ABSTRACTS OF PAPERS OF THE FALL CONVENTION

AT

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OCTOBER 11-14, 1937

The Papers Committee presents the following abstracts of papers presented at the recent Fall Convention in view of the fact that some of the papers may not be published for several months. The papers presented at Conventions constitute the bulk of the material published in the Journal, and so must be spread over the several months intervening between Conventions.

"Hunting the Songs of Vanishing Birds with a Microphone;" P. Kellogg, *Laboratory of Ornithology*, Cornell University, Ithaca, N. Y.

A résumé of the idea behind recording bird songs is presented, including a brief discussion of the usefulness of bird song studies to students of Ornithology; present methods of recording songs; and early attempts at phonographic recording.

The rise of interest in recording bird songs at Cornell is described. This includes the first recordings in coöperation with the Fox-Case Corporation and subsequent work with A. R. Brand.

Problems in recording bird songs in the wild: the high frequencies of bird song; the necessity of working at relatively great distances from the subject; wind and other noises; the need for portability and simplicity of the equipment, all combine to increase the difficulties of the work. The solution of these problems has been partly accomplished, and methods are discussed, including the advantages and faults of parabolic concentrators.

"Safeguarding and Developing Our Film Markets Abroad;" N. D. Golden, *Bureau of Foreign and Domestic Commerce, Department of Commerce*, Washington, D. C.

American motion pictures are maintaining their immense popularity throughout the world, yet the barriers and obstructions that tend to limit their sales continue to be imposed abroad. Safeguarding and developing our film market abroad, "contingents" taxes, and complex restrictions, which continue to be imposed in all too many instances are some of the problems American Producers

must face abroad. Some are legitimate enough, from the standpoint of local interests, but others appear to be unreasonable. In certain cases our motion picture industry may be justified in taking a strong and positive stand with the object of bringing about the rectification of unfair measures. We need not be unduly hesitant. Our producers and distributors can afford to make effective their opposition to merely narrow-minded or punitive practices, while at the same time conforming readily to rational and moderate foreign requirements. In any such stand they will have the backing of one momentous factor—namely, the avidity of foreign audiences to see and hear our magnificent entertaining films.

Foreign markets play a highly significant role in the success of our motion picture industry. They must be constantly cherished and cultivated, and energetically safeguarded. It is noted that any strong wave of nationalistic sentiment in Central Europe, finding expression in restrictive laws affecting motion pictures—or a movement toward control or rigid censorship somewhere in Asia—or some inimical reaction in a Latin-American country—may contribute to an ultimate effect whereby motion picture engineers might find less in their pay-envelopes or might even be confronted by more severe effects.

The steady efforts of the Bureau of Foreign and Domestic Commerce to safeguard and augment American motion picture markets by supplying a wealth of factual data and utilizing a variety of trade-promotive methods are covered in the paper presented. The Bureau's motion picture unit has recently been raised to full divisional rank, in recognition of the industry's importance. Such helps as it provides are especially vital at the present moment because, under the circumstances existing today, our motion picture producers and distributors are likely to find themselves puzzled, entangled, or thwarted by the ever-growing intricacy of the conditions that they face abroad; their continued success in foreign markets depends upon the functioning of a reliable intelligence service.

"High-Speed Motion Picture Photography Applied to Design of Telephone Apparatus;" W. Herriott, *Bell Telephone Laboratories, Inc.*, New York, N. Y.

High-speed motion pictures are employed at Bell Telephone Laboratories as a visual aid in the study of problems associated with the design, manufacture, and testing of telephone apparatus. A new high-speed camera of the optical compensator type operating at 4000 pictures per second is described, and its application to the study of problems associated with telephone apparatus is discussed.

"Further Progress in Film Storage;" J. G. Bradley, *The National Archives*, Washington, D. C.

Research has continued along the lines indicated by previous tests and reported at the Hollywood Convention of the Society. It has been determined that the cascade type of storage cabinet has certain advantages and may be relied upon satisfactorily to control film fires in a cabinet having a capacity of ten reels.

A new method combining the advantages of insulation and cooling agent, while retaining the unit isolation features, is in the process of development, and a preliminary report will be presented. Stainless steel insulated cabinets are now installed at The National Archives.

"The Effect of the Composition of an MQ Developer on Its Reduction Potential;" R. M. Evans and W. T. Hanson, Jr., *Kodak Research Laboratories*, Rochester, N. Y.

A short time ago it was found that the reduction potential of a photographic developer solution could be measured electrochemically. The potential is read by dipping a platinum electrode into the solution and balancing the potential thus set up against a standard saturated calomel half-cell by means of a potentiometer. The addition of a potential mediator to the solution hastens the attainment of an equilibrium and greatly facilitates making the readings without affecting the final equilibrium.

This new tool of research has led to an extended study of the correlation between the photographic action of various developer solutions and compounds and the electrochemical reduction potential. The results are of great theoretical and practical interest. Knowledge of the reduction potential of a developer solution is, however, not at all sufficient to describe its photographic properties. Reasons for this are given, and possible uses for the measurements in practice are discussed briefly.

In this paper the authors discuss the *MQ* developers and the effects of the various constituents upon their reduction potentials. Studies have been made on mixtures of elon and hydroquinone as well as on the two components separately, with regard to the effect of *p*H, types of alkali present, concentration, sulfite and bromide, and the presence of other reducing agents. Mixtures of elon and hydroquinone give a greater reduction potential than either alone, a maximum being reached when the mol ratio is approximately 1 elon to 3 hydroquinone. The results are easily explained upon a physicochemical basis. The photographic effects of the above variations are now being studied.

"A Modern Motion Picture Laboratory;" C. L. Lootens, *Republic Productions, Inc.*, North Hollywood, Calif.

A complete description of the new laboratory of the Consolidated Film Industries, Inc., which was completed during the winter 1936–37. Included are layouts and pictures of equipment in the basement, first, and second floors. The description of the laboratory and equipment follows the sequence of operation of negative development, "dailies," master and release printing, together with a description of the special printers, processing units, chemical system, silver recovery system, and other mechanical items of interest.

"Modulated High-Frequency Recording as a Means of Determining Conditions for Optimal Processing;" J. O. Baker and D. H. Robinson, *RCA Manufacturing Co., Inc.*, Camden, N. J.

The quality of variable-width sound records depends to a great extent upon image definition. The requirements, therefore, for a perfect sound-track are complete transparency in the clear portion, complete opacity in the dark portions, an extremely sharp boundary between the clear and dark portions, and exact duplication of the wave traced upon the track by the galvanometer.

Distortion is introduced by any change in the average transmission in recording high-frequency waves. At high densities the average transmission is reduced, and at very low densities the average transmission is increased by the presence of

the high-frequency waves. The average transmission is compared to the transmission through the film for a 50 per cent exposed track without signal.

It is possible, therefore, to find a density at which there is little, if any, change in average transmission, and this density corresponds to the most nearly perfect image definition and the least distortion. On an original or negative recording, with the present commercial recording stocks, this density is extremely low, being of the order of 0.6 to 0.8. For the least amount of ground-noise, the negative must be recorded at a much higher density. A change in the average transmission of the negative can be tolerated, since by the proper choice of print density, a condition of minimum distortion in the positive track can be attained.

A modulated high-frequency recording affords an extremely accurate method of determining the correct negative and print densities for any given conditions of laboratory processing. An oscillator, designed for several carrier frequencies, is provided with a 400-cycle modulator for recording. The modulated carrier is recorded for several values of lamp current and processed to give a number of negative densities. Prints are then processed at various values of densities, and the 400-cycle output measured on suitable reproducing equipment. The combination of negative and print densities that gives the least amount of 400-cycle output indicates the condition for best image definition and least distortion.

Care must be exercised in the design and construction of the oscillator to maintain the 400-cycle output to a minimum.

"Possibilities of Stereoscopic Motion Pictures;" G W. Wheelwright, 3d, *Land-Wheelwright Laboratories, Inc.*, Boston, Mass.

The historical background of three-dimensional motion pictures is first discussed, leading up to the requirements of true stereoscopy and a discussion of some of the factors involved, such as overlap, detail, apparent sizes of objects, haze, lighting effects, and two-eye pictures taken eye distance apart. Serious three-dimensional work falls into two classes: (*a*) critical-angle stereoscopy, and (*b*) anaglyph stereoscopy. Under the latter heading falls the use of colors to achieve stereoscopic effects, as in Lumière's work, and Audioscopics, which have several disadvantages; also polarizing anaglyphs, first operated by Anderton in 1893, and most recently through the use of Polaroid.

Advantages to be gained from three-dimensional pictures in color as opposed to single pictures using the same color system are explained. Some of the problems of photographers and theaters in using the polaroid system are discussed, followed by a discussion of the advantages of stereoscopic pictures in dramatic delineation.

"Distortion in the Reproduction of Hill-and-Dale Recording;" M. J. Di Toro, *Research Dept. of Ediphone Division, Thomas A. Edison, Inc.*, West Orange, N. J.

In the reproduction of a hill-and-dale recording, the curve traced by the reproducer stylus differs from the recorded curve, with the consequent introduction of both frequency and amplitude distortion. This distortion is called "tracing distortion," and must be tolerated only in virtue of the physical necessity of a finite tip radius for the reproducer stylus. Curves and formulas are given for the quantitative determination of the harmonic generation and decay in fundamental due to tracing distortion as functions of the amplitude and frequency of the recorded undulation, the linear groove speed, and the tip radius of the repro-

ducer stylus. It is shown that for "constant-velocity" recordings, when the minimum radius of curvature of the recorded undulation is equal to or larger than 5 times the tip radius of the reproducer stylus, the rms. harmonic generation is at most 10 per cent. Moreover, the generation of harmonics is a much more serious limitation upon the quality of the reproduction than is the decay of fundamental frequency, as, for example, in cases where the loss of fundamental is only 2 db., this harmonic generation is prohibitively high, being much greater than 10 per cent.

"Recent Developments in Hill-and-Dale Recorders;" L. Vieth and C. F. Wiebusch, *Bell Telephone Laboratories, Inc.*, New York, N. Y.

A new sound-on-disk recorder has been developed in which is used the principle of feeding part of the output of the system back to the input of the associated driving amplifier in properly controlled relationship. The use of this principle, which is widely used in feedback amplifiers, replaces the usual practice of providing dissipative elements for the control of an electrically driven vibrating system. Heretofore no practical application of feedback to electromechanical systems has been made, possibly because the requirements for stable operation of such systems are difficult of achievement. Through recent developments these requirements have been satisfactorily met. The new recorder is capable of recording on wax or direct recording material without any effect upon its characteristics, which include uniform response from 30 to 12,000 cps. and exceptional freedom from distortion products. The recorder is extremely simple and affords easy means for field calibration from the feedback element whose output is in direct proportion to the stylus velocity. These means also make available a monitoring voltage, which, properly amplified, gives a precise aural picture of the stylus behavior during recording.

"Film Perforation and 96-Cycle Frequency Modulation in Sound-Film Records;" J. Crabtree and W. Herriott, *Bell Telephone Laboratories, Inc.*, New York, N. Y.

When motion picture film is flexed around a cylinder, the film in the region of the sprocket-holes does not follow a smooth curve. In a sound record this leads to frequency distortion of perforation frequency.

"Suggested Standard Nomenclature for Release Print Sound-Tracks;" J. K. Hilliard, *Metro-Golden-Mayer Studios*, Culver City, Calif.

A general description of the following types of movietone sound-track, which are currently being released or will be released in the immediate future according to plans:

(*1*) Standard movietone; (*2*) standard movietone with squeeze- or matted-track; (*3*) standard movietone with double-squeeze or matted-track; (*4*) movietone push-pull; (*5*) movietone push-pull squeeze or matted-track; (*6*) variable-width bilateral with bias; (*7*) variable-width bilateral with shutter; (*8*) variable-width unilateral bias track; (*9*) variable-width push-pull.

During the past year all the above-mentioned tracks have been used to some extent in released movietone pictures. The paper shows samples of the various

types of tracks and gives a general description of their characteristics. A description is also included of the general technic involved in recording and reproducing the so-called "hot and cold" or "*A* and *B*" prints. During the past two years this particular type of print has been used very successfully in extending the volume range of the variable-density release to approximately 50 db. This release is intended to be shown only in theaters having equipment adequate to reproduce music 6 to 10 db. higher than average dialog.

A description of the mechanics and technic for re-recording using the squeeze-track is outlined. This procedure increases the noise reduction from 3 to 6 db., depending upon the amount of squeeze applied.

"Air-Conditioning with Lithium Chloride;" G. A. Kelley, *Surface Combustion Corporation*, Toledo, Ohio.

A system of air-conditioning is described that employs lithium chloride for independently controlling both the relative humidity and the dry-bulb temperature of air. It is used both for comfort air-conditioning and for treating air for industrial processing work.

Lithium chloride is one of the most hygroscopic of inorganic compounds, and the aqueous solution has the property of absorbing moisture from, or adding moisture to, the air, depending upon the vapor pressure difference between the air and the solution. From this it is seen that, by properly controlling the concentration and temperature, the lithium chloride solution is capable of either dehumidifying or humidifying the air, depending upon the requirements. The air is cooled or warmed when passed over an aqueous solution of lithium chloride, depending upon whether the solution is cooler or warmer than the air. Further cooling or warming of the air when desired is attained by using an after-cooling or after-heating coil.

The cycle of air-conditioning is explained and illustrations of an air-conditioning unit are shown. The application of the system to a typical problem of interest to motion picture engineers is discussed and illustrated by means of a schematic flow diagram. Operating data for full-load and for less than full-load conditions show low cost of operation and efficiencies equally as high when operating either at maximum load or at less than maximum load. Washing, deodorizing, and neutralizing bacteria from the air by contact with lithium chloride are important factors where pure clean air is desired.

"The Activated Alumina System as Applied to Air-Conditioning and Drying Problems;" G. L. Simpson, *Pittsburgh Lectrodryer Corp.*, Pittsburgh, Pa.

The phenomenon of adsorption is discussed. Some of the properties of the solid adsorbent, activated alumina, are given.

A dynamic characteristic curve of the adsorbent is included. This characteristic is utilized industrially to dry air and gases to dewpoints as low as −76° C (0.0004 grain per cubic foot; 0.0009 milligram per liter). Apparatus utilizing activated alumina in this way is described and illustrated.

Uses include the drying of controlled atmospheres, bottling gases, and in chemical processing when water vapor would promote corrosion or adversely effect the process. Compressed-air lines are kept free of water to prevent freezing in winter or spoilage of work.

In industrial and comfort air-conditioning, comparatively large quantities of partially dried air are required. A continuous dehumidifier to meet these requirements is described and illustrated.

Performance is a function of machine design as well as of fundamental characteristics of the solid adsorbent used. Depending upon factors of first cost and economy of operation, a wide range of characteristic performance may be obtained. A curve shows the present-day characteristic of a line of machines commercially available.

The humidity in storage rooms and processing departments may be reduced by the simple installation of one of these machines without auxiliary equipment. Combined with cooling and circulation these dehumidifiers may be used effectively in summer air-conditioning installations in industrial and comfort applications.

In the manufacture of film base, water vapor may be deposited in the material by cooling due to solvent evaporation. This is avoided by using dehumidified air in the process.

Some substances can not be heated much above room temperature without damage. Humid summer air has too high an absolute humidity to accomplish satisfactory drying without raising the temperature beyond this limit. Dehumidified air fed to drying cabinets or tray dryers solves the problem. Uniformity of drying conditions may also be achieved by controllably dehumidifying the input air to drying systems.

"Die Castings and Their Application to Photographic Appliances;" J. C. Fox, *Doehler Die Casting Co.*, Toledo, Ohio.

Die castings are defined as castings made by forcing molten metal into a metallic mold or die. The alloy most generally used is of the zinc base type, having a tensile strength of approximately 40,000 lbs. per sq. inch. For photographic appliances, the alloys of lower specific gravity are more desirable. Aluminum base alloys are used more extensively in photographic appliances for that reason. Physical properties of various aluminum die casting alloys are given.

Since low specific gravity is of prime importance in castings used for photographic appliances, the development of the process of die casting the lightest of all commercial metals, magnesium, is of particular interest to motion picture engineers. Magnesium is one-third lighter than aluminum, and magnesium die castings are now being used wherever light weight is important. Physical properties of magnesium die castings are given. Reference is also made to the die casting of brass and German silver, recently developed.

Report of the Standards Committee; E. K. Carver, *Chairman.*

There have been but two meetings of the Standards Committee since the last report. During the summer, fourteen new drawings have been completed, covering 8-mm. film standards, revision of the drawings for sprockets, and reels for 35-mm., 16-mm., and 8-mm. film, but only preliminary discussion of them has occurred.

The Standards Committee has given initial approval to the dimension 0.15 mm. for the space separating the two halves of the push-pull sound-track, but the balloting is not yet complete.

"The Use of Inconel for Photographic Film-Processing Equipment;" G. L. Cox, *International Nickel Co.*, New York, N. Y.

The general corrosion resistance of Inconel, making it useful in film processing, is discussed. Typical applications with significant service data are described. Special reference is made to the outstanding usefulness of Inconel in the preparation of the sensitized plate, fixing, toning, intensification, and reduction operations. The well established uses of nickel and Monel for developing operations are briefly discussed.

"Newer Types of Stainless Steel and Their Applications to Photographic Processing Equipment;" H. A. Smith, *Republic Steel Corp.*, Massillon, Ohio.

Within the last three years, two new types of stainless steel have been developed: (*1*) type *315* which contains approximately 18% chromium, 8% nickel, 1.5% copper, and 1.5% molybdenum; and (*2*) a modification of type *316* (the usual 18-8S Mo) where the molybdenum content has been raised to from 3 to 4% molybdenum. Considerable test data are now available for type *329*, containing approximately 27% chromium, 4.5% nickel, and 1.5% molybdenum. The latter steel shows promise in that pit-corrosion tendency is considerably reduced. Satisfactory welds may also be made with this type. From the corrosion-resisting standpoint, three other compositions are discussed: type *309*, 24% chromium, 13% nickel; type *310*, 25% chromium, 20% nickel; and type *446*, 27% chromium.

Electrochemical potential curves are given showing the behavior of these types of steel in hypo and developer solutions. A table of the position of these stainless steels in the electrochemical potential series is given.

It is pointed out that a polished (No. *6*) and a finely ground (No. *4*) finish are more corrosion-resistant than a pickled finish, not only from the potential standpoint but due to the decreased possibility of their collecting foreign matter that will accelerate corrosive attack.

"Vacuum-Tube Engineering for Motion Pictures;" L. C. Hollands and A. M. Glover, *RCA Radiotron Division, RCA Manufacturing Company, Inc.*, Harrison, N. J.

Manufacturing and developmental technics of vacuum tubes are described with particular reference to their use in motion picture equipment. A brief discussion of how application requirements affect the choice of materials, structural design, and electrical characteristics of phototubes and amplifiers of both power and voltage types is included. How tubes are designed to meet specific needs is illustrated by reference to recent tube developments. Work on producing tubes having low-hum, low-microphonic, and low-noise characteristics is described as of special interest to the motion picture engineer. The paper closes with recommendations as to how to use vacuum tubes to best advantage.

"Spectral Distributions and Color-Temperatures of the Radiant Energy from Carbon Arcs Used in the Motion Picture Industry;" F. T. Bowditch and A. C. Downes, *National Carbon Co., Inc.*, Cleveland, Ohio.

Color-temperatures of various carbon arcs have been calculated from spectral energy data. The dominant wavelength and per cent purity of each arc are given with reference to both "average daylight" and "noon June sunlight."

It is pointed out that the color-temperatures of these carbon arc light-sources are of value in comparing them upon a visual basis only. The effects of the radiant energy from the arcs upon any photosensitive medium other than the human eye (for example, photographic film) are very different from the visual impression.

Spectral energy distribution curves of several carbon arc sources are published for the first time.

"Recent Developments in Background Projection;" G. G. Popovici, New York, N. Y.

The complexity of the background projection process is generally known. It has been widely applied in cinematography with great success. A new field offers tremendous opportunity, namely, still photography. Two types of background projectors are described, one to cover screens up to 10×12 feet, the other to cover screens up to 13×18 feet. During the research stage, some very interesting facts have been observed. The following elements of the problem are discussed:

(*1*) The spot condition: what causes it and how to reduce it successfully, even eliminating it entirely in specific cases. (*2*) Screen textures: nitrate or acetate base sprayed with polarizing material for diffusion (flatlight type); the new Trans-Lux screen of the high-transmission type. (*3*) Theory of light refraction through screen. (*4*) Light brightness *vs.* diffusion of screen. (*5*) Optical conditions, condensers, objective lenses, *etc.* (*6*) Light-source proper: brightness *vs.* current, behavior of different types of carbons; spectral consideration in color projection. (*7*) Cooling the slides with air, a novel method incorporating refrigerated air for the super-projector. (*8*) Projector electrical, optical, air-operating characteristics, including remote control of arc, douser, air-cooling system.

"A Method of Enlarging the Visual Field of the Motion Picture Screen;" B. Schlanger, New York, N. Y.

Recent trends toward the smaller sized motion picture audience indicate that new considerations can be given to the possibility of a larger and differently shaped screen, retaining the 35-mm. film. The screen is pictured as completely occupying the entire forefront of the motion picture auditorium, becoming a space stage instead of an artificially framed picture.

"Recent Developments in Gaseous Discharge Lamps;" S. Dushman, *Research Laboratory, General Electric Company,* Schenectady, N. Y.

The luminous and electrical characteristics of a number of vapor discharge lamps which have attained practical importance in recent years are described. These include the sodium vapor lamp, the high-intensity mercury vapor lamp, and the high-pressure quartz capillary lamp. The fundamental physical phenomena and the manner in which these effect the light output and efficiency are discussed briefly. The effect of variations in gas pressure and current density upon the distribution of intensity in the spectrum is dealt with, and also the accompanying changes in intrinsic brilliancy and color of light emitted.

The latter part of the paper contains a discussion of recent developments in the utilization of fluorescent materials in gaseous discharge lamps. These lamps

offer interesting possibilities from the point of view of general illumination and special color effects.

Report of the Studio Lighting Committee; R. E. Farnham, *Chairman.*

The past year has witnessed unusual advances in both studio lighting equipment and technic of lighting, second only to the famous 1928 period when the studios adopted incandescent lighting.

Cameramen are entering an era of "precision" lighting. Highlights and shadows are carefully balanced with dimmers as well as by placement of the units. This calls for equipment giving more accurate light control. The influence of lighting for color is creating a greater appreciation upon the part of cameramen of the color-quality of the light in black-and-white photography.

The report also describes the development of a satisfactory filter of extreme accuracy, making possible the use of incandescent lamps of the *CP* type for Technicolor photography, either alone or when mixed with other suitable illuminants.

"Grading Projectionists;" G. P. Barber, *Government of the Province of Alberta,* Edmonton, Alberta, Canada.

Advanced methods of licensing projectionists in the Province of Alberta are described, with some comments on the apparent benefits derived from the process. The process of becoming a first-class projectionist requires a licensed apprenticeship of at least twelve months, followed by one year as third-class and, later, one year as second-class projectionist before taking final examination for a first-class license. Each period, except apprenticeship, is preceded by a thorough examination.

"Coöperation as the Keynote of Projection Service;" T. P. Hover, *Warner's Ohio Theater,* Lima, Ohio.

It has been pointed out that engineers as a group are backward in dealing with problems involving the human element. They would rather deal with things than persons. They can not be blamed for this attitude, however, because most engineering problems can be solved by definite formulas and procedures, while problems dealing with the human element seldom follow the expected path.

This human element is a vital consideration in the successful operation of a theater that requires that sound and projection equipment be maintained in first-class condition at all times.

Plans and ideas that have aided us in maintaining a high standard of projection in Lima are presented. Since the city is more than 150 miles from the nearest parts-supply company, a well planned system of mutual coöperation is of the greatest importance in order to prevent shut-downs with attendant loss of money and good-will. The success of the plans over a period of ten years recommends it to the consideration of other projectionists' organizations that are more or less isolated from repair and emergency engineering facilities.

A Discussion of Screen-Image Dimensions; F. H. Richardson, New York, N. Y.

An argument is presented for recommended standard screen-image proportions based upon the dimensions and brightness that will provide most comfortable viewing conditions at the center of the theater seating space. It proposes that

such compromise would tend to best average viewing conditions and, therefore, least eye-strain and most enjoyment for the audience as a whole.

"Precision All-Metal Reflector for Use with Projection Arcs;" C. E. Shultz, *Heyer-Shultz, Inc.*, Montclair, N. J.

The peculiar characteristics of an all-metal reflector are discussed regarding its resistance to tarnish, pitting, breakage, and heat. Comparison is made between the present standard glass reflector and this new type as to reflectivity, dependability, accuracy, color-response, and longevity.

"Perforated Screens and Their Faults;" F. H. Richardson, New York, N. Y.

Certain faults of perforated screens are discussed, particularly with relation to imperfection in perforations. The question is raised as to what extent the faulty perforations, as illustrated by slides, may be detrimental to sound quality in theaters.

"Commercial Sixteen-Millimeter Projection Faults;" C. L. Greene, Minneapolis, Minn.

Because commercial motion pictures on 16-mm. film are an outgrowth of "home movies," the standards of projection are low. Less care is given to their proper presentation than in the case of theatrical showings of 35-mm. film; whereas, because of the greater overall magnification, greater care should be given. Some of the more glaring faults are treated in detail, a general treatment is set forth, and the importance of proper presentation is clarified by comparison of show-windows of the street and of the screen.

"The Sound-Level Meter in the Motion Picture Industry;" H. H. Scott and L. E. Packard, *General Radio Company*, Cambridge, Mass.

The modern sound-level meter may be used as a convenient means for making a large number of measurements of value to the motion picture industry. Recent designs featuring light weight, small size, and convenience of control make modern sound-level meters particularly well adapted for such purposes.

Among the many possible uses are: measuring noise-levels in studios and theaters; measuring noise made by ventilating equipment, cameras, or projection equipment; measuring background noise-level from reproducing system; checking overall frequency response of reproducing system; checking variation in frequency-response throughout auditorium; checking level of reproduction in auditorium; *etc.* Typical data are presented showing results obtained in a theater.

"New Ideas in Mobile Sound-Recording Equipment;" J. G. Matthews and C. M. Ralph, *General Service Studios, Inc.*, Hollywood, Calif.

An extensive rental service, in addition to the usual studio facilities, has created at General Service Studios, Inc., a demand for sound-recording equipment that is unusually broad in scope. Portability requirements range from completely portable "trunk" equipments to mobile recording and re-recording rooms having a high degree of comfort and convenience. Operating requirements impose the need for twenty-four-hour-per-day service, at times, from any one of a number of

power sources. At the same time, in consideration of the rental aspect, simplicity and fool-proof operation were found to be essential.

The requirement for a mobile recording room has been met very economically and advantageously by the use of a cabin type of trailer. Features of the equipment are: complete operation from a-c. supply on the lot, darkroom facilities, simplicity of operation, adequate storage space, comfort, and appearance. The multiple-channel re-recording trailer is designed along similar lines and is a versatile unit which, with its signaling and remote control systems, permits its use with all other recording equipment to form a complete channel.

The requirements for all degrees of portability on location work have been excellently met by the adaptation of a portable recording channel to a two-ton, standard-body truck. From a utility standpoint this channel incorporates many design features that make its use highly desirable for this class of service. The recording console is standard with that in the recording trailer. An internal battery-motor-generator power-supply allows three-day location operation without recharging. When available, three-phase alternating current allows full channel and motor system operation for any length of time desired. Channel operation is possible on single-phase alternating current. Three-phase motor systems expedite recording. The equipment is removable from the truck for extreme, "trunk" channel portability. Changes from one recording condition to another are accomplished by one master switch.

Such novel features as have been incorporated in the trailer and truck equipment seem, thus far, to have been well justified.

"A Mobile Sound-Recording Channel;" L. T. Goldsmith and B. F. Ryan, *Warner Brothers Pictures, Inc.*, Burbank, Calif.

A location-truck recording channel is described that incorporates the latest equipment and operating features. All the advantages and facilities of a fixed installation are retained in the unit without sacrificing its mobility or simplicity of operation.

The equipment used was built for Warner Bros. by the RCA Manufacturing Company. Recordings are of either the standard bilateral or push-pull variable-width type, and are made using ultraviolet exposure of the film. High-quality circuits are used from microphones to the recording machine. Monitoring is accomplished with high-speed volume indicators and high-fidelity head-phones.

Facilities are provided for operating the portable mixer case either inside the truck or remotely at distances up to 1000 feet. A collapsible duralumin microphone pole is carried, and several wind and rain screens are provided to permit recording under adverse conditions.

Disk or film playback equipment can be operated from the truck and recordings made at normal road speed if desired. The unit is quiet in operation so that it may be used close to the action on the set.

"A Device for Cleaning the Sound-Track of Motion Picture Film during Projection;" R. J. Fisher, *Flower City Specialty Co.*, Rochester, N. Y.

A description is given of a device for cleaning the sound-track or zone on which sound is recorded. It comprises a compact attachment applicable to all existing projectors without alteration of the projector mechanism, which is simple and

sturdy in operation. Its object is to improve the reproduction of recorded sound by removing completely all dirt, dust, and lint lodging on the sound-track during the process of projection, rewinding, and shipping.

"Reduction of Loop-Length Variations in Non-Slip Printers;" E. W. Kellogg, *RCA Manufacturing Co., Inc.*, Camden, N. J.

Compensation for varying degrees of film shrinkage is accomplished in the Bedford non-slip printer by changes in the length of a loop of film between a sprocket and the printing point. This involves uncertainty of synchronism by the amount that the loop, as first threaded, differs in length from the final running loop. For most purposes, the present designs do not cause more change in loop-length than may be readily tolerated.

For certain purposes, especially if this type of printer is to be employed for 16-mm. films, there may be too much departure for synchronism. A guide-roller arrangement is described by which the necessary change of angle of approach of the raw stock to the printing point is attained with comparatively small change in loop-length.

Several possible arrangements are considered and some other features of the non-slip printer are discussed.

"A Recorder for Making Buzz-Track;" E. W. Kellogg, *RCA Manufacturing Co., Inc.*, Camden, N. J.

The only requirements of a buzz-track are that the track be of correct width and properly located with respect to the edge of the film nearest the track, and that the sound produced by a weave in one direction shall be readily distinguishable from that which results when the film is displaced in the other direction.

It is better that the buzz-track film should be a direct recording rather than a print, since there is less chance of inaccurate location. A simple recorder has been constructed for the sole purpose of making buzz-track film. It can readily be converted for 16-mm. All possible precautions are taken to insure correct track width and location.

In view of the small quantity of buzz-track required, it is contemplated that only one such machine will be needed.

"Recording Tests on Some Recent High-Resolution Experimental Emulsions;" J. O. Baker, *RCA Manufacturing Co., Inc.*, Camden, N. J.

The effect of, and conditions for, image definition in variable-width sound-recording are discussed in a separate paper, "Modulated High-Frequency Recording as a Means of Determining Conditions for Optimal Processing," also presented at this Convention. There it is shown that the present commercial sound-recording emulsions have the least distortion at very low density, accompanied by an undesirable amount of ground-noise if used as a positive.

A new experimental emulsion, *E.K. 0-7461-1*, differs from present emulsions in that it has extremely high resolution and minimum distortion at a density of approximately 1.5.

The speed of this emulsion is less than that of regular recording stocks, but since it is used with white light and no filter is required, sufficient densities are readily attained with present optical systems. These characteristics offer possibilities heretofore not attainable.

The high-resolution, low image-spread and low film-hiss of this emulsion makes possible recording a positive sound-track that can be played directly, thus eliminating the distortion usually introduced in the printing process and the ground-noise contributed by the negative.

The advantage of using this emulsion for direct playbacks will be realized whether the recording is standard, Class *A* push-pull or Class *B* push-pull. The inherent perfection of image definition in the new emulsion means increased processing tolerances in adjusting the Class *B* system for perfect cross-over between the negative and positive half-waves.

It is not at present feasible to use this emulsion as a negative for making prints on positive stock. For special sound-films without pictures, the new emulsion may be used for a printed positive, using a negative made on the same stock, provided the printer losses are not excessive.