ABSTRACTS OF PAPERS

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The Papers Committee submits for the consideration of the membership the following abstracts of papers to be presented at the Fall 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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Dynamic Screen—a Speculation; Robert W. Russell, *Training Film Production Laboratory,* Ft. Monmouth, N. J.

Within its present limits, various phases of the motion picture have been brought close to technical exhaustion and artistic satisfaction. Competition with color television and other forms of entertainment require that motion pictures come forth with another "sudden impact of novelty" similar to its other great discoveries: screen personalities, story, montage, sound, color. One great frontier remains for film-makers and engineers: the selective delimitation of the screen. The familiar rectangular screen shape forces the motion picture to accomplish everything within a rigid opening like a window. Feeble attempts have been made to vary this arbitrary shape, usually by trying to substitute other arbitrary shapes: the "Grandeur" wide-film, the square frame, the circular "iris-in," camera matte shapes. Unprogressive justification for the present rectangle is in static painters' composition, in commercial standardization, and in a false claim of relationship to the "Golden Section" rectangle. It is possible to speculate on a new type of motion picture production using the unlimited, unframed "Dynamic Screen," permitting another "sudden impact of novelty" to meet the increasing competition of similar medium of entertainment. Great new frontiers of cinematic effect are opened up by making the screen area the entire proscenium wall, by employing a projector lens that will throw the 35-mm frame to cover this whole wall as a potential, and by selectively limiting the projected image to smaller pictures within this potential, using peculiarly appropriate or eccentric delimitations in an overall montage of boundaries. Such a production can be imagined, described, and even accomplished with present-day equipment.

Mobile Television Equipment; R. L. CAMPBELL, R. E. KESSLER, R. E. RUTHERFORD, AND K. V. LANDSBERG, *Allen B. DuMont Laboratories*, Passaic, N. J.

While portability is a necessary requirement for outside pick-up equipment, several advantages result when portability is carried into the studio. To equip a studio of adequate size with fixed equipment for operation of several cameras involves considerable time and expenditure. However, with portable studio equipment, the entire equipment installation can be located to suit studio needs, as well as moved to different studios or outside locations.

The dolly type of equipment is described in some detail, and systems for program control are discussed. Some of the design features discussed are portability and flexible synchronizing equipment; electronic view finders; oscilloscope monitors; and other operating facilities.

Production and Release Applications of Fine-Grain Films for Variable-Density Sound Recovery; C. R. DAILY, *Paramount Pictures, Inc.*, Hollywood, Calif.

Fine-grain film materials have supplanted the normal positive type emulsions for all variable-density sound-recording and printing operations. The sound-quality improvement realized by the reduction in noise and distortion is now available for all sound operations, including release prints. The paper describes a number of problems encountered and solved in the commercial application of such films for sound recording, including factors affecting the choice of negative and print materials, noise, distortion, sensitometric characteristics, recorder lamp supplies, and noise problems on stages.

Laboratory Modification and Procedure in Connection with Fine-Grain Release Printing; J. R. WILKINSON AND F. L. EICH, *Paramount Pictures, Inc.*, Hollywood, Calif.

While fine-grain emulsions have been in general use for specialty purposes for three years or more, their use as a medium for release prints is comparatively recent. This paper discusses the necessary modifications required in a release print laboratory to produce satisfactory fine-grain release prints. The discussion covers the light-source, power supply, light-testing, and printing equipment. Observations noted while processing the first thirty million feet of release prints are made relative to the behavior and characteristics of the film.

A Note on the Processing of Eastman 1302 Fine-Grain Release Positive in Hollywood; V. C. SHANER, *Eastman Kodak Co.*, Hollywood, Calif.

A brief historical résumé is given of a series of fine-grain films that have been put upon the market during the past four years. This series of fine-grain films culminated with the acceptance of Eastman *1302* fine-grain release positive at one Hollywood laboratory to the exclusion of regular positive of the *1301* type for release printing. Experimental data are presented to show the comparative sensitometric characteristics of fine-grain positive *1302* and regular positive *1301* at various *p*H values and potassium bromide concentrations typical of Hollywood positive developers. A basic positive developer formula derived from chemical analyses of every release positive developer in Hollywood was used in the experimental work. Some practical facts are discussed, based upon the experiences obtained from the initial use of the fine-grain film in Hollywood.

A Frequency-Modulated Control Track for Movietone Prints; J. G. FRAYNE AND F. P. HERRNFELD, *Electric Research Products, Inc.*, Hollywood, Calif.

A 5-mil frequency-modulated track located between sound and picture areas is proposed to control reproduction in the theater from one or more sound-tracks. A variation of approximately one octave in the control frequency provides a 30-db change in volume range which may be used in part for volume expansion of loud sounds or as noise reduction for weak sounds. The control-track frequency is varied manually and recorded simultaneously with the sound-track in the dubbing operation, the gain of the monitoring channel being varied in accordance with the control frequency to produce automatically the enhanced volume range desired from the release print. The track is recorded in line with the standard sound-track, and does not require separate printing or reproducing apertures. It is scanned by a separate photosensitive surface, the output being converted from frequency to voltage variations by a frequency-discriminating network identical to that used in the monitoring channel. The output from the network, applied to the grid of a variable-gain amplifier in the sound channel, controls automatically the volume of the reproduced sound in accordance with that observed in the dubbing operation.

The Design and Use of Film Noise-Reduction Systems; R. R. SCOVILLE AND W. L. BELL, *Electrical Research Products, Inc.*, Hollywood, Calif.

The factors underlying the design and use of biased recording systems are described. In order to minimize noise and "shutter bump" special precautions in filtering must be taken. Suitable values for "attack" and "release" times are dependent upon the type of recording, margin settings, and reproducing conditions. Comparison of variable-density and variable-area requirements is made. Methods used in designing the rectifiers, filters, and other circuit details are given and the application to a new equipment known as the *RA-1124* noise-reduction unit is shown.

Streamlining a Sound Plant; L. L. RYDER, *Paramount Pictures, Inc.*, Hollywood, Calif.

This paper discusses the trend in modern sound-recording equipments. It reviews the objectives and requirements that are now existing in regard to studio recording as contrasted to previous recording systems. Several new developments in the art of sound recording are discussed and from this group are selected a complementary series of improvements which together are streamlined into a new recording plant.

A Precision Direct-Reading Densitometer; M. H. SWEET, *Agfa Ansco Corp.* Binghamton, N. Y.

The history of physical densitometers is briefly discussed. In spite of developments in modern electronic circuits, simple photoelectric instruments suitable for routine sensitometry are not yet in common use. The present densitometer is designed to fill this need.

The minimum requirements for a satisfactory instrument are outlined. Photographic density as such, and density standardizations are discussed.

The densitometer density of the present instrument as related to that of other types is demonstrated. The optical aspects, including the geometry and spectral qualities of the system, are explained, and the problem of calibration discussed. Emphasis is placed upon the practical agreement of different optical systems suitably calibrated, and specific examples are shown.

The circuit arrangements of previous photoelectric densitometers are outlined. The theory and practical development of the present electrical circuit are described, and the effects of the novel features are shown. An accurate linear density scale is obtained in a single-stage d-c amplifier, and the sensitivity is sufficient to permit the use of a rugged output meter. A density range of 0 to 3.0 is covered, and the characteristics of the output meter are given.

The technics used in prior densitometers in attempting to secure a linear density scale and adequate scale length for good legibility are discussed, and the technic used in the present instrument is compared with them. The performance characteristics of the electrical circuit make it suitable for application to recording instruments.

The routine operation is described and the permanence of calibration is shown. Data are given on the warm-up period and drift, and on the influence of varying line voltage. Operation is entirely by alternating current. Practical performance considerations such as convenience in reading, eye fatigue, *etc.*, are reviewed, and figures showing the comparative speed of operation and reading accuracy are given.

A Review of the Question of 16-Mm Emulsion Position; WM. H. OFFENHAUSER, JR., *Precision Film Laboratories*, New York, N. Y.

When a 16-mm sound-film is properly threaded in a 16-mm projector, the emulsion of the film may face the screen (which position is called the "standard" position), or it may face the projector light-source (the "non-standard" emulsion position). The well designed 16-mm sound projector of today should be capable of projecting either "standard" or "non-standard" prints.

In the case of 35-mm film, the standard position for the emulsion of a print is opposite that for 16-mm; in 35-mm, the emulsion faces the light-source of a projector. The anomaly of the 16-mm emulsion position arose from the fact that a large number of the earliest 16-mm commercial sound-films were made by optical reduction from 35-mm negatives. Since the "standard" was established, however, numerous developments have occurred in direct 16-mm production which now practically compel the recognition of so-called "non-standard" prints as a factor of fast-growing importance in our rapidly growing 16-mm industry. The expression "non-standard" emulsion position no longer carries the stigma ordinarily associated with other things that are called non-standard.

Motion picture films may be printed either by contact (the emulsion of the film to be copied is in physical contact with the raw film upon which the copy is to be made) or by optical printing (the emulsions of the two films are not in physical contact; some form of lens system is interposed between the film to be copied and the raw film upon which the copy is to be made). By far, the largest percentage of picture film printed today is printed by contact methods. It does not seem likely that 16-mm picture film will be printed optically in the near future for a number of reasons, not the least of which is the lack of available lenses due to the defense program.

The use of Kodachrome duplicates has been growing very rapidly and since contact printing of Kodachrome originals will continue to be used for some time, the "non-standard" emulsion position will continue to be a rapidly growing factor in 16-mm sound-projection that can not be ignored.

Some Equipment Problems of the Direct 16-Mm Producer; L. THOMPSON, *The Calvin Company*, Kansas City, Mo.

The production of industrial films by the direct 16-mm method is now definitely out of the experimental stage.

As more industrial work is done by this method there is an increasing demand for more and better 16-mm equipment suitable for professional use. Such equipment can be developed successfully only after the professional user has found by actual experience what he needs and wants.

A number of 16-mm professionals were asked for suggestions as to what is needed. These suggestions, combined with the author's own ideas gained over a period of 10 years in the professional 16-mm field, form the basis of this paper. Some of the ideas presented could be acted upon immediately; some of them can not be put into practice until the demand for 16-mm service becomes even greater.

A Constant-Torque Friction Clutch for Film Take-Up; WILLIAM HOTINE, *The Rotovex Corp.*, East Newark, N. J.

From the standpoint of film protection, a take-up mechanism should be reliable, wear should not appreciably alter its characteristics, and it should maintain the film tension between safe limits. These objects are attained by driving the take-up spindle through a constant-torque clutch of novel construction and design. A new type of friction-clutch is described, which, when adjusted initially to deliver a given safe torque to the take-up spindle, maintains this torque at a constant value which can not be exceeded. The clutch construction is simple and rugged, and wear of the friction element does not appreciably affect the operation. Due to the fact that the torque at the take-up spindle is maintained at a constant value, a safe value of film tension is not exceeded. An analysis of the forces and mechanical constants of the clutch mechanism is given, deriving an equation of these in terms of torque delivered.

Recent Developments in Projection Machine Design; E. L. BOECKING AND L. W. DAVEE, *Century Projector Corp.*, New York, N. Y.

This paper discusses the design features of a new projector to meet the ever-increasing demands for accuracy and simplicity required by modern projection in the theater. Basic, fundamental, scientific functions of motion picture mechanism design are discussed relative to perfection of film motion, clearer definition, light transmission, and picture steadiness.

As in the design of any scientific mechanical device, the stability and inherent durability must first begin with perfection in the basic design and it must be built upon a foundation of engineering knowledge proved by practical operating experience. In order that these design features may be appreciated it will be the purpose to show how every step of the engineering design, every part of the mechanism, and every motion were carefully planned so that mechanical perfection could be achieved.

The design and operation of the gear-train are discussed with respect to its simplicity, mechanical accuracy, and long life; the design and operation of the bearings are reviewed in the light of recent developments relating to permanent operation with minimum servicing; and the intermittent movement operation is analyzed in relation to more stable operation and steadier picture reproduction.

The film-gate and film-trap design, providing more uniform film travel at less film tensions, is described as well as methods of obtaining perfect placement of the film plane with respect to the optical axis. Finally, the theoretical design features of single- and double-shutter operation are outlined and the actual operating results expected and realized discussed.

Economic and Technical Analysis of Arc Lamp and Screen Light Characteristics; H. D. BEHR, New York, N. Y.

Many exhibitors do not understand what is meant by the relative inefficiency of power for ultimate consumption at the arc in comparison to power actually delivered at arc. Deficiencies in various parts of the projection plant are described and a value is placed upon losses to emphasize the need for constant attention to details.

Tables are presented showing the excessive carbon and current costs that result when arcs are operated at higher currents due to defects in equipment. Emphasis is placed upon the fact that too many arcs operate at or near the upper limits for which they were designed and too little leeway is left for extra current to increase light for dull prints or color-prints.

Some ideas are given as to what to look for in competitive arc equipments. Various procedures are described for minimizing current and carbon waste due to poor reflector mirrors.

Suggestions of projectionists have too long been ignored by managements. The latter should take a little time from their booking and other problems to ascertain that poor screen light is costly and definitely contributes to drops in attendance.

The IR System: An Optical Method for Increasing Depth of Field; ALFRED N. GOLDSMITH, *Consulting Engineer,* New York, N. Y.

This paper is submitted as a report of progress made in the development of the increased range (IR) system. In it is described the solution of a long-standing problem in the field of optics, namely: the attainment of greater depth of field than is attainable by any previous method of utilizing a lens system for image formation.

The solution is particularly applicable in the fields of photography and television under conditions of controllable lighting of the external objects to be depicted. In this paper there will also be included methods for demonstrating the correctness and effectiveness in practice of the increased-range system which, as stated, has been invented to meet the need for increased depth of field, as well as indications of certain of the directions in which the practical evolution of the IR System may reasonably be expected to proceed under studio conditions.

Adventures of a Film Library; RICHARD GRIFFITH, *Museum of Modern Art Film Library*, New York, N. Y.

Collecting and circulating important films of the past is not as dusty an occupation as it sounds, as the director and curator of the Museum of Modern Art Film Library discovered when this institution was founded in 1935 for the purpose of instituting a considered study of the motion picture as art, industry, and social influence. Even the mechanical acts of collecting and preserving film have involved the human factor: people feel strongly about works that they themselves have created, criticized, or merely seen, and the collection of films both in this country and in Europe has been fraught with emotional, financial, and even political complications, while the number of illustrious personalities who have in one way or another become involved in the Film Library's work is prime evidence of the ability of even the most ancient fragments of celluloid to retain a contemporary as well as an archaeological interest.

Circulation of the Film Library's motion picture programs has also proved illuminating in its revelation of the attitude taken toward the film medium by all varieties of persons. The Film Library's purpose has from the first been to provide students with the opportunity to form a critical attitude by examining important films at first hand. But experts as well as laymen so warmly enjoy movies that many were at first reluctant to "spoil" their pleasure in films by examining them critically. As more and more historic films have been restored to the screen, however, there has gradually grown up throughout the United States a new appreciation which has learned not only to marvel at the rapid development of this new medium but also to discern its enormous and largely untapped potentialities.

A New Electrostatic Air-Cleaner and Its Application to the Motion Picture Industry; HENRY GITTERMAN, *Westinghouse Electric & Manufacturing Co.*, New York, N. Y.

The principle of electrostatic precipitation is not new. To the best of our knowledge, it was first enunciated in 1824. It was used in England in the late 80's of the last century. In this country the Cottrell process has been in use for approximately 30 years with great success. However, it was not until 1932 that Dr. G. W. Penney of the Westinghouse Research Laboratories produced an electrostatic precipitator that could be used in connection with atmospheric air breathed by human beings. This advance was due to the fact that Dr. Penney's apparatus did not produce ozone in any appreciable amounts. Much lower voltages and currents have been possible through the use of this system. Instead of imposing huge voltages and currents upon a single system, in which ionization and precipitation took place in the same chamber, the new system consists of two parts. The first is made up of cylindrical rods alternating with small tungsten wires on which a potential of 12,000 volts at very low current is imposed. This creates an electrostatic field that charges all solid particles passing through it. The air-stream carrying these charged particles then passes through plates alternately charged negative and positive. The charged particles are precipitated against the oppositely charged plates. The efficiency of the system is such that guarantees can be made to remove 90 per cent of all solid particles in the air-stream down to and including $^1/_{10}$ of one micron in size. Ordinary air filters range in efficiency from 12 to about 40 per cent by particle count.

Of particular interest to motion picture engineers is the fact that three of the leading film-producing manufacturers in this country have adopted this system for air-cleaning in their plants. Several of the more prominent exhibitors are considering using it in some of their theaters. It is possible to maintain a much cleaner condition in the theaters themselves and thereby produce economy in redecorating the interiors. Furthermore, great savings are possible in the amount of outside air needed in air-conditioning systems, which will enable engineers to specify lower capacity cooling units without sacrificing any cooling effect whatsoever.

A number of installations are discussed describing the various aspects of particular interest to motion picture engineers.

Color Television; PETER C. GOLDMARK, *Columbia Broadcasting System, Inc.*, New York, N. Y.

The paper will be introduced with a brief history of color television and the reasons leading up to the CBS color television System. A general theory for color television, including color, flicker, and electrical characteristics, will be given. Equipment designed and constructed for color television transmission and reception will be discussed. Slides illustrating circuits, equipment, and actual color pictures will be shown.

Synthetic Aged Developers by Analysis; R. M. EVANS, W. T. HANSON, JR., AND P. K. GLASOE, *Eastman Kodak Co.*, Rochester, N. Y.

The dropping mercury electrode is applied to the problem of analyzing aged photographic developers, and new tests are described for elon and hydroquinone. The question of suitable tests for bromide is discussed and it is shown that the bromide test must be independent of chloride. Such a test is described.

Using these new technics and others it is demonstrated that it is possible and practicable by chemical analysis alone to match exactly the photographic characteristics of an aged *MQ* developer. The only elements necessary for such an analysis are elon, hydroquinone, sulfite, salt concentration, *p*H, bromide, and iodide. The precision required for the proper analysis for each constitutent has been investigated and is reported for three developer-film combinations. In general the precision required is different for every combination.

Iodide Analysis in an MQ Developer; R. M. EVANS, W. T. HANSON, JR., AND P. K. GLASOE, *Eastman Kodak Co.*, Rochester, N. Y.

A method is described for the analysis of iodide in a developer, involving precipitation of the halide with silver nitrate and oxidation of the iodide while it is in the form of solid silver iodide to iodate with chlorine water. The iodate is then determined polarographically. Quantities of iodide from 2.5 to 10 milligrams of potassium iodide were analyzed with an accuracy of 2 to 4 per cent. Thiocyanate in the developer interferes but it can be removed by boiling with strong sulfuric acid before precipitation.

Using this method of analysis it was shown that an equilibrium amount of iodide is obtained in a developer. Curves are given showing the attainment of equilibrium for development of Eastman panchromatic negative motion picture film in Kodak *D-76* and in *D-16* developers, and Eastman panchromatic positive motion picture film in Kodak *D-16* developer. The equilibrium value depends upon the emulsion, the developer, the developed density, and perhaps other variables which will be investigated more thoroughly.