a study of screen brightness and surrounding brightness and the effect on audience comfort. p. 441

#### **Report of Projection Committee, October, 1929**

Ventilation of lamphouse and rheostat rooms and problems of the projectionist were the subjects considered by the committee. p. 444

#### **Report of the Secretary**

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#### **Information for Authors concerning Publication in the Journal**

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### **VOL. XIV, NO. 5, MAY, 1930**

#### **Some Properties of Chrome Alum Stop Baths and Fixing Baths (Part I)**

J. I. CRABTREE AND H. D. RUSSELL

A determination of the factors which influence the hardening action of chrome alum solutions when compounded in stop baths. Suitable formulas are given and the behavior of a recommended stop bath on exhaustion is dealt with in detail. p. 483

#### **Sound Films for Surgical Instruction**

P. E. TRUESDALE

Experiences in the production of sound films of medical subjects are briefly described and some future possibilities are suggested. p. 513

#### **Some Aspects of a Western Electric Sound Recording System**

S. S. A. WATKINS AND C. H. FETTER

Descriptions of the studio, the recorder, and of laboratory technic are given. p. 520

**Measuring the Effective Illumination of Photographic Objectives**

J. HRDLICKA

A sensitometric method for determining the effective aperture of any objective is described. p. 531

**Camera Mechanism, Ancient and Modern** ARTHUR S. NEWMAN

An account is given of the early history of motion pictures in England and of the various apparatuses employed. Some of the author's ideas about desirable points in camera construction are included. He advocates the fixed pilot pin, and pin joints rather than cams and slides. p. 534

**Standards Adopted by the Society of Motion Picture Engineers**

A report of standards adopted and practice recommended by the Society, complete to May, 1930. p. 545

**Annual Report of the Treasurer**

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## VOL. XIV, NO. 6, JUNE, 1930

**Loudspeakers and Theater Sound Reproduction** LOUIS MALTER

The author presents data on frequency response, angular distribution of radiation, and opinions regarding input power capacity for directional baffle type and horn type speakers. It is claimed that the frequency response of the directional baffle is superior and in other respects there is not much choice between the two types. p. 611

**Apparatus Developed to Simplify Manufacture of Lens Wheels for Continuous Projectors**

ARTHUR H. HOLMAN

In the grinding and polishing machine described, the lens blank and lap move about the center of curvature of the lap surface and the lap surface remains true to curve. A means of setting the exactly matched lenses on the wheel is described. p. 623

**The Photographic Treatment of Variable Area Sound Films**

J. A. MAURER

Volume range and high frequency response of variable area records are affected by photographic treatment. For best results negative densities should lie between 1.0 and 1.6 and should be printed to a density of about 1.3. p. 636

**The Aperture Effect**

ELLSWORTH D. COOK

Assumptions are made which make it possible to consider the

effect of the finite size of the sound recording and reproducing slits analytically. The seriousness of the aperture effect is shown as a function of the ratio of slit width to wave-length in a series of graphs. The effects on aperture width of lens aberration are treated in the second part of the paper. With properly corrected lenses the effects are small. p. 650

### **Curved Gates in Optical Printers**

WILLIAM S. VAUGHN AND FORDYCE TUTTLE

In projection printing curved gates are almost essential. A method of computing the curve for an image gate is shown. The curve may be a parabola, hyperbola, ellipse, or circle. Conditions for making it a circle are discussed. p. 663

### **Some Properties of Chrome Alum Stop Baths and Fixing Baths (Part II)**

J. I. CRABTREE AND H. D. RUSSELL

A discussion of the factors which control the hardening action of chrome alum solutions when compounded in fixing baths. The properties of a number of fixing baths are given and the behavior of a recommended bath is dealt with in detail. p. 667



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