NEW MOTION PICTURE APPARATUS

During the Conventions of the Society, symposiums on new motion picture apparatus and materials are held in which various manufacturers of equipment describe and demonstrate their new products and developments. Some of this equipment is described in the following pages; the remainder will be published in subsequent issues of the Journal.

NEW IDEAS IN MOBILE SOUND RECORDING EQUIPMENT*

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STUDIO UNITS

The sound recording facilities of the average motion picture studio consist usually of fixed channels for stage and backlot production and several trucks for location use. For different locations and special work, some studios have supplemented this basic equipment with portable channels. Even greater flexibility than this standard equipment affords is required by a studio whose principal commodity is *sound* and whose business is largely that of furnishing sound equipment and service to a number of independent producers.

Since cost is a paramount consideration of the independents, a method of operation must be established that utilizes lower cost equipment wherever possible, keeps maintenance and overhead at a minimum, and puts every piece of equipment in almost constant use to permit a rental rate that this type of production can afford. Curtailed shooting schedules place an unusual demand upon equipment, which must provide flexibility sufficient for frequent moves; must be adequate as to power supply, to withstand long hours of uninterrupted service; and must be easily maintained.

Upon enlarging our activities in this field, several major decisions had to be made before embarking upon a rather extensive construction program. The Western Electric *Q* channel was chosen as the most suitable type of equipment for this service. It is small, light in weight, all a-c. operated, and neat and modern in appearance; and since it was designed primarily as a portable channel, its individual units are complete in themselves and easily interchangeable—an important consideration for maintenance. The compactness of the apparatus permits its installation in such manner that every key and switch is within reach of a seated operator. It was anticipated that the concentrated nature of this equipment would allow the use of standard body location units, described later.

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Since about 60 to 80 per cent of picture production takes place upon stages or within lot boundaries, it appeared that considerable saving in investment could be realized by designing a unit for this particular purpose, eliminating the expensive and bulky equipment necessary for independent operation away from power supply. The now commonly available house-trailer was suggested as ideal for this work, having additional advantages over trucks in lower first-cost and practically no mechanical maintenance.

This idea was adopted, and five units were purchased with two towing cars. The latter serve also as delivery and standby cars, one being equipped with complete portable testing apparatus for maintenance department routine and emergency use; consequently, these two self-mobile units fulfill the important requirement for maximum operating efficiency—constant use (Fig. 1).

The trailers selected were the best that could be obtained: well constructed, with steel chassis, hardwood frame, and all-steel body welded throughout; and

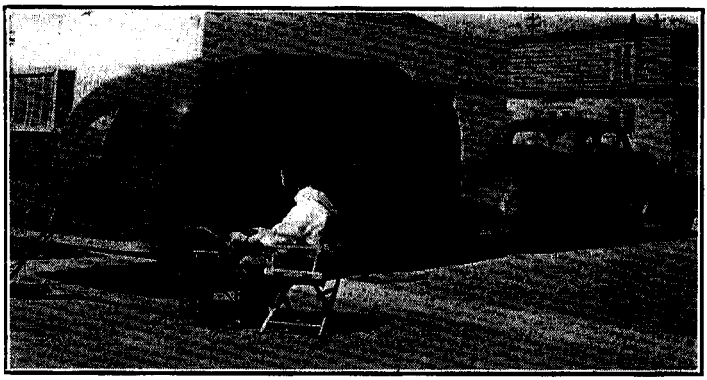

FIG. 1. Exterior view of sound trailer for studio use, showing monitor stand.

present a neat appearance in keeping with modern automobile design. Certain modifications from the manufacturer's usual model were specified: the chassis was reinforced for greater load capacities, heavier springs and tires were provided, some windows were blanked out, storage space and cable reel openings were cut in the rear deck, and more efficient heat and sound insulation (dry-zero) used. The trailers were received without the usual household interiors, all cabinet work being added on the General Service lot.

The sound recording equipment was arranged in a console, as shown in Fig. 2, at the front end of the trailer, care being taken to locate each piece of equipment for most convenient operation. The operator sits directly in front of the recorder and has all controls within easy reach at either side. The standard cable connections of the *Q* channel are retained, but are completely concealed behind the console. The equipment is installed so as to appear as a permanently mounted channel, but each individual unit is readily removable from the front for repair, replacement or servicing. The recordist has before him the main amplifier and

noise-reduction unit on his right, and the recorder control panel and auxiliary panel on his left. The latter carries the motor-start switch, signals, clock, and monitor-amplifier controls. The monitor speaker is directly above and the two power units for *A* and *B* supply are on each side below the table.

A built-in bench on one side of the trailer contains drawers and cabinets providing ample storage space for spare parts and auxiliary operating equipment. At the rear on the opposite side is a darkroom for magazine loading, which is complete enough to allow breaking down "OK" takes, where that method of handling negative is used. The whole interior is done in a modern motif, lighting being provided by lumiline lamps behind frosted glass flush panels.

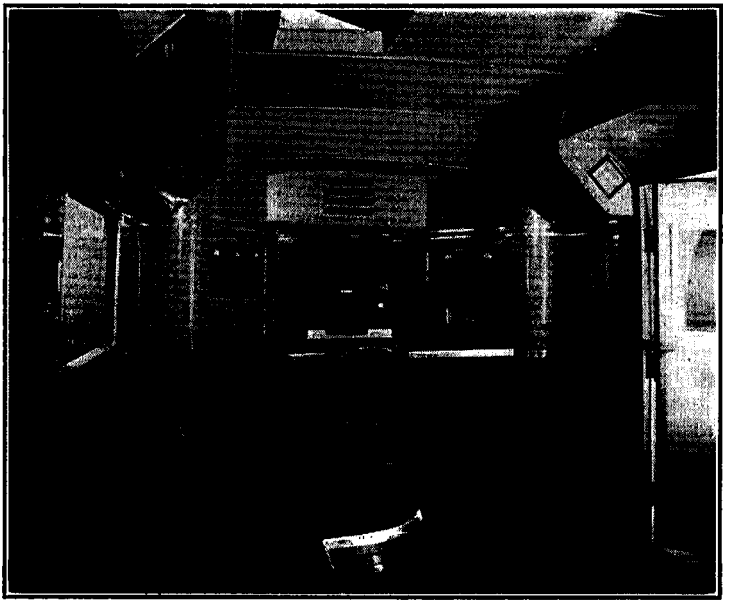

FIG. 2. Interior of truck showing sound recorder and controls.

The power-supply chosen as the most logical single source was 220-volt, three-phase a-c. 60-cycle, which is available on most lots and is required for most camera motors and provides the best regulation. The recorder motor is three-phase synchronous, and slow acceleration is accomplished by the line resistance method, the resistors being shunted by a compound relay when the motor is up to synchronous speed. Two 220–110-volt transformers are used: one 1-kva. for lighting, ventilating, convenience outlets, *etc.*, and one 2.5-kva. for supplying current to the power units. The power unit feeding the noise-reduction unit is operated through a Raytheon voltage regulator to prevent bias fluctuations. The transformers, voltage regulator, and fuse-box are mounted in a compartment at the rear of the trailer. A panel in this compartment mounts the entrance

plugs and jacks, providing transmission and signal to the mixer, power supply, and remote-control motor line. The latter is used when it is desired to start the recorder from some other point (as in re-recording set-ups) or on 50-cycle lots, in which case a frequency converter is placed in the line. The power units will operate on either 50 or 60 cycles.

Cable reels are mounted inside the trailer at the rear, accessible through trap-doors in the rear deck, and cranked through holes in the side. One man can reel or unreel cable unaided. A mixer stand of unusual design to support the pick-up unit at a convenient height and a "fish-pole" type of microphone boom complete the equipment carried on the trailer, thus providing the producer with a complete high-quality sound recording channel right on his own lot for the duration of the picture.

The success in adapting the trailer to producing work led immediately to its consideration as a portable re-recording "room." It is of decided advantage for a producer to re-record on his own lot, where his cutting rooms are handy for last-minute changes, and where he can monitor the completed picture in a room to which he is accustomed. The plan now in process is to transform the customer's largest review room into a re-recording monitor room, by merely providing trunking facilities to a point where a re-recording and a recording trailer can be plugged in. Thus, duplication of expensive and relatively little-used equipment on each lot is avoided, and by having all producers so equipped, the mobile apparatus is kept in maximum use.

The re-recording trailer has four *RA-1010* ERPI re-recordng machines mounted in it with rewind and loop-running attachments, cutting facilities, blooping equipment, *etc.* This equipment is again all a-c. operated from three-phase, 220-volt supply, the exciter lamp supply being obtained from a three-phase rectifier with floating battery and *B* supply from a separate power unit. The trailer also carries special mixer and equalizer units. Six tracks may be handled, including two on the review room projectors. Review rooms for use with this equipment must therefore have double-film attachments, a distributor system for interlocking all motors (synchronously driven so as to correspond in speed to the recorder), and a mixer desk containing proper cables for terminating the mixer and equalizer units with a jack field for selecting tracks on various potentiometers in accordance with the equalizing treatment necessary. The special equalizer unit, built by Electrical Research Products, Inc., after our specifications, contains two high and low-frequency equalizers, a radio and telephone effect filter, and a variable high-pass filter, all of which may be placed in any of four tracks or in the output line. It is possible to insert these in the middle of a take without circuit disturbance, or an equalizer may be transferred from one track to another at any time.

LOCATION UNITS

The field or location unit requirements for this class of work include the usual facilities for complete sound channel and motor system operation at points remote from the studio and from available external sources of power supply. In addition, however, demands are frequently met that are not usually encountered elsewhere. Portability requirements range from completely portable "trunk" equipments to highly self-contained location truck channels. Operating require-

ments impose the need for the strictest economy of production time, under adverse conditions, together with twenty-four-hour-per-day service, at times, from any one of a number of different power sources.

This degree of portability and operational flexibility has been excellently met by the adaptation of a portable recording channel to a two-ton standard body truck. The Western Electric *Q* channel was found highly adaptable, and fulfilled the requirements for completely portable use. With adequate care in the physical and electrical arrangement it was found possible to have this combination result in a small, light and extremely mobile truck affording, as well, comfortable and convenient quarters for the operator. Figs. 3 and 4 show the exterior of the truck and the interior of the recording compartment.

FIG. 3. Exterior view of sound-truck for location work.

The provisions for power supply, to be mentioned in more detail later, make possible complete production operation under the following conditions:

(*1*) Where the production is remote from the conventional sources of power the basic power is derived from a bank of storage-batteries having a capacity for three-day operation.

(*2*) Where three-phase, 220-volt alternating current is available, the entire channel and motor system can be operated from this source. This condition allows for recharging of the storage-batteries.

(*3*) Where 110-volt single-phase alternating current alone is available, the entire channel can be operated from this source. The motor system power is then supplied basically from the storage battery.

(*4*) Where operation must be carried on even remote from the truck itself, the channel is operated on dry-cell batteries, and a different (d-c, interlock) motor system is used allowing small portable storage-batteries.

A general description of the channel naturally divides itself into the items of major interest. These are the storage-battery to alternating-current motor-generator, the power switching and distribution system, the motor system, the battery charger ventilation, the recording console, and the operating facilities. Fig. 5 illustrates in simplified form the general electrical arrangement.

For conversion of the storage-battery power into the required alternating current for operating the motor system and, at times, the channel, a two-bearing, 1800-rpm. motor-generator is used. This is driven on the motor end from a 36-volt storage-battery, and generates on the alternator end 220-volt three-phase

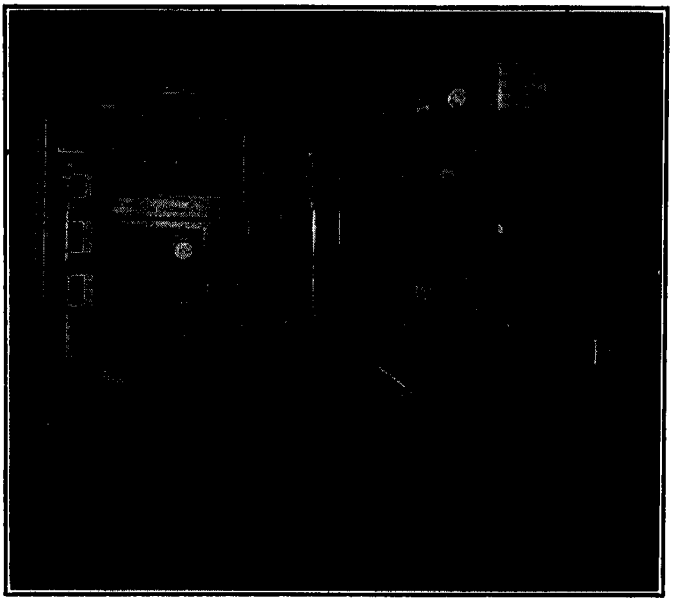

FIG. 4. Interior of location sound-truck.

alternating current. For the uninterrupted recording of film footages totaling twenty thousand feet while operating the sound recorder, two cameras, and occasionally a playback, it was found necessary to use a 2-hp. 2600-volt-ampere motor-generator and a 288-ampere-hour storage-battery. The machine is placed under the recordist's seat, shown in Figs. 4 and 6, and is supported directly upon the truck chassis through a series of rubber vibration absorbers. Due to this method of mounting and because of an efficient system of sound-proofing the inside of the generator compartment, vibration is entirely lacking and noise from the machine is inaudible at a distance of ten to fifteen feet. Continuous operation is possible due to forced-draft ventilation of the generator compartment. The design is such that the camera and recorder motors remain connected to the alternator through line switches, and are put into operation simultaneously with

the motor-generator by means of its automatic starter and a push-button control station convenient to the operator.

A main switching panel occupies a convenient and unobtrusive position in the recorder's compartment. Reference to Fig. 4 shows the general appearance of this panel and its position on the left-hand wall of the compartment. This switch panel is, in effect, the control center of the channel. The switches are of the multiple jack-and-plug type, allowing manipulation of a large number of circuits by the simple operation of moving the plug from one position to another. This type of switch affords definite and high current-carrying capacity of the contacts and obviates the necessity for relays. From an operational standpoint

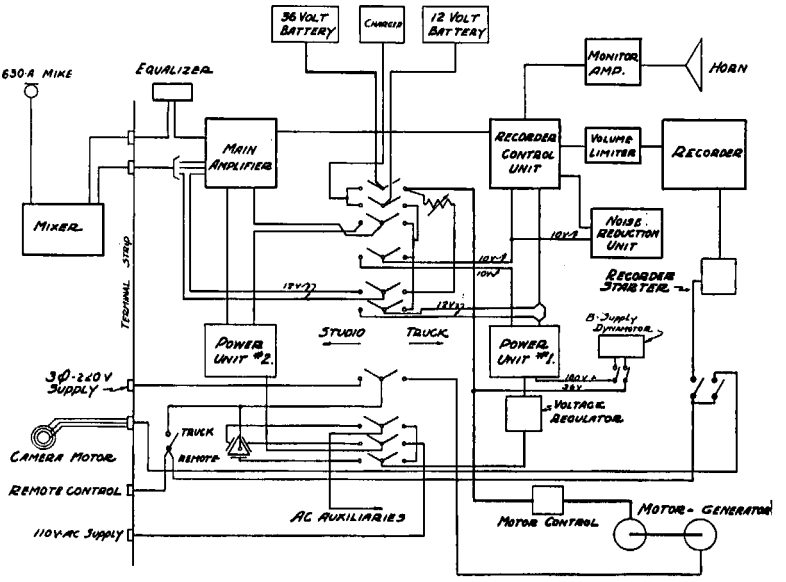

FIG. 5. "Q" circuit diagram, for truck.

this switching arrangement allows no opportunity for error in setting up the channel, as there is one position of the master switch plug for each condition of operation, as mentioned in the preceding paragraphs. As an example of the functions of this master switch, the following switching is accomplished when changing the channel from internal truck power operation to external three-phase power-line operation: transfer of the main-line three-phase from the alternator to the power inlet jack in the rear; transfer of the channel tube heaters from the storage-battery to power units; transfer of the plate circuit supply from auxiliary generator to the power units, connection of the power units to the power supply, transfer of the heater supply filter from the battery circuit to the power unit circuit, and other minor switching operations. This simplicity of operation has been found of value particularly when encountering uninitiated operators in rental service. In addition to switching, this panel is also the central location of

all fuses for the truck to minimize delays from this source. Circuit testing and trouble shooting are also facilitated, as the junction box associated with the panel forms an electrical center from which all the circuits are distributed.

Recharging the storage-batteries is accomplished by means of a battery-charger installed on the truck. The charger was specially built for the purpose and incorporates the conventional tube rectifiers. The maximum charging rate is 30 amperes. Two batteries, one a 36-volt and one a 12-volt, constitute the complete battery equipment. No other batteries, either wet or dry, are used.* In-

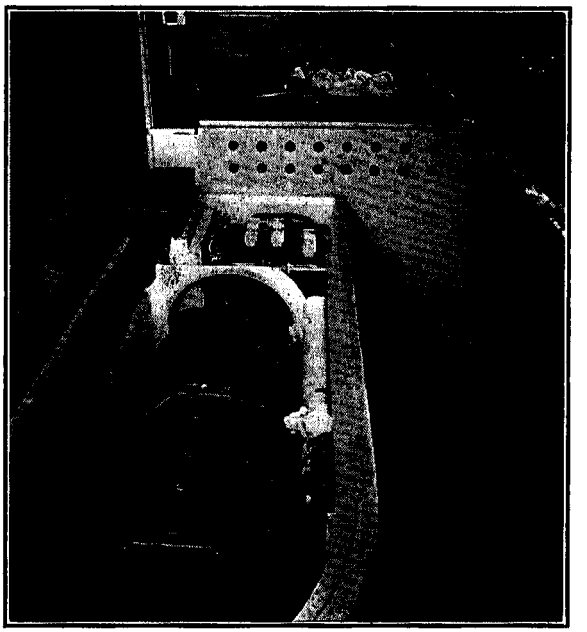

FIG. 6. Method of supporting motors.

sertion of the battery-charging plug at the top of the main switch panel selects for charge either the 12-volt, 36-volt, or both batteries. Simultaneous charging of the two batteries at different charging rates is also possible. Ventilation of the truck, for the removal of battery fumes, *etc.*, is accomplished by means of a motor-driven ceiling ventilator, which is automatically turned on whenever the charger is put into operation. At other times it is under the control of the operator.

The recording console is constructed similarly to the one described for the trailer. Removal of the equipment is thus possible for strictly portable work and

* Exception is order-wire dry-cells.

for interchangeability in maintenance. Standardization of the equipment in the light of appearance, layout, and operating routine was kept in mind throughout the design. By virtue of this it has been possible to establish standard operating routines for all the equipments.

The use of the truck channel in actual production has, thus far, shown it to be a very reliable and versatile unit. Cable extensions of the order of a thousand feet are common. Maximum freedom from trouble has been attempted by providing an alternate channel *A* and *B* voltage supply for use in the event of the failure of the conventional one. This is accomplished by switching to total a-c. power unit operation using the battery-driven alternator as a source of supply. However, continuous operation in this manner for extended periods is not practicable because of excessive demand on the 36-volt storage-battery and the driving motor of the generating plant.

The equipment has proved quite equal to the demands made upon it by the fast-moving location work that we encounter. In many instances the ratio of "moves" (or changes in production set-up and location) to scenes shot is of the order of one to two. This means high-speed manipulation to avoid delays. In such instances it is customary to operate with the extended mixer either on or within the truck. With this condition the sound equipment is continually ready to operate at any spot simply by extending a microphone and motor cable a few feet to the scene of the dialog. This on-the-set operation is made possible by the quietness of the truck power plant. Sound and vibration absorption were design objectives in the construction of the generator compartment and the installation of the sound recorder. Fig. 6 shows the interior of the compartment and illustrates the use of acoustic material, vibration-free mounting, and through ventilation.

Input and output connections to the truck for the purpose of connecting pick-up equipment, motor systems, signal systems, testing equipment, power lines, auxiliary equipment, *etc.*, are located at the rear of the body below the doors and are accessible at all times. This terminal box provides storage space for all equipment used external to the truck.

The synchronous-motor type of driving system was adopted for the camera and recorder. Its use was dictated by a number of considerations, namely, necessity for 1000-foot or longer motor-cable extensions, minimum of control equipment, economy of motor-cable conductors, and flexibility of speed control. The latter feature is accomplished by means of preadjusted armature and field resistors controlled by switches. Speed changes can be made from 24 frames to 22, 20, or 18 during a take, as is often required in "Westerns" to speed up the action.

Many companies operate intermittently on and off the studio lot in the course of a day or week, and in such cases the truck has proved itself very useful. While on the lot it can be used as a studio channel operating entirely on the lot's commercial power supply. This gives opportunity for replenishing the storage-batteries and allows quick moves to outside locations.

Transmission, power, and signal cable connections on the rear terminal strip of the truck allow its use to be interchangeable with that of the recording trailer as the recording unit of a mobile re-recording or scoring set-up. In this class of service the recorder can be remotely controlled from the projection booth and the operation interlocked by a system of signal lights.

Interchangeability, not only between individual pieces of apparatus but between whole units, truck or trailer, is one of the most valuable operational assets of this new equipment. When scheduling necessitates, a complete switch of equipment may be made without confusing the recordist with a new operating layout, or annoying the mixer with a different monitor, or irritating the producer by variation in quality of the product.

In closing, we wish to thank Mr. D. C. Hickson for valuable contributions to the physical appearance of the units and for the original suggestion of the use of trailers; our thanks also to J. R. Whitney and our colleagues, W. W. Lindsay, Jr., and R. S. Clayton for advice and collaboration in the design details.

A NEW MOTION PICTURE CAMERA CRANE*

E. H. HEYER AND E. L. FISCHER**

During the last fifteen years there has been considerable change in camera technic for motion picture production. The rather unnatural effect of cutting from long shots to close-ups has been avoided more and more by perambulating the camera from one position to another during the shot. In general, rolling tripods, camera dollies, and perambulating platforms are in use now for nearly all types of scenes. With more elaborate sets being designed every day, dialog and action becoming faster, more effective camera angles and pictorial effects being wanted, there was a need for more efficient perambulating apparatus to move camera and cameraman into the exact positions from which to take the most effective shots.

This problem is effectively solved by the so-called camera crane, of which several are in use in the major Hollywood studios. In common with previous designs, the new Universal camera crane shown in Fig. 1 provides the cameraman and his camera almost unlimited freedom of motion, up or down, left or right, backward, forward, or pivotal. This great freedom of motion facilitates following the actors up and down stairs, lifting away over props, arc lamps, and furniture, and most important, it affords the cameraman a new artistic means of increasing or diminishing the audience's field of view at any rate and from any direction desired.

Common also with its predecessors are the following general design features of the crane: A rigid structural boom supports upon its front end a camera carriage whose horizontal condition is maintained by a parallelogram mechanism joining it to two points of the central supporting post. The opposite end of the boom carries a balancing weight-box fitted with handles by which the operator swings the crane left and right or up and down. A catwalk supports the operator at a convenient height for reaching the handles, and may be extended, when desired, completely around the crane to accommodate large rotational movements. The

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