

ABSTRACTS OF PAPERS OF THE SPRING CONVENTION

AT

HOLLYWOOD, CALIF.

APRIL 17-21, 1939

The Papers Committee submits for the consideration of the membership the following abstracts of papers to be presented at the Spring Convention. It is hoped that the publication of these abstracts will encourage attendance at the meeting and facilitate discussion. The papers presented at Conventions constitute the bulk of the material published in the Journal. The abstracts may therefore be used as convenient reference until the papers are published.

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Report of the Progress Committee; J. G. Frayne, *Chairman*.

A summary of advances made during the past year in the various technologic phases of the motion picture art.

"Brief Review of Foreign Film Markets during 1938;" Nathan D. Golden, *Motion Picture Division, U. S. Bureau of Foreign and Domestic Commerce.*

American motion pictures continued to enjoy widespread popularity throughout the world during 1938, although the intensification of difficulties abroad has resulted in a drop of 70 to 65 per cent in America's domination of the world's motion picture screens. The obstacles encountered have been of diverse character, including legislative restrictions, quota systems, high taxes, foreign-exchange controls, occasional excessive censorship, so-called "racial" theories, fervent efforts to build up local film industries, active hostilities in the Far East and Spain, transfers of territories, and such intangible factors as uncertainty and apprehension.

Various significant legislative enactments occurred during the year in Europe. Great Britain imposed a new quota system, to last for 10 years. Commencing

January 1, 1939. Italy placed the distribution of all films under Government monopoly, and because of the severe terms of this decree American picture firms have ceased doing business in Italy. In Switzerland was a new decree making the importation of motion pictures subject to an import permit from the Interior Department. Denmark created a Government agency, the Film Central, to distribute all Danish films not distributed by the producer himself or by independent Danish distributors. Notwithstanding the erection of new barriers, American films have continued to enjoy a substantial European market.

The ban on the, importation of American motion pictures into Japan was lifted in October, 1938 for a limited number of American films. New South Wales established a new Theater and Films Commission and set up new provisions of the Quota Act

Difficulties loomed in Argentina through the introduction of a bill to give definite powers of regulation and control to the local Cinematographic Institute; Argentina has also imposed a ban on the importation of advertising matter. In Guatemala a new tax was levied against American distributors. Cuba attempted to put through an exhibitor's quota, but the bill failed of passage, being wholly impracticable in its provisions.

The Latin American market at present appears to afford a promising opportunity to offset the restriction of our picture markets in other parts of the world. With 5239 potential theater outlets in that area today, and with new theater construction increasing every year, American companies are coming to realize that Latin America is a region that should be intensively cultivated. This, it is believed, may best be done by producing in Hollywood Spanish-dialog films employing stage favorites brought from Latin America and placed in Hollywood settings, with the use of reconstructed sets and our proficient American technic.

During 1938, foreign motion picture production totaled 1706 feature films, against 1809 in 1937. The countries of the Far and Near East led in production, with 967 features, as compared with 959 in 1937. Production in Europe fell off sharply, the total for all Europe being only 609 features. Latin American feature-film production increased by 40 films to a 1938 total of 130, Mexico being the largest producer, with 60 features.

Spanish-dialog films have scored notable box-office successes in nearly every Latin American country in which they have been shown, locally produced pictures having often exerted a powerful appeal during the past year, because they have portrayed familiar aspects of life, in a language understood by the audiences. On the other hand, a wealth of recent evidence demonstrates the grave defects and difficulties of the motion picture production attempted in certain countries abroad on wholly insufficient foundations.

"Television Lighting;" William C. Eddy, *National Broadcasting Co.*, New York, N. Y.

Lighting a television production presents many problems peculiar to this new field of public entertainment. These problems have necessitated the redesign of lighting equipment and the establishment of a simplified technic for handling the equipment that differs radically from moving picture practice.

To cope properly with the lighting requirements of the continuous action sequences, characterizing television productions, a system employing inside silvered

incandescent lamps in a standardized unit was developed by NBC engineers. Based on multiple standardized groups of $1\frac{1}{2}$ kw. each, these units are used in both the foundation light and modeling equipment of the television studios in Radio City, thus insuring quantitative as well as qualitative control of lighting by the personnel.

With cameras generally in motion and an average duration of pick-up from one camera a matter of seconds, the problem of modeling in the sets becomes acute. This appears to be satisfactorily solved by the technic now in use wherein the major interest is centered around the close-up camera. Even this solution, however, required new and ingenious equipment to maintain light in the sets and still give floor precedence to the cameras and sound equipment.

While NBC at the present time has appeared to have standardized on the inside silvered lamp, exhaustive tests were carried out in an attempt to utilize more orthodox equipment. Actual tests under production conditions proved, however, that certain requirements of space, weight, and flexibility could not be had without a serious sacrifice of foot-candles on the set, resulting in the present set-up of equipment and personnel that are handling the television lighting assignment in the East.

Under these circumstances, our producers—relying on their scientific skill, the richness of their facilities and resources, and the variety and range of talent available to them in every field—will, it would seem, be well advised to stress most strongly in the foreign markets the factor of the *superior quality* of American films. We should export only pictures of unquestioned excellence. High quality will continue to retain for American motion pictures an exceedingly worth-while place in the markets of the world.

"The Time Telescope;" C. R. Veber, *Department of Biophotography, Rutgers University, New Brunswick, N. J.*

The Veber time telescope or combination time-lapse and photoelectric exposure control machine speeds up imperceptible motion. It is the antithesis of the Edgerton time microscope, which covers the other end of the time spectrum.

This optico-electric robot has both constant and variable (integrated) exposure time. The variable-exposure control with exposure modulator gives either a gradual change in density, or equal average frame densities regardless of spectral or intensity changes in subject lighting. It corrects for failure of film to follow the reciprocity law. Photoelectrically regulated, it is the first known camera control mechanism that automatically exposes the subject properly regardless of changes in color density, area, and average light intensity during or between exposures. Long periods of time between exposures make possible the use of a small fixed diaphragm ($f/256$), one advantage of the photoelectrically controlled exposure time. A photoelectrically variable diaphragm is not good here due to low exposure range, constantly changing the depth of field.

Norman McClintock, of Rutgers, in 1933 assigned the author to develop time-lapse machines that would eliminate curtains and permit time-lapse photography in field and greenhouse as well as in laboratory. Grants by the Chilean Nitrate Educational Bureau and Rutgers University made possible the construction of a number of machines including the one described here. Fifteen thousand feet of time-lapse material has been made in 2 years—40,000 machine hours of operation,

the first time-lapse pictures made under natural conditions, and the longest continuous run six months.

Other uses, besides plant growth studies, include time lapse studies of erosion, disintegration and rotting, plastic flow, temperature and other changes, corrosion, wear, and pitting.

"Analysis and Measurement of Distortion in Variable-Density Recording;"

J. G. Frayne and R. R. Scoville, *Electrical Research Products, Inc.*, Hollywood, Calif.

Types of non-linear distortion in variable-density recording are discussed and methods of measurement outlined. The frequency intermodulation method is described and applied to film processing for determination of optimal negative and positive density and overall gamma. Variance of these parameters from classic sensitometric values are traced chiefly to halation effects in film. Use of yellow dye in emulsion and fine grain emulsions tend to bridge the gap between intermodulation and sensitometric control values.

"Microphones for Sound Recording;" F. L. Hopper, *Electrical Research Products, Inc.*, Hollywood, Calif.

Factors influencing the choice of a microphone for sound recording are considered. The characteristics of a new miniature condenser transmitter and amplifier, as well as a number of other types of microphones now in use, are included.

"A Lightweight Sound-Recording System;" F. L. Hopper, E. C. Manderfeld, and R. R. Scoville, *Electrical Research Products, Inc.*, Hollywood, Calif.

A portable system for production recording, consisting of two main units, is described. A mixer, recording amplifier, monitoring facilities, and noise-reduction unit are contained in one compact unit weighing 42 pounds. A film recording machine weighing 100 pounds completes the system, and contains all modulator, lamp, and motor controls, as well as film speed indicator and footage counter. The power supply may be secured from batteries or a-c. operated rectifiers.

Report of the Projection Practice Committee, H. Rubin, Chairman.

A report of the work of the Committee since the last Convention. Work on the proposed revision of the NFPA *Regulations for Handling Nitrocellulose Motion Picture Film* has been completed and the revision will be placed before the NFPA at the Chicago meeting in May. The present report discusses also the Committee's search for practicable and inexpensive light-measuring instruments for use in theaters, in addition to other subjects engaging the attention of the several sub-committees.

Report of the Exchange Practice Committee; A. L. Schwalberg, Chairman.

A brief account of the work of the Committee during the past year, including handling of shipping cases, direction of rewinding film returned from theaters, disposition of scrap film, use of lacquer in splicing, etc.

"A Direct-Reading Photoelectric Densitometer;" D. R. White, *Dupont Film Mfg. Co.*, Parlin, N. J.

A photoelectric densitometer has been built which shows the density of the area being measured on a direct-reading scale visible at a reading window. A density range from 0 to 3.0 is covered with a reproducibility of approximately ± 0.005 . A motor-driven circular neutral wedge is used as the balancing means, and the density scale marked on the wedge is read by a stroboscopic flashing light controlled through a special amplifier system.

"An Instrument for the Absolute Measurement of the Graininess of Photographic Emulsions;" A. Goetz, W. O. Gould, A. Dember, *California Institute of Technology*, Pasadena, Calif.

The objective determination of graininess is based upon the evaluation of a graininess coefficient G defined by the distribution function of the relative transparency fluctuations $\left(x = \frac{\Delta T}{T_m}\right)$: $\pi(x) = \frac{C}{G} \cdot e^{-(x/G)^2}$. The instrument consists of a microphotometric recorder and a photoelectric integrator. In the former unit the x -fluctuations of a uniformly exposed section of an emulsion are recorded with high resolving power and magnification (300X) by means of a photocell. The amplified photocurrent is traced with a high-frequency galvanometer on 35-mm. film analogous to a large-scale variable-area record. Thus, a true representation of shape and frequency of the x -fluctuations in the scanned emulsion area (width: 30 microns, length: 10 mm.) is obtained in black and white.

The distribution function of the fluctuations as well as the value of G is obtained by placing the record on a revolving drum and scanning it by an illuminated slit. The light transmitted by the record falls upon the photocell, the current of which is thus representative of the average occurrence of x -fluctuations for a deviation (ΔT) from the mean transparency (T_m) determined by the position of the slit on the record. Hence, the change of the photocurrent represents the distribution function while the slit is moved across the revolving record. The scale on which the photocurrent is measured consists of a family of distribution curves (probability integral $\int \pi(x)$), each being characteristic for a certain G -value. The mechanical arrangement is such that a light-beam indicating the photocurrent selects and follows a particular curve while the slit is moved, thus determining whether or not, and if so to what extent, the x -fluctuations follow the above distribution function. Furthermore, it indicates the graininess coefficient in terms of the above function. The taking of a graininess record of an emulsion (capable of up to 10^6 fluctuations) takes 3 min., its analysis 2 min.

"A Multiduty Motor System;" A. L. Holcomb, *Electrical Research Products, Inc.*, Hollywood, Calif.

Various features of motor drive systems now in use by motion picture studios are described and the requirements for an ideal system defined. A recently developed system is described that will operate efficiently on alternating current for stage use or on direct current for location work. Many operating facilities are included which a survey has indicated should become a part of any ideal motor drive system.

"Acoustic Condition Factors;" M. Rettinger, *RCA Manufacturing Co.*, Hollywood, Calif.

The term "acoustic condition factor" in this paper is used as a general term descriptive of the acoustic environs of a point in an enclosure. Relationships expressed as ratios are given for several quantities, such as "useful" and "harmful" sound, direct, and generally reflected sound energy and sound intensity. Curves are shown representing loci for partial anti-nodes produced by interference between direct and first as well as second reflections in a rectangular room in which the sound source is located symmetrically. Equations are given expressing the minimal distance between source of sound and microphone for the probable avoidance of recording absolute nodes.

"Recording and Reproducing Characteristics;" K. F. Morgan and D. P. Loye, *Electrical Research Products, Inc.*, Hollywood, Calif.

In the improvement of sound motion pictures, the trend has been to make the response of all parts of the recording and reproducing circuits as nearly "flat" as possible. In some cases, however, this has resulted in unnatural sound, and therefore certain empirical practices have been adopted in the studios and theaters to make pictures sound best.

The results of a study are described, the purpose of which has been to evaluate the factors affecting the quality of speech as recorded and reproduced, from the vocal cords of the actor on the sound stage to the brain of the listener in the theater. The characteristics of the various factors have been determined and combined with dialog, voice effort, and other equalizers designed to produce an overall characteristic "subjectively flat" at the brain of the theater patron. These factors, as well as others now in the process of being studied further, are presented.

One of the most important characteristics studied is that of the change in voice quality with a change in effort on the part of the speaker, which is described in detail. The stage and set acoustic characteristics, microphone characteristic, and dialog equalization to compensate principally for the hearing characteristic of the average theater listener, are among the factors discussed.

"The Polyrheter, a 150-Channel Film Reproducer;" G. T. Stanton, *Electrical Research Products, Inc.*, New York, N. Y., F. R. Marion and D. V. Waters, *Western Electric Co.*, New York, N. Y.

The creation of a modern Babel might appear to be the purpose of the Polyrheter, or 150-channel film reproducer, recently completed for the World's Fair in New York. Actually, 150 versions of a fifteen-minute story are carefully sorted to bring each to only four persons seated in comfortable chairs on a moving conveyor.

A verbal description of a diorama along the edge of which the conveyor progresses, carefully synchronized with the motion of this conveyor, is given each group of persons and is repeated to each succeeding group with approximately a six-minute lag. In telling the fifteen-minute story, approximately 150 versions are being repeated simultaneously, each version differing only in its starting time.

In considering possible ways of meeting the elaborate and unheard of requirements established for this sound system, various combinations of disk, film, and steel-tape reproducing apparatus were considered, a novel form of film reproducer

being selected primarily on the basis of proved operating reliability over long periods of time.

The apparatus is a twenty-ton magnification of the call announcer, the first model of which is satisfactorily operating in telephone plants after nine years of continuous service. The Polyrhetor consists essentially of a rotating steel drum eight feet in diameter, machined to watch-like precision, capable of carrying 24 continuous film loops past 168 optical scanners and associated amplifiers mounted on seven posts equally spaced about the drum. A multiple system of section-alized trolleys conveys the sound through sliding contactors to small speakers in the cars, around which sufficient acoustical partitioning is provided to avoid program interference from car to car.

This project presented many problems unique in sound equipment design and their step-by-step solution is briefly discussed.

"Simplifying and Controlling Film Travel through a Developing Machine;"

J. F. Van Leuven, *Fonda Machinery Co.*, Los Angeles, Calif.

A developing machine is described in which the drive of the film is frictional and the film-carrying rollers are driven on the slack of the film. The first driving roller is slightly smaller in diameter than all succeeding driving rollers, thereby setting up a tension on the film throughout the machine.

The upper shaft of film-carrying rollers is held in peripheral engagement with the driving rollers by adjustable springs which have a mounting that is yieldable downward so that any excess tension on the film draws the film-carrying rollers away from the driving rollers until the excess tension has been relieved, which allows the film-carrying rollers to be drawn upward by the springs to contact the driving rollers again.

The driving rollers are directly over the upper film-carrying rollers. The driving mechanism is completely above the tanks and solutions, and all film-carrying rollers in the wet end are mounted individually free and, in turn, are all mounted on free-turning tubing or shafting.

Film-carrying rollers in the dry box, in addition to being mounted on Arguto bushings and individually free, are mounted on tubing which in turn is mounted with grease-seal ball-bearings on shafting, the entire unit being free to rotate or to slide laterally on the shaft, thus becoming self aligning.

To meet the high initial and maintenance cost of ball-bearings found in film-carrying spools, 7 $\frac{1}{4}$ -inch film-carrying rollers are used throughout.

Film enters machine in a steady, constant flow. Tension can be altered by the operator and, when regulated by adjustment of springs, remains virtually constant throughout the machine. The steady flow makes great speed possible and yet retains a high factor of safety. The machine has the following attributes: great simplicity; entire freedom from precision maintenance; film is always under even adjusted control and does not slip on rollers; breakage from mechanical causes is practically eliminated.

"A Reel-and-Tray Developing Machine;" R. S. Leonard, *Municipal Light and Power System*, Seattle, Wash.

A reel-and-tray film-processing system of 7 to 200-ft. capacity, designed to overcome deficiencies in existing small-scale film-processing equipment, is de-

scribed. Some of the difficulties encountered in its construction are related, and a summary given of the results in practice. Advantages listed are, one-man operation; cleanliness; economy of solution, because only enough is used to develop the film and is then discarded; uniformity of development with any quantity of film from 7 to 200 feet; no film damage; no undue aerial or chemical fog; clean energetic development with straight H&D curves; and flexibility in use or extension to future developments.

"A New Mobile-Film Recording System;" B. Kreuzer, *RCA Manufacturing Co.*, Hollywood, Calif., and C. L. Lootens, *Republic Productions, Inc.*, North Hollywood, Calif.

The design requirements for this type unit and how these requirements were met in the selection of truck, body design, equipment layout, *etc.*, are discussed. The recording equipment utilized together with the power equipment and other special features of the unit are described. This type of unit has been in successful operation without revision.

"An Introduction to Television Production;" H. R. Lubcke, *Don Lee Broadcasting System*, Hollywood, Calif.

The current television technical facilities of the Don Lee Broadcasting System in Los Angeles are briefly described. A mosaic type camera and accompanying Don Lee control equipment are used. A coaxial cable conveys the signal therefrom to the *W6XA0* sight-sound television transmitters, operating on daily schedule on 45 and 49.75 megacycles, respectively.

The routine of production of a dramatic comedy serial entitled, *Vine Street*, in its thirty-second biweekly episode at this writing, is utilized as an example. A total time of twenty hours of one or more members of the dramatic unit is required to prepare and present one fifteen-minute episode.

The sequence of production is as follows: preparation of script; construction or modification of props and scenery; cast memorization of lines; cast rehearsals; camera-sound, sound-effects, light rehearsal with production staff; make-up; the performance itself, including visual-aural introduction of the act; the performance proper with overall supervision of lighting, microphone, and television adjustments by a television-producer at a distant receiver; closing announcement; written and verbal report of errors or advances in technic made during the performance.

Specifications for the physical instrumentalities and the current television technic are covered for each of the above factors of production.

Report of the Television Committee; A. N. Goldsmith, *Chairman*.

Partial reports by the two sub-committees: (A) on Television Production and Reproduction Technic, O. B. Hanson, *Chairman*, and (B) Film Properties and Laboratory Practice, O. Sandvik, *Chairman*. The scopes of activity of the sub-committees are described, and their program for the coming year. Among the items covered by these scopes are (1) glossary, (2) bibliography, (3) tutorial material, (4) dimensional practices, (5) normal equipment and procedure, (6)

special problems such as inter-industry coördination, future equipment needs and specifications, *etc.*

"A Continuous Type Television Film Scanner;" Peter C. Goldmark, *Columbia Broadcasting System*, New York, N. Y.

A motion picture film scanner, the first of the continuous type to be used for television transmissions, is described. The apparatus was put into operation in New York City in the summer of 1937 and has been in use since. In its preferred form the scanner projects the image of a continuously moving film onto the cathode of a dissector tube. Five images, representing different portions of the film in the gate, produced by five stationary lenses, are superimposed one on top of the other, while a rotating shutter with concentric slots permits only one lens at a time to produce an image. The scanning is accomplished partly by the uniform motion of the film and partly by the magnetic scanning of the electron image in the opposite direction. The pictures thus obtained are completely free from shading, cover a great range of contrast, are free from flicker, and are steady. The construction of the scanner is simple and inexpensive.

"Safekeeping the Picture Industry;" K. W. Keene, *Underwriters Laboratories, Inc.*, San Francisco, Calif.

The purpose of the paper is to deal with a very specialized phase of the motion picture industry; that is, its hazards of fire and consequent accident, as due not solely but chiefly to the prevalent use of nitrocellulose film. Consideration will be given to the causes of hazards and an attempt made to show that they are real and what is being done about them.

The many organizations and groups concerned with and supporting the cause of fire prevention and protection in the industry are first described briefly as to their basic organization and methods, and are then correlated.

The publications by these organizations—standards, recommended regulations, *etc.*—as they bear on the picture industry with respect to the storage, handling and use of nitrocellulose film and the equipment associated therewith, are works not of one man or even of one group of men, but instead reflect the best opinions obtainable from a cross-section of all the industries and groups who are interested. The rules, so to speak, are formulated democratically.

All the many forces pitted against the common enemy, fire, are sincere, and it should be cause for pride that our American institutions—manufacturer, utility, insurance, government, education, association, *etc.*—support this cause unhesitatingly and generously in time and money.

As distinguished from the recommended Regulations of the National Board of Fire Underwriters and the National Fire Protection Association, which in general specify the safe methods of installation and use of and needed safeguards for apparatus and equipment in the field, the Standards of Underwriters' Laboratories specify the safe construction and performance of apparatus and equipment and are applied and "policed" in the producing factory.

The paper concludes with a discussion of some of the underlying considerations affecting the Standards of Underwriters' Laboratories as applied to projectors, rewind machines, sound amplifiers, speakers, *etc.*

"RCA Aluminate Developers;" J. R. Alburger, *RCA Manufacturing Co.*, Camden, N. J.

A fundamentally new principle in design of photographic developers has been investigated and found to afford many worthwhile characteristics, chief of which is the effective self-replenishing property of the developer solutions. Application of the new principle to developer solution makes it possible to develop about eight times the quantity of film as would be possible under ordinary conditions. The principle may be applied to any developer.

"Push-Pull Class A-B Sound Track;" C. H. Cartwright, *Mass. Inst. of Tech.*, and W. S. Thompson, *RCA Manufacturing Company, Inc.*, Hollywood, Calif.

After an explanation of the term Class A-B and a brief specification of such a recording system, the general requirements for the operation of any Class A-B system are given and illustrated.

Differences between the operation of push-pull photocells and push-pull vacuum tubes are pointed out and explained, and a discussion of the relative advantages of Class A, Class A-B, and Class B push-pull tracks is given.

"A High-Intensity Arc for 16-Mm. Projection;" H. H. Strong, *Strong Electric Co.*, Toledo, Ohio.

A short description of a high-intensity reflector type projection arc lamp and associated rectifier equipment, designed as a light-source for 16-mm. projectors.

"The Status of Lens Making in America;" W. B. Rayton, *Bausch & Lomb Optical Mfg. Co.*, Rochester, N. Y.

When the modern optical industry was born, this country was predominantly agricultural. Its principal industrial developments related to transportation. It was natural, therefore, that Europe should have gained great prestige in the field of optics in the final quarter of the nineteenth century.

With the turn of the century, however, agricultural developments had about reached their limit and industrial activity began to occupy a larger place in American life. Along with others the optical industry felt the incentive to greater activity and the first fifteen years of this century saw a rapid advance in the magnitude of the industry and improvement in the quality of its product.

We were still, however, completely dependent on European sources of supply for our optical glass and for some of the small-demand class of laboratory instruments. Then came the war that not only cut off all aid from Europe but ultimately led Europe to our doors with appeals for optical munitions.

The war only hastened what would have been inevitable anyway, *viz.*, the complete independence of America in optical matters.

The American optical industry has now reached a point where its raw materials (optical glass) and its technical skill recognize no superiors. It can make any practical optical element or instrument for which quantitative specifications can be written.

"Notes on French 16-Mm. Equipment;" D. R. Canady, *Canady Sound Appliance Co.*, Cleveland, Ohio.

A brief résumé of French substandard projection equipment of unusual design including a general description of a practical application of the new water-cooled mercury-vapor lamp to 16-mm. projectors. Mention is made of an interesting projector that employs no sprockets, automatically adjusts the size of the loops, and reduces film wear to a minimum.

"New 16-Mm. Recording Equipment;" D. R. Canady, *Canady Sound Appliance Co.*, Cleveland, Ohio.

A description of new 16-mm. equipment, including recorder, film-phonograph, and a new 35-mm. to 16-mm. reduction printer.

"The Present Technical Status of 16-Mm. Sound-on-Film;" J. A. Maurer, *Berndt-Maurer Corp.*, New York, N. Y.

Improvements in the technic of recording and printing during the past few years have made possible the production of 16-mm. sound-films, either by optical reduction or by direct recording, having considerably better quality than is being obtained in general commercial practice. By the use of a moderate degree of equalization in recording, it is practicable to obtain from 16-mm. negative prints giving a flat frequency response to 6000 cycles, with useful response to 7500 cycles, when reproduced through a flat amplifying system. Harmonic and envelope distortion and speed variations can be kept within acceptable limits for high-quality reproduction. The principal remaining defect is background noise. Some general agreement upon commercial 16-mm. reproducing system characteristics is needed, however, before this improved quality can be made generally available.

"The Preservation of History in the Crypt of Civilization;" T. K. Peters, *Oglethorpe University*, Ga.

The problems confronting the scientist who inaugurates the unique task of preserving in film for the people of the 80th century a complete picture of our life in America today; the problem of the life of film and of its relationship to ancient papyrus that has come down to us over sixty centuries; the method of preserving it; the microfilming and preparation of the records; the making of a duplicate film on metal; and the entire scope of the project is set forth and discussed.

"New Frontiers for the Documentary Films;" A. A. Mercey, *United States Film Service, National Emergency Council*, Washington, D. C.

The motion picture today is the legacy of experimentation of the past. The ancient Egyptians indicated movement in their processional hieroglyphics; the Greeks suggested movement in the magnificent friezes on the Parthenon.

Muybridge's famed experiment with twelve cameras to catch the movements of a horse was antedated by experimentation of centuries before. Kircher with his magic lantern in 1640, Peter Mark Roget, Sir John Herschel, von Stampfer, Sellers, Heyl, the great Faraday, Daguerre, and Nicpce—these and others worked and contributed to establish in practicality the law of persistence of vision with regard to moving objects.

From the still camera to the movie camera, man moved into new realms of record and drama. Thus was evolved the fade-out, the close-up, special lighting, dissolves, and process shots. We had the Melies, the Lumières, the Griffiths, and the deMilles contributing to early production technics.

The documentary is one of our oldest movie forms, for it means factual photography with the impact of drama. The documentalist takes real people in real places. The 15 years from Flaherty's *Nanook of the North* to Lorentz's *The River* represent years of advance in engineering; but those working in the medium recognize many unsolved problems of sight and sound.

The problems of modern life open exciting possibilities for both the producer and the engineer—problems that will mean new developments in the science of the motion picture. We have great frontiers ahead in the production of documentaries on housing, recreation, the business of food distribution, the problem of raising and obtaining food, communications, the conservation of natural resources, the backgrounds and rumors of war—all these offer a challenge to both the engineer and the producer, for in working together they will contribute much to a great art and a great science—the modern motion picture.

"A New Magnetic Recorder and Its Adaptations;" S. J. Begun, *Brush Development Co.*, Cleveland, Ohio.

A magnetic recording machine is now commercially available, using an endless steel tape loop as a recording vehicle. Such an endless loop makes it possible to record and reproduce without reversing the direction of rotation of the mechanism. Neither is it necessary to manipulate the recording and pick-up heads.

The simple operation of the unit makes it not only ideal for educational purposes, but also makes it very adaptable where a signal is to be repeated to a great number of times, or where reproduction is required shortly after recording, and where only the one reproduction is required. The same machine, with simple modifications, adapts itself to a great number of uses.

Exhaustive tests have been conducted to determine the life and the durability of the machine, under very severe conditions, and when operated by a layman. The results of such tests have been in every degree satisfactory.

"Lamps and Optical Systems for Sound Reproduction;" F. E. Carlson, *General Electric Co.*, Cleveland, Ohio.

Sound reproduction systems are designed on the premise that the sound-track will be illuminated by a scanning-beam of substantially uniform flux density. This paper presents results of extensive studies of the actual beam characteristics for all types of optical systems and lamps employed in the reproduction of sound from film. They were made possible by a unique microphotometer, designed by the author, with which the scanning beam can be analyzed in minute elements.

The studies cover: Relative levels of scanning beam illumination; effect of source displacement from design position on total flux at the sound-track; microphotometer recordings of distribution of flux density across the beam as affected by optical systems and source forms and by displacements of the source.

Report of the Studio Lighting Committee; C. W. Handley, *Chairman.*

An explanation is given of lighting problems from the viewpoint of the cinematographer. Certain advances in equipment and working tools remain in

obscurity for a long period before they find their rightful places in motion picture set lighting because they seem to interfere with dramatic effect. If they possess merit, however, they are gradually adapted to general use. A typical example is the light-meter, which is now going through the final stages of assimilation to studio lighting technic. New fast films have been brought into use and the resulting changes in lighting technic are now in the process of perfection. Recent changes in lighting equipment are described. Three new higher-speed negative films for the Technicolor process are being used. The effect of the new films on Technicolor set lighting is explained.

"Further Improvements in Light Record Reproducers and Theoretical Considerations Entering into Their Design," A. L. Williams, *Brush Development Co.*, Cleveland, Ohio.

Direct recording is becoming commercially more and more important. Acetate blanks are used for high-quality recordings, but these materials are essentially softer than pressed records, and therefore make necessary new considerations in the design of a high quality pick-up to be used with them.

It is shown that a dynamic stylus pressure of approximately 25 grams is the maximum force that acetate can tolerate without permanent deformation of the modulated grooves, even when due consideration is given to the proper matching of stiffness and inertia of the vibratory system of the pickup. A simple formula is given for the most suitable condition of the matching of inertia and stiffness for a complex wave-form.

Other factors that interfere with the construction of a light pick-up, such as uneven record and turntable surfaces, are explained, and suggestions are made for the reduction of these effects. The advantages of "constant amplitude" as a method of recording and reproduction, are shown, and a constant amplitude system is demonstrated.

"Application of Motion Picture Film to Television," E. W. Engstrom and G. L. Beers, *RCA Manufacturing Co.*, Camden, N. J.

Motion picture film will form an important part of programs for television broadcasting. Film projectors for this use are required to meet a number of conditions peculiar to television. Methods for projecting and utilizing motion picture film are outlined. A specific film projector and associated television channel are described in some detail.

In establishing a technic for producing films most suitable for television, equipment is needed to interpret properly the final results. Apparatus that will be used by broadcasting stations is described. A simpler system has been designed that may be useful for the specialized service of gauging the merit of films for television. This is described and its operation indicated.

Some very preliminary observations are included on the characteristics of films that have given good results in experimental work and in field tests.

"Television Studio Technic," A. Protzman, *National Broadcasting System*, New York, N. Y.

The studio operating technic as practiced in the NBC television studios today are discussed and comparisons are made, where possible, to motion picture tech-

nic. Preliminary investigations conducted to derive a television operating technic revealed that both the theater and the motion picture could contribute certain practices.

The problems of lighting, scenic design, background projection, and make-up are discussed, with special emphasis on the difficulties and differences that make television studio practice unique.

An explanation is given of the functioning of a special circuit used in television sound pick-up to aids in the creation of the illusion of close-up and long-shot sound perspective without impracticable amount of microphone movement. The paper concludes with a typical television production routine showing the coördination and timing of personnel and equipment required in producing a television program.

"Methods of Using and Coördinating Photoelectric Exposure-Meters at the 20th Century-Fox Studios;" D. B. Clark, *Twentieth Century-Fox Studios*, Hollywood, Calif.

Consistency in negative printing values is one of the most desirable single factors in modern cinematography. Photoelectric light-measuring devices can help the cinematographer maintain such consistency to a far greater degree than is possible otherwise. Not only tests, but actual production have shown that with the proper use of these instruments, the entire output of the studio's camera staff can be so coördinated that, almost without regard to the photographic conditions prevailing on the set, all negative will print correctly within a range of three or four printer-light adjustments.

To make this coördination possible, several requirements must be recognized. Among these are a dominant, and by no means completely fulfilled demand for photocell meters of unflinching consistency; *i. e.*, meters that are not subject to error from photocell fatigue, changes in humidity or temperature, and the like, and are sufficiently uniform that all the studio's meters may be expected to give uniform readings under any given conditions.

While these requirements are not wholly met in existing meters, it has been found possible to use such meters to advantage. Coördination is effected by use of a special, portable testing unit of the photometer type. In this a standard light-source is used in circuit with a battery and milliammeter, and controlled by a rheostat. When the light is brought to known intensities by the application of known currents, the photocell meter being tested must, if accurate, give predetermined readings.

Further logical developments, predictable on the basis of existing knowledge or equipment, should include complete acceptance of strict time-and-temperature methods of negative development and some form of automatic, photoelectric-cell-controlled print-timing. This would remove all variables, including human fallibility, from the processing problem, and leave the responsibility for results solely in the hands of the cinematographer, who would in turn be guided by his meter in keeping within the tolerances imposed by film and processing, and in his efforts to turn out consistently ideally exposed negative.

"20th Century Silent Camera;" G. Laube, *Twentieth Century-Fox Film Corp.*, Hollywood, Calif.

The camera operates without any sound-proofing box or blimp, weighs sixty pounds and is the first instrument of its kind to function without the incumbrance of sound-proofing enclosures.

A microscope viewing finder is built into the camera and is brought into position back of the photographing lens by rotating the camera case, which is mounted in a yoke.

The monitor view-finder is rigidly secured to the side of the camera and does not pivot or swing. However, the image produced by it truly conforms to the image being photographed on the film. This feature enables the operator to work with the complete assurance of seeing exactly what is being recorded on the film and without having to guess or make allowances for such errors that arise from parallax and change of focus.

The camera derives its driving power from a motor mounted on the back of the yoke member and drives direct to the shutter. Either synchronous or a-c. interlock motors may be used and driven at shutter speed. This type of drive assures an even and undisturbed rotating motion of the shutter.

The film-moving mechanism, or the so-called camera movement, embodies elements of absolute precision and locates each frame of the picture with registering pins that remain stationary during the exposure. The film is moved from frame to frame at a slower speed than with former cameras and with uniform acceleration, overcoming film damage and loop slap.

The dwell time, or the period when the film is standing still and receiving the exposure, is long and allows for exposure with a 200-degree shutter. These features provide a means for producing pictures showing a superb quality of definition and freedom from defects.

Many features of convenience are apparent. The camera may be synchronized with projection process by looking through a special aperture and turning a knob at the back. The camera conveniently loads when on a low or high set-up. The operator has an unobstructed view of the set when lining up, and may look directly over the camera. All parts are completely sealed from the action of sand, dirt, and water. The camera turret mounts four lenses and provides a quick change from one to another. The freehead is a new hydraulic type, with adjustable drag on both pan and tilt members.