

**ABSTRACTS OF PAPERS**  
FOR THE  
**FIFTY-FIRST SEMI-ANNUAL CONVENTION**

**HOLLYWOOD-ROOSEVELT HOTEL**  
**HOLLYWOOD, CALIF.**  
**MAY 4-8, 1942**

*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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**Audio-Visual Aids to Naval Training;** WILLIAM EXTON, JR., U.S.N.R., Bureau of Navigation, Navy Department, Washington, D. C.

The expansion of the Navy requires expansion in personnel as well as in materiel. The expansion in personnel means the provision of literally hundreds of thousands of men trained in the operation of complicated equipment. This includes radio, various types of ordnance equipment, navigation, the handling of ships, tactics and maneuvers, the maintenance and repair of all sorts of equipment, aeronautical operations of every kind, and every other activity connected with naval affairs.

Naval training is usually conducted by skilled officers, both commissioned and non-commissioned. At present, experienced and skilled officers who might normally be assigned to training duties are required for operations at sea. At the same time, the number of men to be trained has increased enormously, and the number of fields in which they must be trained has also increased because of the development of new technics and materiel. Furthermore, new inventions have brought about the need for training in fields in which there is virtually no experience and concerning which only a few experts have knowledge.

The Navy believes that the use of audio-visual aids will be of tremendous help in this connection. These can not entirely replace the skilled and experienced officer or non-commissioned officer, but they have certain very definite advantages. One of these is the standardization of instruction, so that men trained at every activity will have interchangeable skill. Another is the supplementing of

the instructor who may not have had much pedagogical experience or be an able teacher, although he may have ample knowledge of the subject. The third is the stimulation of the interest of the trainees. It is possible through visual aids to give them a more comprehensive picture of the application of the technic they are learning to general naval operations than is normally possible during training. Furthermore, since ships are not now available for training purposes as they are during peacetime, audio-visual aids make it possible to give some conception of the application of the subject in which training is being given to actual operations. The armed forces of the United States, guided by such considerations as these, are carrying the use of audio-visual aids for training purposes beyond civilian experience with these media. It is to be hoped that the experience gained and the technics developed will be of value in the future for civilian purposes.

**Motion Pictures: Technology in Art; L. S. BECKER, Warner Bros. Pictures, Inc., Burbank, Calif.**

The motion picture and the automobile were born at the turn of the century and grew up together. Both have their foundations in science and technology, and both have profoundly affected our individual and national lives. Their maturity has placed them among the five largest American industries, yet one is fundamentally an art. An automobile is something concrete, tangible, something real; a motion picture is light and shadow, laughter and tears, speech and music. The motion picture is an art as well as an industry. The motivating forces of the film are drama, comedy, human experience—yet it could not exist except for the organized efforts of the many craftsmen and technicians that make it an industry. Since art and industry are so interwoven, a change in technology affects the art of the film, while the demands of the art bring about technical improvements.

This report illustrates the role that technology plays in the conception of the film as an art, and the changes that the demands of the art itself have brought about in technic. The cameraman's universal focus, the soundman's reverberation chamber, the set designer's cloth ceiling—all have their share in telling a story realistically and dramatically. Someone's story idea sets this intricate machinery in motion, and from the writer, actor, artist, and engineer comes a living entity—a combination of arts that have been in development since man first learned to record his experiences for posterity.

**Motion Picture Laboratory Practices; JAMES R. WILKINSON, Paramount Pictures, Inc., Hollywood, Calif.**

The function of laboratory service to studio production departments and to the release distribution field is discussed. The size and scope of laboratory operations are illustrated graphically by an organization chart showing the number of sub-departments. These in turn are classified into three major divisions: namely, control, processing, and maintenance. Analysis of individual department activity begins with the control division, and emphasis is placed upon the recent trend toward the more scientific approach to the problems of processing. The discussion continues with the processing division, starting with negative development. The processing method of each successive department is described, showing the in-line flow of the work for both studio and release print operations.

Problems relating to proper mechanical and electrical maintenance are also discussed.

**Re-Recording; L. T. GOLDSMITH, Warner Bros. Pictures, Inc., Burbank, Calif.**

The nature of re-recording as it applies to motion picture production is described in some detail by showing what happens to a typical picture in the re-recording department after shooting on the set has been completed and the picture has been edited to the satisfaction of the producer.

Sound is added to those portions of the picture that have been photographed silent because of the difficulty or impossibility of recording the corresponding sound at the time, as, for example, credit titles, montages, miniatures, stock shots, and scenes photographed silent to playbacks of pre-recorded sound. Music that has been specially scored and recorded for the picture together with appropriate sound effects are added to heighten its dramatic presentation.

Improvements in dialog quality are made if required by employing electrical equalizers; although distortion is often purposely introduced where telephone, dictaphone, radio, and similar types of quality must be simulated as required by the picture.

Proper balance of the relative volume of the dialog and the accompanying music and sound effects is determined to the satisfaction of the re-recording supervisor. All the sounds from as many as a dozen or more different sources are re-recorded to a single composite sound-track which afterward is printed with the picture to make up the final print to be projected in the theater.

The organization of the re-recording department is discussed and the duties of the various members of the personnel are outlined. Crews are so made up that an average of from three to six pictures are in work at the same time. A bibliography is included to which the reader can refer for more detailed descriptions of the special equipment and processes employed.

**An Analysis of the Complete Sound Recording System Now Used by M-G-M Studios; J. K. HILLIARD, Metro-Goldwyn-Mayer Studios, Culver City, Calif.**

This presentation is an illustrated discussion and demonstration of the complete variable-density recording system as used by Metro-Goldwyn-Mayer Studios.

The channel is the result of several years of development and engineering to achieve a high standard of quality and signal-to-noise ratio. The complete system will be described, beginning with the microphone, limiter amplifier, R.M.A. pre- and postequalization, improved coils with special shielding, cylinder lens, noise reduction, improved type headset monitor, fine-grain sensitometry, improved super-portable equipment, new recording machines and re-recording machines, and disk recording apparatus. Engineering specifications and analysis of the design considerations and the functional aspects of the apparatus will be given, followed by a demonstration and informal discussion.

**The Development of the Sound-Film, 1927-42; JOHN E. ABBOTT, The Museum of Modern Art Film Library, New York, N. Y.**

With the appearance of the part-talking film, *The Jazz Singer*, in 1927, a new motion picture era began. Talking films had been introduced before, but not until then had the electrical engineers solved the problem of amplifying as well as

recording and reproducing sound. As often, technical invention preceded creative use, and at first the new machines were used clumsily. It almost seemed, momentarily, that in gaining a voice the movies had lost a soul. Aesthetic pleasure or intellectual content are hard to find in the first talkies, although the newsreels gained much through the new dimension. The rest was mostly a tinpot substitute for theater. Yet it is well to recall the character of such primitive talkies as *Lights of New York* (the first all-talkie) in order to understand what the elements were that stirred the wonderment and curiosity of the public in 1928, and it is the only effective way of appreciating the speed and ingenuity with which this apparent retrogression in film-making was overcome during the next few years. That it has been overcome completely, even today, is perhaps open to question. The future is certainly rich in potentialities.

In gathering together films of the sound era from many countries for its archives, the Film Library has necessarily encountered some difficulties. It is not generally realized that certain of the early talkies can no longer be projected: either the machinery for running them no longer exists or unequal degrees of shrinkage in visuals and sound-track (often separate then) preclude synchronization today. Even among some pictures of real importance which survive, only poor effects can be obtained. Early sound recording was crude and many factors combine to make renewed experience of *The Love Parade* and *Public Enemy*, for instance, somewhat disconcerting. Audiences following film history at the Film Library's showings can not but be sharply aware of the permutations and improvements in sound recording and reproduction or in the dramatic use of sound and dialog during the early years of sound pictures. They will recognize that unhappy subservience to theatrical form that devitalized the cinema so extensively, and rejoice to see it gradually resume the freer, more cinematic technics of the silent era. Now many famous film stars go into eclipse, while new favorites emerge. Reflecting the world about it, though somewhat belatedly, the cinema has already created the gangster film, but sound gives it startling vitality and familiarizes the English-speaking world with some strange verbal expressions. Now, too, the American film reflects social and political problems, and the trick film reappears. The Russian film, continuing to be seen here mostly by special groups, hardly overcomes the technical difficulties of sound recording, though its directors advance some valuable theories. In France single films flare up again and again to remind us of this country's great contribution to cinematography. By 1934, the film in Germany was harnessed to the uses of propaganda, with results that are important technically and will be valuable historically, though their content, highly repugnant to our national taste, precludes their being publicly shown. As in previous decades, innovations and advances have come about in this country through experiments within the major studios as well as independently in the case of documentary films. Today the motion picture is being used by government everywhere as never before and there is no longer any doubt of the tremendous importance of this medium to society as a whole.

**The Production of Industrial Motion Pictures;** LLOYD THOMPSON, The Calvin Company, Kansas City, Mo.

The production of industrial sound motion pictures is similar to production in the major studios. Limited budgets mean that certain short-cuts must be taken

but the final screen results must be such that the audience is not aware of the limited budget. If satisfactory results are to be obtained, close coöperation is required between the director who has his special problems and the technical department which also has its special problems.

The paper lists a number of these problems and also discusses what can be expected of industrial producers.

**Procedural and Dimensional Practices for Production of 16-Mm Motion Pictures for Television Projection;** R. BLACKINTON FULLER AND L. S. RHODES, Marsh Cinesound, Inc., New York, N. Y.

A general report on setting of procedural and dimensional practices for the production of 16-mm sound motion pictures for television projection, including abstracts from discussion with leading television engineers of the major companies for the eventual determination of reproduction standards for equipment and methods that are, at the present time, subject to variations that may impair the quality or clarity of films projected on the television system.

The paper shows that in the various steps from the original film to the final image on the television receiver, a considerable percentage of the frame area is lost by "cropping" in the projector, in the iconoscope, and in the kinescope. Unless this loss is taken into consideration and compensated for in the original planning of films for television, loss of image area may seriously impair the effect of the motion picture.

The paper makes specific recommendations based upon the conclusions drawn, but does not attempt, in view of present conditions, to fix final aperture standards any further than to urge that such standards be set up by the proper group. Many of the factors directly concerned in production are considered with a view to the ultimate quality to be attained.

Reference is made to actual experiences and problems met by the authors in the preparation of animated cartoons and other films for television broadcasting, hoping that their experience may help others to avoid some of the difficulties encountered and thus contribute to the efficiency and effectiveness in the preparation of motion pictures for this rapidly growing medium.

**The Practical Aspect of Edge-Numbering 16-Mm Film;** H. A. WIRT, Wilding Picture Productions, Inc., Chicago, Ill.

The use of the edge number and how it is generally applied in the industry, and the advantages of edge-numbering at 16 frames as a standard for 16-mm film are discussed.

It has been long-accepted practice to edge-number 16-mm film in relation to 35-mm frames. Such practice has proved advantageous in complex films, such as one constructed of some 16-mm film combined with 35-mm to complete a final subject in finished form on 16-mm, still maintaining all the advantages gained in the past practice by the use of 35-mm.

**Continuous Replenishment and Chemical Control of Motion Picture Developing Solutions;** H. L. BAUMBACH, Paramount Pictures, Inc., Hollywood, Calif.

The chemical reactions that take place in a photographic developer are discussed in detail. It is pointed out that, following the determination of a chemical formula for producing optimal photographic results, the concentration of every

important ingredient of the solution may be held constant by continuous replenishment and chemical control. After a discussion of the theoretical considerations involved, details are given for the establishment of picture negative, variable-density sound negative, and positive systems in use at the Paramount West Coast Laboratory.

**The Application of Potentiometric Methods to Developer Analysis;** JOHN G. STORR, Eastman Kodak Company, New York, N. Y.

Potentiometric titration methods are applied to routine developer analyses in order to simplify and speed up the operation and to minimize the "human error" arising from judgment of color change end points, *etc.* A brief theoretical treatment of potentiometric titrations is included, and new tests for elon, hydroquinone, bromide, and carbonate are outlined. Detailed procedure outlines are included along with a discussion of the problem of  $pH$  vs. the alkali content of a developer. A glossary showing stepwise procedure operations required to accomplish the analyses has been compiled along with a complete equipment and chemical reagent list. The precision of the methods is evaluated by a table showing analysis data on carefully mixed known developers.

**The Engineering Aspects of Portable Television Pick-Ups;** HARRY R. LUBCKE, Don Lee Broadcasting System, Hollywood, Calif.

The routine of portable television programming may be termed "applied" television engineering. This is hardly more than a byplay of words, but it is intended to convey the impression of an engineering technic evolved to put a program across regardless of extenuating circumstances. The emphasis is not on engineering, but on the program, with engineering as one of the tools used in accomplishing the program.

The essentials of the technic are set forth. Proper preparation requires constant servicing of equipment when the latter and the staff are available. A pre-program test several hours before program time is essential to consistent performance, and allows reasonable time for correcting installation or transportation-caused faults. A suitable equipment warm-up period precedes the program. Service failures during the program are usually unpredictable but must be met by prompt diagnosis and repair. Thorough knowledge of the many circuits, normal and abnormal operational characteristics thereof, and the knack of finding trouble are requisites of this aspect.

Methodical preparation eliminates some of the difficulties. The television engineering attributes of a program location are tested and recorded prior to the arrival of equipment. Voltmeter, dummy load, photometer, field glasses, and photographic camera comprise the preliminary test equipment. Experiences in televising 140 separate portable programs of the Don Lee Television Station, W6XAO, Hollywood, are described.

**RCA Audio Chanalyst—a New Instrument for the Theater Sound Engineer;** ADOLPH GOODMAN AND EDWARD STANKO, RCA Manufacturing Co., Camden, N. J.

During the past decade, the technic and equipment of the sound device engineer have improved tremendously. Progress in this section of the industry has

kept pace with other developments, until today the methods and procedures in this branch are solidly based upon good engineering practice.

The growth in this important phase of theater operation has brought with it many new and important instruments for more accurate quantitative measurements of equipment performance. This has led to the demand for a light, compact test instrument incorporating the functions of practically all the various instruments now carried by the theater sound engineer. The requirements for such an instrument are met by the RCA Audio Chanalyst. In addition, an entirely new service technic known as Audio Signal Tracing has been made available through use of this instrument.

This means that tests and checks can be made on an amplifier or sound system while the equipment is operating under normal conditions. In tracing the audio-frequency signal, visual and quantitative checks are combined with aural tests. The compactness and flexibility of the Audio Chanalyst decrease the time required to locate troubles, and the engineer is now provided with new devices to allow him to do a more precise and efficient job on a routine service call.

**A One-Ray System for Designing Spherical Condensers; L. T. SACHTLEBEN, RCA Manufacturing Co., Indianapolis, Ind.**

A spherical condenser is a simple lens of relatively large aperture. The outer portions of such a lens focus the rays much nearer to the lens than do the center portions. As a result the lens as a whole fails to produce a sharp image. This defect is known as spherical aberration. Although no sharp image is produced, an image-like region of maximum light concentration does exist. This is known as the disk of least confusion. Its diameter may be minimized by shaping the lens so as to minimize spherical aberration. It is with this disk of least confusion and its required location that the designer of a spherical condenser must deal.

Without a knowledge of the properties of the disk of least confusion a designer might compute rays through a large number of trial lenses until, by an extensive and costly trial-and-error process, a condenser having the correct shape for minimum spherical aberration, with the disk of least confusion at the required location, may be obtained.

The present paper examines some simple properties of the disk of least confusion. It shows how, by computing the course of a single ray through the proposed lens, a spherical condenser will result having the correct shape for minimizing spherical aberration; having also the correct center thickness for its assumed diameter and edge thickness; and for which, finally, the location of the disk of least confusion is known. The method is applicable to condensers comprising more than one lens, and leads to the required design with a minimum number of relatively simple trials.

**Developments in Time-Saving Process Projection Equipment; R. W. HENDERSON, Paramount Pictures, Inc., Hollywood, Calif.**

The projection of a motion picture on a translucent screen for background purposes has become increasingly important in studio operations during the past ten years. Many shots now made through the use of this process would have been extremely costly and perhaps impossible if attempted by direct filming of the complete action.

The sharp rise in production costs in the past few years, attributed partly to the foreign market situation, demanded that every effort be expended to simplify production methods.

With this in view, Paramount Pictures embarked upon a complete modernization program of the Transparency Department production equipment early in 1940. New compact projection units, bases for the projectors, rewind tables, screen frames, screen-handling equipment, and light-bridges were designed and built. This equipment has immeasurably simplified operations as well as improved quality beyond levels heretofore achieved.

Specifications and descriptions of this equipment are presented, with emphasis upon a comparison of the new with the old. The success of this equipment can be attributed largely to standardization of component parts. Complete interchangeability of essential units, coupled with easy access to critical points, has gone far toward eliminating lost time and motion in meeting unexpected emergencies.

**Cinematography as Practiced in Hollywood, 1942;** JOHN W. BOYLE, Hollywood, Calif., in collaboration with others.

The purpose of this presentation is to describe current practice in cinematography as followed in the Hollywood studios. Some of the subjects to be covered are camera equipment, set lighting, operation of camera crews, exteriors and use of booster light, exteriors taken indoors, make-up, diffusion, coated lenses, use of light-meters, color contrast of sets, set and production designers, value of hard light for exteriors and interiors, stand-ins, air photography, matching stock shots, Technicolor and bipack, Kodachrome, and monopack.

**The Focusing View-Finder Problem in Television Cameras;** G. L. BEERS, RCA Manufacturing Co., Camden, N. J.

The technical excellence of a television program may frequently depend upon the characteristics of the view-finder used in the television camera. Conditions peculiar to television make it desirable that television camera view-finders be of the focusing type. The requirements of an ideal view-finder of this type are discussed. During the past ten years a number of view-finder arrangements have been investigated in connection with the development of television cameras. Several of these are described and their relative merits indicated.

**Some Recent Developments in Record Reproducing Systems:** G. L. BEERS AND C. M. SINNETT, RCA Manufacturing Co., Camden, N. J.

Several factors of importance in obtaining satisfactory reproduction of sound from lateral-cut phonograph records are considered. An experimental record-reproducing system employing the principles of frequency modulation is described and data are supplied on the measured and calculated performance characteristics of the system. Curves are included showing the vertical force required for satisfactory tracking with the experimental frequency modulation pick-up as compared with other pick-ups of conventional design.

**Frequency Modulation Distortion in Loud Speakers;** G. L. BEERS AND H. BELAR, RCA Manufacturing Co., Camden, N. J.

As the frequency response range of a sound-reproducing system is extended the necessity for minimizing all forms of distortion is correspondingly increased. The

part that the loud speaker can contribute to the overall distortion of a reproducing system has been frequently considered. A type of loud speaker distortion that has not received general consideration is described. This distortion is a result of the Doppler effect and produces frequency modulation in loud speakers reproducing complex tones. Equations for this type of distortion are given. Measurements confirming the calculated distortion in several loud speakers are shown. An appendix giving the derivation of the equations is included.

**The Gasparcolor Process; BELA GASPAP, Hollywood, Calif.**

A brief historic review of the photographic multi-layer materials and their elements will be given. The principles of the Gasparcolor Process, the first multi-layer material which was introduced to the Motion Picture Industry in 1933 will be described. The process utilizes a positive printing stock which contains dyes in the emulsion layers in the proper densities and color balance; using indifferent treating baths for destroying the dye locally and proportionately to the developed silver image present in the photographic layers. The process uses fast dyes which have good absorption characteristics.

The processing can be carried out with practically the existing facilities of the black and white laboratories, requiring only slight additions. The balancing and printing are similar to black and white procedure, the only variables being the printing lights, keeping the processing time constant.

The various steps in the process will be demonstrated and some of the results shown. A brief discussion of the different taking methods suitable for this process will also be reviewed.

**A New Sound Motion Picture Reproducing Equipment for Radio City Music Hall; J. E. VOLKMAN AND J. S. PESCE, RCA Manufacturing Co., Indianapolis, Ind.**

The Music Hall has always maintained a high standard of sound reproduction since its opening in 1932. From time to time during this period improvements have been made on the original equipment which was the first commercial high fidelity reproducer to employ the well known rotary stabilizer sound-head that has subsequently become an accepted standard in the industry.

While this is true, still further improvements were felt desirable to enable more forceful presentation of current productions so as to be in keeping with the progress made in film recordings. Among these improvements the following are the more prominent:

(1) Greater flexibility between components to facilitate changes in set-ups so as to further enhance presentation and also facilitate service, maintenance and operation.

(2) Less distortion and more power output to fully utilize the increased dynamic range of some of the most recent musical recordings.

(3) Improved distribution of the higher frequencies through the use of a new type of horn.

A review of these requirements indicate that they could be best met and that it would be more practical to employ standard components of the latest design.

This procedure was followed, and early checks on performance show that these requirements have been met.