March 15, 1960 J. STRAUSS 2,928,311

METHOD AND APPARATUS FOR PRODUCING MOTION PICTURE FILMS

Filed Nov. 13, 1950 5 Sheets-Sheet 1

Fig. 1

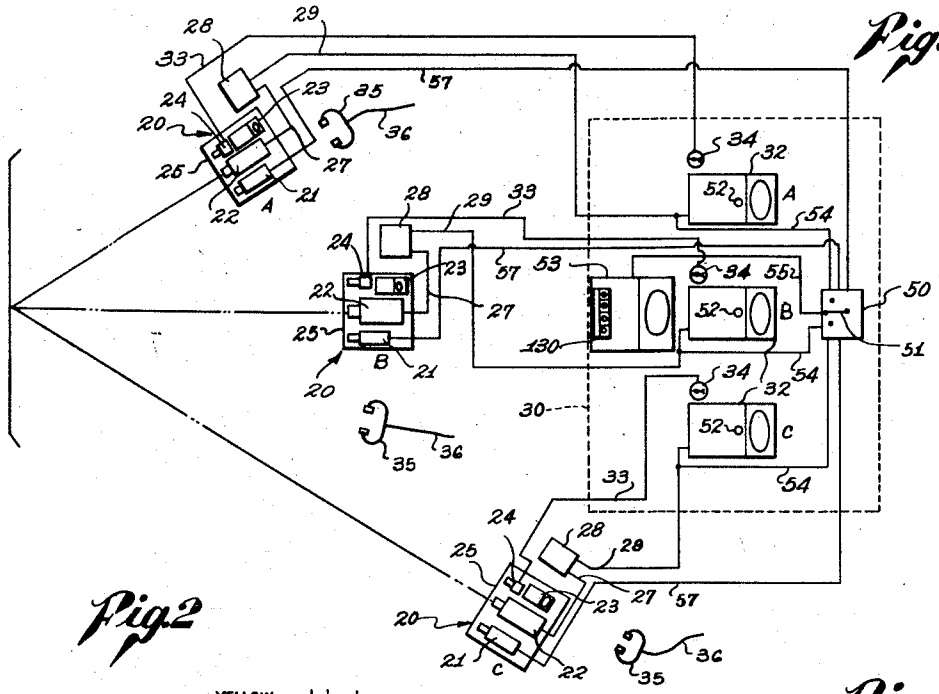


Fig. 2

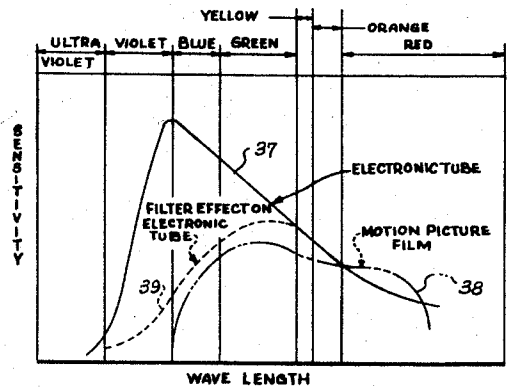


Fig. 3

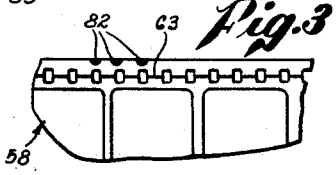


Fig. 4

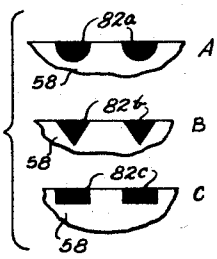
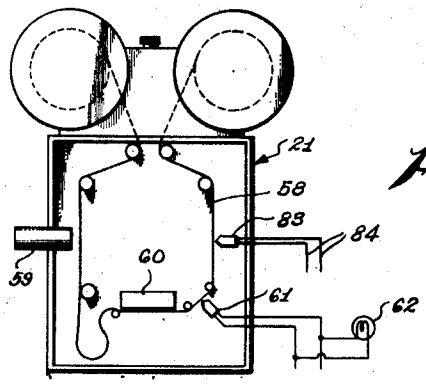


Fig. 5



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METHOD AND APPARATUS FOR PRODUCING MOTION PICTURE FILMS

Filed Nov. 13, 1950 5 Sheets-Sheet 2

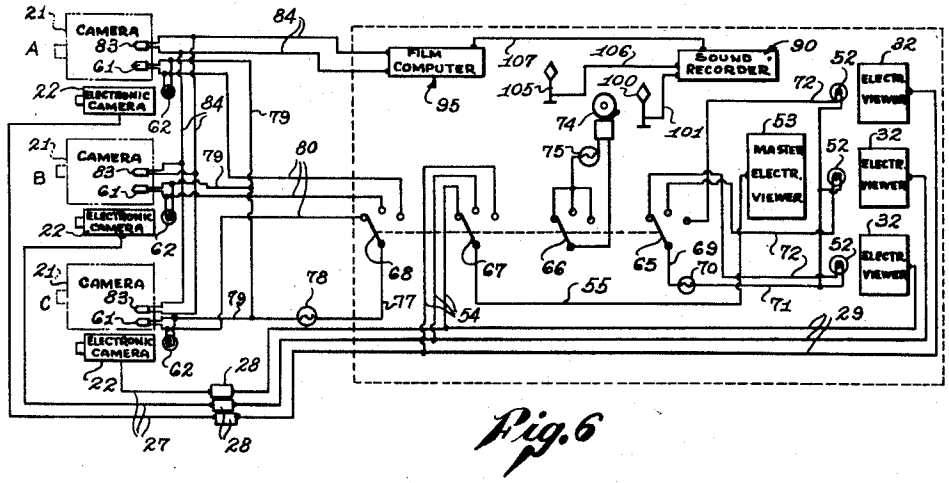


Fig. 6

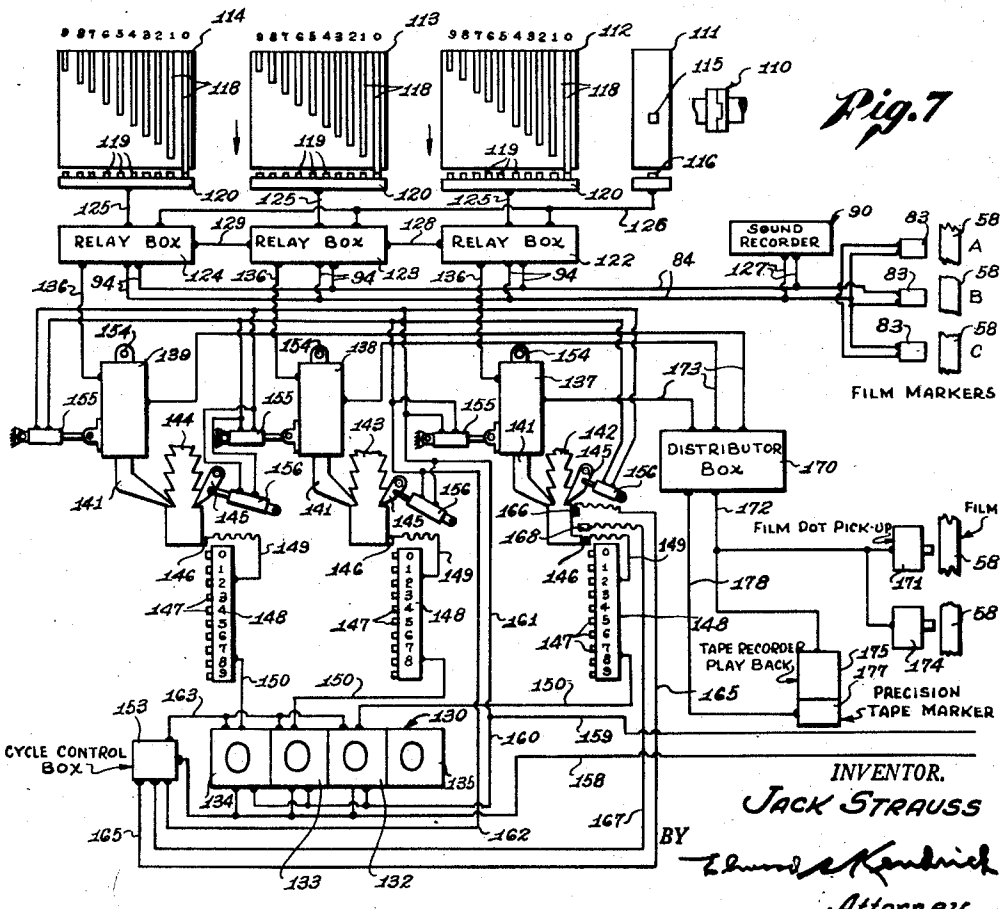


Fig. 7

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METHOD AND APPARATUS FOR PRODUCING MOTION PICTURE FILMS

Filed Nov. 13, 1950 5 Sheets-Sheet 3

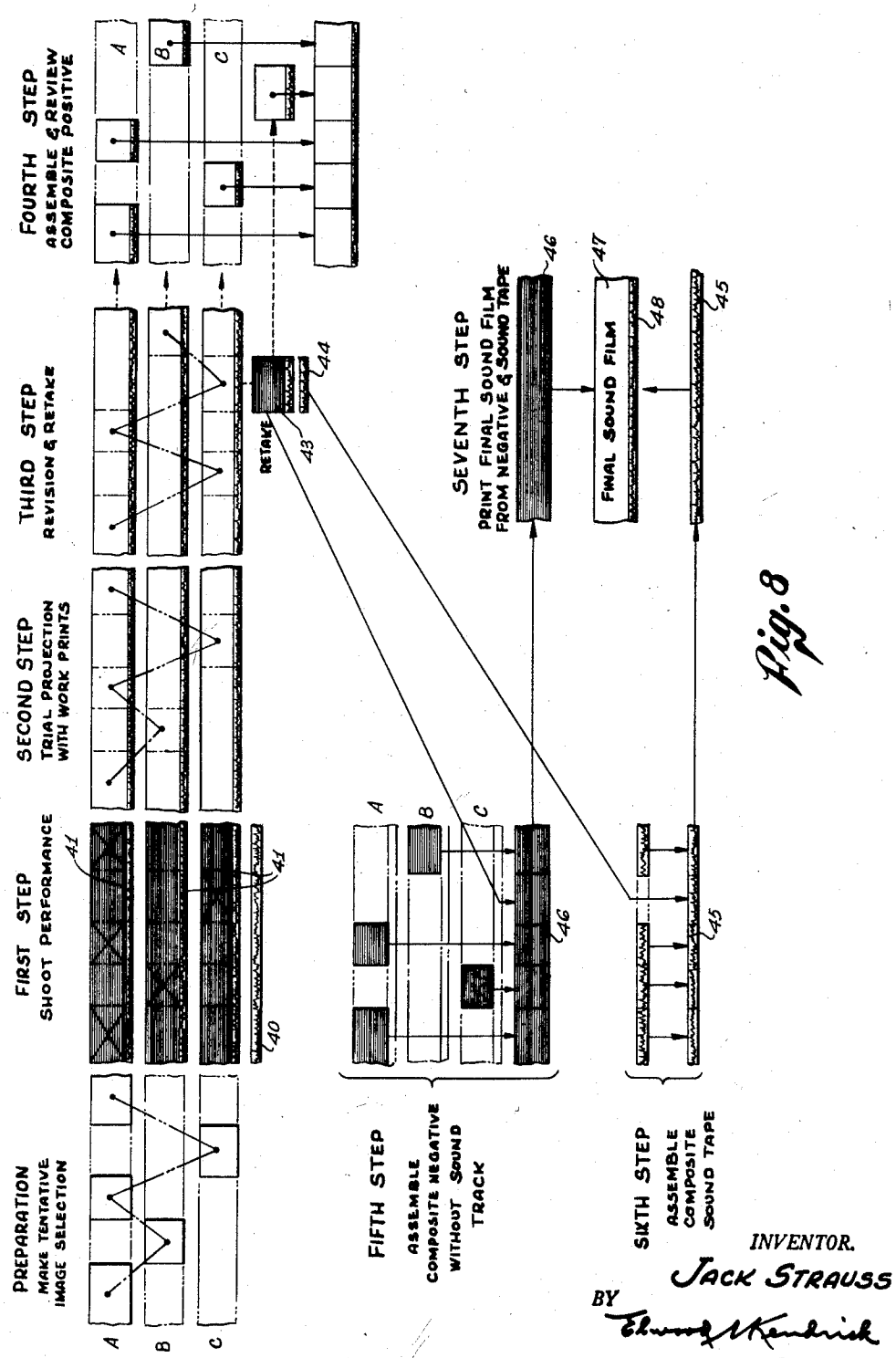


Fig. 8

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METHOD AND APPARATUS FOR PRODUCING MOTION PICTURE FILMS

Filed Nov. 13, 1950 5 Sheets-Sheet 4

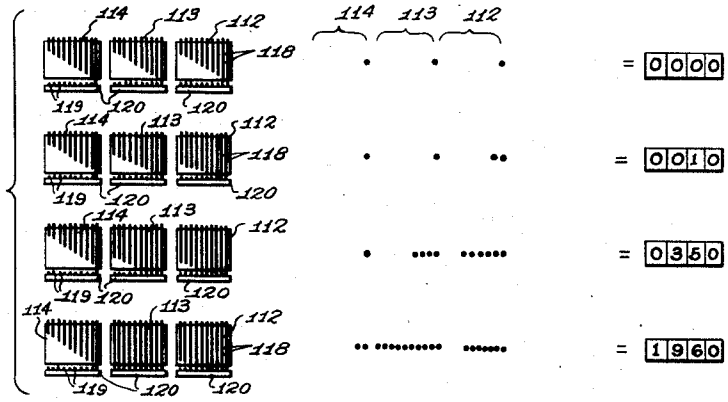


Fig. 9

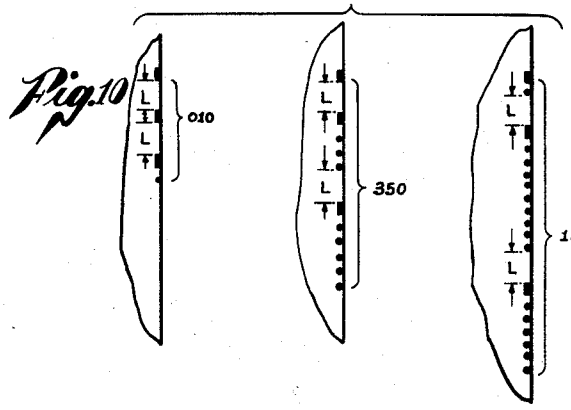


Fig. 10

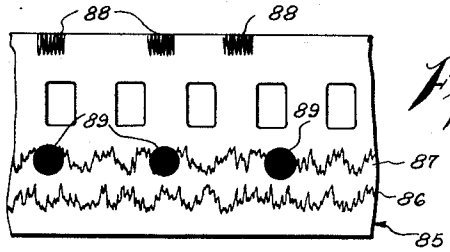


Fig. 12

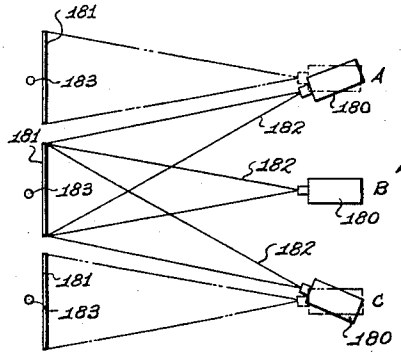


Fig. 13

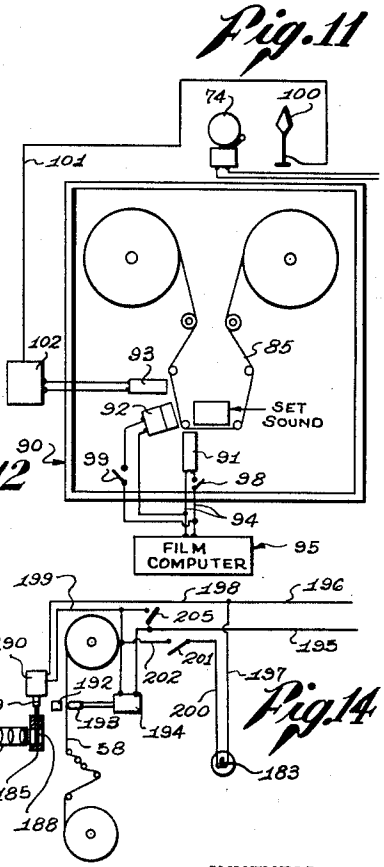


Fig. 11

Fig. 14

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March 15, 1960 J. STRAUSS 2,928,311

METHOD AND APPARATUS FOR PRODUCING MOTION PICTURE FILMS

Filed Nov. 13, 1950 5 Sheets-Sheet 5

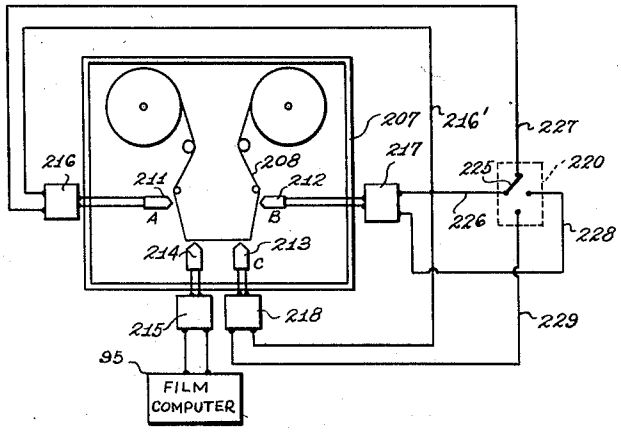


Fig. 15

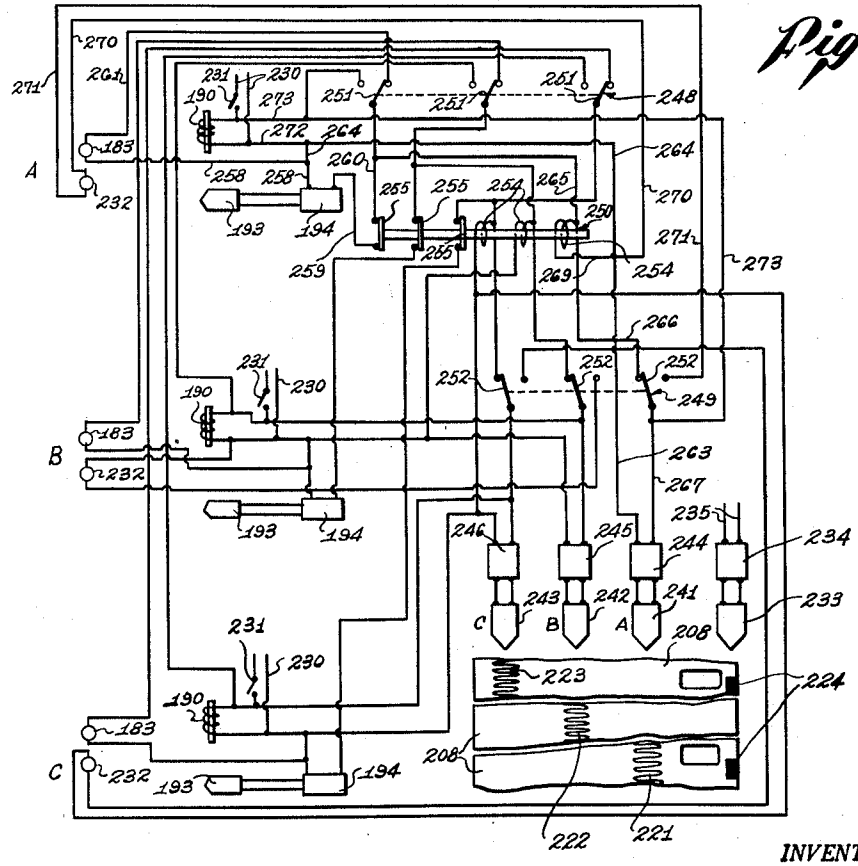


Fig. 16

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2,928,311

METHOD AND APPARATUS FOR PRODUCING MOTION PICTURE FILMS

Jack Strauss, Hollywood, Calif., assignor to Camera Vision, Inc., Beverly Hills, Calif., a corporation of Nevada

Application November 13, 1950, Serial No. 195,351

24 Claims. (Cl. 88—16)

My invention relates to the production of motion picture film and is directed to improvements in production methods and instrumentalities constituting a complete production technique extending from the planning of a picture to the final approval of the finished film.

Viewed broadly, the production of a motion picture film consists of the two basic steps of photographing a performance and editing the finished film. The ideal would be simply to shoot a continuous performance just once and then merely to review the finished film just once with final approval.

For several reasons and largely because of the human equation this ideal is not approached with the prevailing procedures used to produce the national output of film. In fact the two broad steps of shooting and editing are usually repeated endlessly when high quality is sought, retakes and cutting extending over months with the consumption of five to ten times as much film as is actually used in the final print.

The broad object of the present invention is to approach as closely as possible this ideal of a single shooting of a performance followed by a single review of the finished film. This object is attained, in the first place, by shooting a performance of the production with special provisions for eliminating the human equation and for otherwise avoiding the necessity of retakes, and, in the second place, by setting up an editing procedure with special automatic aids for arriving at a finally approved film in a prompt straight-line manner.

With reference to eliminating the human equation, my invention is characterized by the use of an electronic image to monitor a motion picture production. This concept is set forth fully in my co-pending application entitled System for Monitoring Moving Picture Production, Serial No. 183,839, filed September 8, 1950, now Patent No. 2,796,799, issued June 25, 1957.

Referring to further safeguards against retakes, my invention is characterized by the use of multiple cameras for simultaneously photographing a performance from multiple viewpoints. It has been found that multiple simultaneous shots of a performance offer surprising possibilities in saving time and cost both in the initial photography considered by itself and in the subsequent editing of the film and it has been found that such savings can be greatly increased by certain automatic aids as disclosed herein.

Further important economies in time and material are made by departing from the prevalent procedures in cutting and editing the film. The new procedures are preferably used with multiple simultaneous shots of a performance but several advantages of the new technique may be realized with only one shot of a performance.

With respect to the aids developed for use in the new technique, some of the more important objects of the present invention include: to provide a method of monitoring the plurality of simultaneously operating cameras in the sense of recording on the spot the director's selections of shots for different portions of the performance;

to make such monitoring records on the multiple films themselves; to record progress or footage on the films for subsequent guidance in cutting and matching the films; to record simultaneously and synchronously progress or footage on a sound tape for subsequent guidance in matching the sound tape and film; to provide a system for projecting the developed films with automatic indication of the original monitoring, the automatic indication being preferably in response to the monitoring record on the films; to provide a system for re-monitoring the film during such projection with a second automatic recording of selections; to provide a system for re-running such film with automatic indication of the re-monitoring; to provide a system for projecting simultaneously on one projection screen multiple simultaneous shots of a performance with the multiple film projectors automatically controlled by a monitoring record; to provide a visible progress or footage meter with relatively large numerals governed either by recording on a film or recording on a sound tape; to provide for recording by photographic methods on the margin of a conventional motion picture film a suitable monitoring record and/or a progress record; to provide on a conventional sound tape adjacent the usual sound track, a progress or footage record and/or a monitoring record in sound; and to provide a system for combining two monitoring records wherein one monitoring record modifies the other in the course of running a plurality of film simultaneously through a plurality of film projectors.

A further important object in certain practices of the invention is to achieve exceptional economy and efficiency by producing more than one film version from a single shooting of a performance. In some instances it is desirable to have different film versions for different audiences or for different purposes. In this respect, the new technique is especially advantageous in making possible one version of a production for television use and another version for conventional motion picture exhibition. It may be, and usually is, desirable for a television film to consist for the most part of close-up shots of the action whereas a film for a motion picture theater may be, and usually should be, more liberal in the inclusion of shots of longer focus.

The above and other objects of the invention will be apparent in the following more detailed description taken with the accompanying drawings.

In the drawings, which are to be regarded as merely illustrative,

Fig. 1 shows diagrammatically a system for photographing a performance with three cameras simultaneously;

Fig. 2 is a graph showing the effect of a special filter used in producing an electronic image of the performance during photography;

Fig. 3 is a fragmentary view of a piece of motion picture film with two tracks thereon, namely a track for the monitoring record and a track showing the film progress or footage;

Fig. 4 shows fragments of three films from three different cameras showing identifying marks thereon;

Fig. 5 is a schematic view showing how a motion picture camera may be equipped to make certain records on the film therein for the practice of the present invention;

Fig. 6 is a diagram of a monitoring system that may be employed;

Fig. 7 is a diagram of a film computer system that may be employed to record the progress of the running film;

Fig. 8 is a diagram showing the preferred sequence of steps in handling the plurality of films to arrive at a final composite print;

Fig. 9 is a diagram for explaining the operation of the film computer system in Fig. 7;

Fig. 10 shows film fragments with progress records thereon made by the film computer of Fig. 7;

Fig. 11 is a schematic view of a sound recorder adapted for the practice of the invention;

Fig. 12 shows a fragment of a sound tape produced by the sound recorder of Fig. 11;

Fig. 13 is a diagram showing how a plurality of projectors may be used in practicing the invention;

Fig. 14 is a diagram of an automatic control arrangement that may be incorporated in a motion picture projector;

Fig. 15 is a diagram showing how a sound recorder may be arranged to make a supplemental monitoring record on a sound tape; and

Fig. 16 is a wiring diagram of a monitoring system designed for use with a plurality of projectors in the practice of the invention.

Accessory monitoring equipment at the camera

Many of the advantages set forth in this disclosure may be achieved without using an electronic image of the performance for monitoring purposes but the reasons for providing such an image are overwhelming. It is contemplated, therefore, that each motion picture camera employed in the practice of the invention will be accompanied by an electronic camera to produce an electronic image of the scene from approximately the same viewpoint as the motion picture camera. It is further contemplated, for reasons set forth in my co-pending application, that each motion picture camera will also be provided with a photo-electric cell for measuring the light of the scene from the camera station. It is also desirable, but not absolutely necessary, to provide an electronic viewer at the camera for the camera operator. An assemblage of such elements may be conveniently termed a camera unit for the purpose of the present disclosure.

A camera unit generally designated by the numeral **20** in Fig. 1 includes a motion picture camera **21**, an electronic camera **22**, an electronic viewer **23** and a photoelectric cell **24**, which photoelectric cell may be provided with a suitable lens. It is contemplated that the two cameras and preferably also the lens-equipped photoelectric cell will be interconnected and interlocked in the manner described in my co-pending application to compensate for parallax and to focus synchronously over a range of distance adjustments. Preferably all of these devices are enclosed in a single housing represented by a rectangle **25** in Fig. 1.

The drawing shows a cable **27** from the electronic camera **22** to a suitable power unit **28** and a second cable **29** from the power unit to a remote station such as a control room represented by the dotted rectangle **30**. The cable **29** leads to an electronic viewer **32** in the control room and suitable cable connections (not shown) will also be made to the electronic viewer **23** of the camera unit **20**. A suitable cable **33** also connects the photoelectric cell **24** with a light meter **34** in the control room.

I have discovered that an electronic image produced by the described arrangement may be given the character of a motion picture image as viewed in a darkened theater by using a suitable filter on the lens of the electronic camera **22**. Fig. 2 shows by way of example what is accomplished by such a filter.

The curve **37** in Fig. 2 shows how the light sensitivity of a common type of electronic image pickup tube is excessive in the higher frequencies of the visible spectrum with peaked value in the violet-blue zone. In contrast, the light sensitivity of a typical motion picture film such as type B panchromatic film is more evenly distributed over the visible spectrum as indicated by the curve **38** in Fig. 2. By using on the electronic camera a filter that selectively reduces the admission of light in and adjacent the blue zone of the visible spectrum, I am able, in effect, to make the resulting electronic image approximate the image that will be ultimately produced with the motion picture film. The curve **39** in Fig. 2 shows the result of employing such a film to selectively diminish the light reaching the television tube. It will be noted that the correction of curve **37** by curve **39** results in a configuration having the same general character as the curve **38**.

When such a filter is used the electronic image is not only a reliable indication of the manner the motion picture film is being exposed but is also a reliable means for detecting incorrect light and shadow distribution in the scene in the course of the performance.

As pointed out in my co-pending application, the use of an electronic image in the photographing of a scene makes possible exceptionally close production coordination by basing the thinking of all members of the production team on the same image of the scene. An electronic image automatically eliminates the extraneous margins of the actual scene and, of course, makes automatic conversion from three dimensions to a flat two-dimensional picture. By use of a suitable control room, as indicated in Fig. 1, all distractions from extraneous noises and movements are eliminated. Difficulties arising from different points of observation are resolved by the one image taken at the camera position and of course that one image is after all the ultimate product and the measure of success of the entire project. Finally, the electronic image used for directing or monitoring the picture may, if desired, be projected on a suitable screen in the control room in close simulation of the atmosphere of a darkened theater so that previews by experts in audience reaction may be made as fast as the scenes are shot.

System for simultaneous photography by plurality of cameras

At least two cameras will be used to carry out this aspect of the invention and preferably three camera units **20** will be used as shown in Fig. 1.

The three camera units **20** are shown connected by cables **29** to the three corresponding electronic viewers **32** in the control room **30**. The letters A, B and C are used in Fig. 1 and elsewhere in the drawings to indicate equipment associated with the three camera units respectively.

A simple practice of the invention that is a long stride forward from present day motion picture production consists in using the equipment shown in Fig. 1 as described to this point. The plurality of cameras affords full protection against re-takes since at least one of the three films will be useable for any one portion of the performance. No time and labor are required to shift equipment from one camera position to another and since the necessity for such shifts is eliminated, the whole performance on a set may be run through continuously without the usual interruptions that break the mood of the players. The three films produced in this way make it possible to postpone decisions regarding selection of viewpoints among the camera positions until after the performance and, of course, the three films with their three viewpoints for each part of the action afford a range of artistic choice in every step of the film editing. Finally, it is possible as heretofore pointed out, to use the three films to produce more than one version of the same performance for different audiences.

In using the equipment described to this point, the director views the three images in the quiet of the control room **30** and has at his disposal a system of intercommunication represented by ear phones **35** and wiring **36** for reaching any member of the production crew including, if desired, concealed radio ear phones for the players in the cast. As the performance proceeds he may dictate to an assistant or to a recording device a moni-

toring record or running record of comment and instructions for furture reference in editing the three films for the production of a final print. Such a running record, which can be synchronized with the performance simply by running it continuously during the performance, would include instructions as to which of the three films is to be used for the various portions of the performance. His decisions in this regard are, of course, based on continuous observation of the three electronic viewers **32** showing substantially the same images that will appear on the finished film.

A feature of this arrangement is that the director may be assisted in the control room by a director of photography who will be guided by the three electronic images and the three light meters **34** in supervising the three camera operators by means of the communication system.

To further carry out this simple practice of the invention, the three films would be cut in accord with the running record to produce a composite film to be run for the director's final approval. Any revisions he may find necessary when viewing the composite film may be carried out merely by substituting in the composite film portions of the other two films available for the same scene.

The basic procedure for handling the three films to arrive at a single final composite print may be understood by referring to Fig. 8 which will now be discussed.

Steps from multiple film to single composite print

In Fig. 8 which shows diagrammatically the recommended procedure for carrying out the invention, the three films from the three cameras are designated A, B and C respectively, film A being devoted to close ups, film B being photographed at a middle range and film C consisting of long range shots.

Fig. 8 includes an optional preparation step which may represent an actual rehearsal or "dry run" of the performance during which notations are made about the different viewpoints or camera positions to be selected for different portions of the continuous performance. In this example, it is contemplated that as far as the three films are concerned the performance will be divided into a sequence of five portions with the first, third and fifth portions taken on film A, the second portion taken on film B and the fourth portion taken on film C. Such planning may, of course, be entirely mental on the part of the director from a reading of the scrip rather than based on an autual rehearsal.

The first step represented by Fig. 8 corresponds to the actual shooting of the performance and shows the three negatives produced by the three cameras simultaneously and also shows a sound tape **40** on which the sounds of the performance are recorded simultaneously with the photography. This sound tape **40** is saved for use in producing the final film or print. In the meantime for the purpose of reviewing the results of the shooting, the same record is available on a sound track **41** on each of the three negatives.

The first step of the diagram shows by crossed diagonals the same five film portions that are designated in the preparation step. If the photography has been planned in advance in this manner and if the director does not change his plan as he watches the three electronic viewers in the course of the performance, the running monitoring record dictated by the director during the performance will actually designate these particular film portions for the final composite print. It is to be understood, of course, that the same selections may be made on the spot when viewing the three electronic images without any planning in advance.

In the second step of the diagram the three negatives are replaced by three positive prints made from the three negatives respectively for further procedure in editing and cutting the film. This substitution is desirable to avoid damage to the negatives by unnecessary handling. The purpose of the second step is to project usually on a sizable projection screen, the portions of the three films in their proper sequence in accord with the record of selections made by the director in the course of the first step. While a single projector may be used, with the operator switching from one film to another as indicated by the selection record, it is advantageous to place the three films in three different projectors and to use the three projectors in the predetermined sequence.

It is assumed in this instance for the purpose of illustration that when the director reviews the prints in step two, he decides that the second portion of the script should be taken from film C instead of film B, and to assume a further complication that will not ordinarily happen, the director decides that there should be a complete re-take of the fourth portion of the performance. Finally, the director decides that the last portion of the performance should be shown by film B instead of film A.

In a typical practice of the invention these decisions on the part of the director will be made in the course of the trial projection represented by the second step in the diagram and will be incorporated in a running monitoring record dictated by the director concurrently with this first showing of the photography.

The purpose of the third step in the diagram is to carry out these further instructions by the director and to review such revisions for final approval. The re-take of the fourth portion of the scene results in a short negative **43** and a corresponding short tape recording **44**. A positive print of the short negative **43** may then be substituted in one of the three films, for example in film C, in preparation for again running the three positive prints through three projectors. The five portions of film are then shown in the order indicated in the third step and, assuming final approval is then given, the next or fourth step is to assemble a single composite print for a test run.

The fourth step in the diagram showing how portions from the various films are brought together in one composite print for a check showing is self explanatory.

In the fifth step of the diagram, a composite negative print is assembled to conform exactly with the composite positive print of the fourth step, the composite negative print being assembled from the three original negatives **41** and the re-take negative **43**.

The sixth step consists of substituting the short sound recording tape **44** of the third step for the corresponding portion of the original sound recording tape **40** to produce a composite sound tape **45** corresponding to the composite negative **46** in the fourth step.

In the seventh step of the diagram, the composite negative **46** and the composite sound tape **45** are employed to produce a final sound print **47** with a sound track thereon taken directly from the sound tape **45**. Since the sound track **41** on the original negatives is ignored in producing the final sound film **47** the sound track is omitted from the diagram of the negatives in the fifth and seventh steps.

While the invention including the steps shown in Fig. 8 may be carried out effectively in the manner described and using only the equipment described to this point in Fig. 1, preferably further aids will be used and a more efficient procedure will be followed. Such further advances over the prior art will now be explained.

Monitoring control system for use during multiple photography

Fig. 1 includes what may be termed a monitoring recorder **50** having a manually operable handle or selector **51** that is movable to any one of three positions to indicate which of the three camera positions A, B and C is selected for the viewpoint at different points in the progress of the performance. The monitoring record itself may take any suitable form, for example a sound tape with three different sound tracks representing the three camera positions or a paper tape with an ink stylus movable to three different tracks representing

the three camera positions. Whatever form of monitoring record is used, it should be synchronized with the running of the cameras and this purpose may be served merely by running the monitoring record at a constant speed continuously during the operation of the cameras.

It is further desirable to have some visible signal to indicate which of the three images is selected and to this end signal lamps 52 may be mounted on or near each of the electronic viewers 32 to be energized selectively in response to the selective positioning of the handle 51 of the monitoring recorder 50. As a further refinement a relatively large master electronic viewer 53 may be placed at a convenient and prominent location to duplicate the images of the viewers 32 selectively in accord with the position of the handle 51. Thus if the handle 51 is positioned at its central position shown in Fig. 1, the signal lamp 52 at the viewer B would be energized and the image produced by the viewer B would be reproduced on a larger scale by the master viewer 53. Fig. 1 shows suitable connections including cables 54 from each of the electronic viewers 32 to the monitoring recorder 50 and a cable 55 from the monitoring recorder to the master electronic viewer 53.

A feature of the preferred practice of my invention is the concept of making the monitoring record directly on the running film used to photograph the scene thus securing absolute synchronism of the monitoring record with the film and at the same time solving the problem of correlating the monitoring record with the film for subsequent cutting and editing of the film. Fig. 1 shows suitable cables 57 extending from the monitoring recorder 50 to each of the motion picture cameras 21 in the three camera units 20. A suitable means for making a monitoring record on film is incorporated in each of the motion picture cameras 21 for automatic operation whenever the selector 51 in the control room is positioned at that one of its three positions corresponding to the particular motion picture camera.

Fig. 5 shows, by way of example, how means may be incorporated in a typical motion picture camera to make a monitoring record on the film being run through the camera. The camera 21 has the usual mechanism for moving the motion picture film 58 intermittently past the lens 59 and in a constant manner past the usual element 60 making a sound track of the performance on the film. In accord with the present invention a recording element 61 is positioned adjacent the film as shown and is operated by the previously mentioned cable 57 from the monitoring recorder 50. Preferably a suitable signal lamp 62 connected in parallel with the recording element 61 is placed on the camera unit to indicate to the players as well as the camera operator when this particular camera is being selected for the final film.

The recording element 61 may operate in any suitable manner to make a running record on the film 58. It may for example scratch a record mark on the film or actually perforate the film or make a mark on the film with a suitable chemical or make a light track on the film. Preferably the recording element 61 when energized simply directs a small pencil of light on the margin of the film 58 to make the required record. Thus Fig. 3 shows how such a light track 63 may be made on the margin of the film 58 in the longitudinal region of the sprocket holes in the film.

Fig. 6 is a wiring diagram of an electrical arrangement that may be used to put the above described monitoring system into practice. In the diagram four switch arms 65, 66, 67 and 68 which are operatively connected together to operate in unison as indicated by the interconnecting dotted line and are all operated by the previously mentioned selector 51 on the monitoring recorder 50. Since the selector 51 is movable to three positions, each of the four switch arms is movable across three corresponding contacts.

The purpose of the switch arm 65 is to control the lighting of the three signal lamps 52 and for this purpose the switch arm is connected by a wire 69 to one side of a suitable source of current 70 and the other side of the source is connected to each of the lamps 52 by a wire 71. The required circuits are completed by three wires 72 that connect the three lamps 52 respectively with the corresponding three contacts with which the switch arm 65 cooperates.

Switch arm 66, which may be omitted if desired, causes a bell 74 to make an audible signal every time the selector 51 is moved to a new position. The purpose of the bell will be explained later. The bell 74 which is energized from a suitable source 75 is connected in parallel with the three contacts as shown and is adapted to ring whenever the switch arm 66 first touches one of the three contacts.

The function of the switch arm 67 is to determine which of the three simultaneous electronic images will be shown on the master electronic viewer 53. In the diagram the previously mentioned cables 27 from the three electronic cameras 22 are connected to the corresponding power units 23, as previously described, and the power units are connected in turn to the corresponding electronic viewers 32 by the cables 29. The previously mentioned cable 55 from the master viewer 53 is connected to the switch arm 67 and the three contacts with which the switch arm cooperates are connected respectively to the three previously mentioned cables 54. Thus the switch arm 67 causes the images produced by the three electronic cameras to be reproduced selectively by the master viewer 53 in accord with the position of the selector 51. It will be appreciated, of course, that this part of the diagram is greatly simplified since a switch for controlling co-axial cables must be more than a simple conductor.

The last switch arm 68 is associated with the three cables 57 (see Fig. 1) that control the operation of the recording element 61 in the three cameras 21. For this purpose the switch arm 68 is connected by a wire 77 to a suitable source of current 78 and the source in turn is connected to one side of the three recording elements 61 by three wires 79. The required circuits are completed by three wires 80 from each of the recording elements 61 to the corresponding contacts with which the switch arm 68 cooperates. As previously mentioned, the three signal lamps 62 at the cameras are connected in parallel with the corresponding recording elements 61.

By virtue of the described arrangement, it is apparent that whenever the selector 51 is placed at any one of its three positions, the following actions occur: the corresponding signal lamp 52 in the control room is energized: the image produced by the corresponding electronic camera 22 is reproduced by the master viewer 53 in the control room; and the recording element 61 in the corresponding motion picture camera 21 is actuated to make a record on the corresponding film.

It will be readily apparent that the preferred practice of the invention as described to this point makes it possible to carry out the ideal procedure of simply photographing a performance in one continuous operation and then reviewing the film just once for final approval. There is utmost simplicity in the way the director or the director's assistant at his instructions merely changes the selector 51 of Fig. 1 from time to time during the performance to make the required monitor records on the three films and the later cutting procedure may consist merely of piecing together the portions of the three films that have thereon the monitor track 63 of Fig. 3 thus making a composite film for projection and final approval.

The full practice of my invention includes certain additional improvements that make it possible to carry out this procedure with exceptionally high efficiency and saving of time. One improvement is the addition of what may be termed a film computer system to compute the progress of the films through the three cameras and to make a corresponding progress or footage record on all

of the film synchronously and, preferably, on the sound recording tape also. Such a film computer system, which will be explained with reference to Figs. 8 to 12 inclusive, has a number of advantages in addition to facilitating the cutting and matching of the film and sound tape.

A second improvement is a system for using a plurality of projectors simultaneously to review the finished film with automatic means to indicate which film is selected, such indication being made in response to the monitor record on the film. One such system will be explained with reference to Figs. 13 and 14.

A third improvement employed in the full practice of my invention is a system for producing a monitoring record in the course of the projection of the developed film for the purpose of recording revisions to be made and reviewed before final approval. This second monitoring record or revision monitoring record is then used for a re-run of the developed films in the course of which re-run the proposed revisions are indicated automatically in response to the revision monitoring record. This last improvement will be explained with reference to Figs. 15 and 16.

General arrangement for making film progress record

The purpose of making a running record on the film itself of the progress of the film through the three cameras in the course of the performance is primarily to facilitate accurate cutting of the film for accurate matching in the final composite film. Making the same kind of progress record synchronously on the sound tape facilitates accurate matching of the tape and film.

The progress of the film may be measured either in units of time or in units of length of film. Each system of units has its advantages. Measurement in time units, say minutes, is useful for example in making a film for a thirty minute television show since such a record on the film not only facilitates accurate matching of portions cut from different films but also eliminates the necessity of translating film footage into minutes of performance. On the other hand, a progress record on the film in terms of film footage is more in accord with motion picture practices and for that reason is preferred in the present invention.

Any system may be employed for recording the footage on the film but a numerical system is preferred in which a series of dots or other signals or symbols is used to represent each digit of a numeral. Such a system of dots on the film can be readily translated by inspection into the corresponding footage numerals. The dots may be readily applied to the film in response to electrical pulses from a suitable counting mechanism and a special advantage of such an arrangement is that a record of pulses on film my in turn be used to re-create the pulses for such purposes as operating a footage indicator, as will be explained.

The footage marks may be made on the film in any suitable manner but here again I prefer to use a beam of light to make a footage record photographically on the margin of the film. Fig. 3, by way of example, shows three such dots **82** on the margin of the film **58** outside the row of sprocket holes.

It is further suggested that the light beams employed in the cameras for making such a footage record be so shaped and so operated as to make dots of different shapes to indicate at a glance in which of the three cameras the film has been exposed. Thus, as indicated in Fig. 4, semicircular dots **82***a* may be used to indicate film exposed in the camera unit at the position A; triangular dots **82***b* may indicate film taken from the camera at position B; and rectangular dots **82***c* may indicate film from the third camera position C.

Fig. 5 shows how a second recording element **83** similar to the previously mentioned recording element **61** may be incorporated in a motion picture camera **21** to make the record of dots on the film. This second recording element, which is energized by a pair of wires **84**, is offset from first element **61** and is located at a position where the film **58** moves at constant speed.

The same footage record may be made on the usual sound tape of the performance and in the preferred practice of my invention the sound tape will have both a sound track recording the performance and a separate sound track recording the running comments and instructions of the director in the course of the performance.

Fig. 12 shows diagrammatically how such a recording may be made on a sound tape **85**. This figure shows diagrammatically the usual sound track **86** of the performance and a second sound track **87** for the director's remarks. The footage dots may be recorded on the tape **85** either magnetically or by visible marking. Magnetically impressed dots are indicated diagrammatically by numerals **88** and visible dots, which may be made by a suitable ink, are shown at **89**.

Fig. 11 shows by way of example how a conventional tape sound recorder generally designated **90** may be modified to produce the described sound tape of Fig. 12. The tape **85** moves past the usual set sound recording element for recording dialogue from the performance and also moves past three additional magnetic recording elements **91**, **92** and **93**.

The recording element **91** is fed electrical pulses by a pair of wires **94** from what may conveniently be called a film computer, generally designated **95**, which is a counting mechanism for measuring film footage and expressing the film footage in terms of pulses of electric current to be recorded as dots on the tape **85**. The recording element **91** makes the previously mentioned magnetic impressions **88** on the tape in response to the electric pulses. The recording element **92** is adapted to make a visible record of the dots, in this instance the ink dots **89** on the tape **85**. This second recording element **92** is connected in parallel with the magnetic recording element **91** for actuation by the same electrical pulses from the film computer **95** and suitable switches **98** and **99** may be provided to disconnect either element **91** or **92** from the film computer.

The function of the third magnetic recording element **93** is to make the sound track **87** recording the director's remarks. Fig. 11 shows the director's microphone **100** connected by a cable **101** to an amplifier **102** which in turn is connected to the recording element **93**. Fig. 11 also shows the previously mentioned bell **74** adjacent the microphone **100** so that the sound of the bell will be recorded on the track **87** to indicate the precise points at which the director desires a shift in viewpoint from one camera position to another.

Turning again to Fig. 6, it may be readily understood how these additional devices may be incorporated in the previously described system for monitoring film in the course of the actual performance. The microphone **105** connected to the sound recorder **90** by a suitable cable **106** represents all of the microphones used to pick up sound from the performance. The figure also shows the cable **101** to the sound recorder **90** from the director's microphone **100** and a cable **107** from the film computer **95** to the sound recorder, which cable comprises the two previously mentioned wires **94** of Fig. 11. Fig. 6 further shows how the film computer **95** is connected in parallel with each of the recording elements **83** in the three cameras **21** by the previously mentioned pairs of wires **84**.

It will be readily understood from the foregoing description how synchronized footage records will be made simultaneously, not only on the three films in the three cameras, but also on the sound tape that records the dialogue of the performance, and the sound tape will not only carry the director's comments and instructions but will also record the bell signals designating points at which a monitoring signal terminates on one film and starts on a second film.

It is practical to use the described sound tape alone to follow the monitoring record and for guidance in cutting the film. For such a purpose the three films would be projected and the monitoring track 87 on the tape 85 would be played back in synchronism with the three films to indicate audibly the pre-selected shifts from film to film.

A specific film computer system

The essential working parts of a film computer that may be used are shown diagrammatically in Fig. 7. This particular computer is designed to record the running feet of the film and may be operated by or at least synchronously with the film mechanism of one of the cameras. For example, a clutch 110 may be employed to operatively connect the mechanism with the film actuating motor of any one of the three cameras 21.

The four rectangles 111, 112, 113 and 114 in Fig. 7 represent the developed or unrolled peripheral surfaces of four counting wheels that are interconnected by the type of gearing familiar in calculating machines in such manner that when wheel 111 makes one complete rotation it advances the wheel 112 one-tenth of a rotation; when the wheel 112 makes one complete rotation it advances the wheel 113 one-tenth of a rotation; and finally when the wheel 113 makes one complete rotation it advances the wheel 114 one-tenth of a rotation. Since this train of counting wheels is so connected to the camera mechanism that one rotation of the wheel 111 corresponds to the movement of ten feet of film through the camera, a complete rotation of the wheel 112 represents one hundred feet, a rotation of wheel 113 represents one thousand feet and finally a complete rotation of the wheel 114 measures ten thousand feet.

The wheel 111 carries a single contact 115 that brushes a stationary contact 116 once for every revolution of the wheel. The purpose of this wheel is to initiate a recording cycle of the mechanism once for every ten feet of film movement and the purpose of the three counting wheels 112, 113 and 114 is to determine the number of dots to be recorded on the film by the operating cycle.

Each of the three wheels 112, 113 and 114 have ten elongated peripheral contacts 118, designated from zero to nine respectively on the drawing, that extend circumferentially for cooperation with a corresponding series of ten stationary contacts 119 on a stationary contact carrier 120. The circumferential contact 118 that represents numeral 9 on each of the three wheels has a length of one-tenth of the wheel circumference and the other nine contacts in the sequence are progressively increased in length by one-tenth of the circumference with the last contact representing zero extending completely around the circumference of the wheel. It is apparent that this last circumferential contact zero on each of the three wheels will continuously touch its complementary stationary contact 119 and that the remaining circumferential contacts will touch their corresponding stationary contacts in sequence as the wheels rotate in the direction of the arrows in Fig. 7, one new contact being touched for every tenth revolution of each wheel.

The three stationary contact carriers 120 associated with the three counting wheels 112, 113 and 114, respectively, are connected with three corresponding relay boxes 122, 123 and 124 respectively, Fig. 7 showing a suitable cable 125 from each of the contact carriers to the corresponding relay box. The stationary contact 116 associated with the wheel 111 is also connected with each of the three relay boxes by a wire 126. Each of the three relay boxes 122, 123 and 124 is connected by a pair of wires 94 with the previously mentioned pair of wires 84 which, as previously explained with reference to Fig. 6, are connected in parallel with the three sound recording elements 83 in the three motion picture cameras 21. Fig. 7 shows the sound recorder 90 connected to the same pair of wires 84 by the pair of wires 94 previously mentioned in explaining Fig. 11, these two wires 94 constituting the cable 107 of Fig. 7.

The mechanism in Fig. 7 described to this point is all that is needed to make the required footage or progress records on the three films in the three cameras as well as on the sound tape. The operation is as follows. Whenever the contact 115 on the wheel 111 touches the stationary contact 116 to signify the running of ten additional feet of film, a control circuit closed by the two contact causes relays in the boxes 122, 123 and 124 to be closed, the number of relays that are closed in the three boxes being determined by the number of circuits that are closed by the circumferential contacts 118 on the three corresponding counting wheels 112, 113 and 114 respectively.

The relays closed in this manner are self-locking relays arranged to release or unload in sequence and in doing so to transmit a corresponding number of successive electric pulses to the two wires 84. First, the relays in the relay box 122 unload in sequence and then, in response to a signal sent from relay box 124 to relay box 123 by means of a control cable 128, the relays in box 123 unload in sequence and, finally, when all the relays are cleared in box 123, a signal from box 123 to the last relay box 124 causes the last series of relays to unload in sequence. The sequential unloading of the relays in the three boxes 122, 123 and 124 sends corresponding pulses of current through the two wires 84 to the recording elements 83 in the three cameras to make corresponding dots simultaneously on the three running films causing the sound recorder 90 to record corresponding synchronous signals on the previously mentioned sound tape 85 (see Fig. 11).

In both relay boxes 123 and 124 the first relay, which corresponds to the zero circumferential contact on the corresponding counting wheel, is a delayed action relay to create what may be conveniently termed a time space between the successive groups of pulsed signals that represent the successive digits in the footage numeral. It is also desirable to have this first relay in each of the three boxes create a somewhat longer signal pulse than the other relays, a signal of the character of a dash in contrast to a dot to distinguish the initial zero pulses in each group from the other pulses.

Fig. 9 shows diagrammatically how the different positions of the three counting wheels 112, 113 and 114 represent different numerical values of film footage. The left side of the figure shows the relation of the circumferential contacts 118 to the stationary contacts 119 at selected positions of rotation of the three counting wheels; the pattern of dots in the central part of the figure represent the number of circuits closed by the circumferential contacts 18 and therefore the number of relays that will be energized and the consequent number of signal pulses that will be generated; the numerals in small boxes on the right side of the figure are the corresponding values in film footage. Since this system counts in terms of ten feet the last digit of the footage numeral is always zero, the other three digits being controlled by the three counting wheels 112, 113 and 114 respectively.

At the start of a run of film, in other words at zero footage, only the zero contacts on the counting wheels are effective to close circuits corresponding to relays in the relay boxes 122, 123 and 124 as represented by the first series of three dots in Fig. 9. As soon as ten feet of film have been run, the second circumferential contact on the wheel 112 closes a circuit as indicated by the second group of dots representing ten feet of film. When 350 feet of film have been run, for example, there are five relay-energizing circuits closed by wheel 112, four circuits closed by wheel 113 and one circuit by wheel 114, as shown in Fig. 9, and when a higher figure, for example 1960 is the momentary film footage,

counting wheel **112** closes seven relay-energizing circuits, counting wheel **113** closes ten, and counting wheel **114** closes two circuits, as shown.

The resulting recordings of the numerical values 10, 350 and 1960, respectively, on the footage tracks of the film are indicated in Fig. 10. Since the zero relays are preferably adapted to generate longer signal pulses than the other relays, each of the three groups of signal impressions on the margin of the film begins with a dash. By ignoring the dashes, it is a simple matter to translate the dots into numerals by counting the dots and ignoring the dashes. It will be noted in Fig. 10 that the individual groups of dots representing separate digits are separated from each other on the film by the distance L. This distance L corresponds to the previously mentioned time space between each series of signal pulses which is created by the previously mentioned delay action on the part of the first relay in each of the relay boxes **123** and **124**. Fig. 10 also represents, of course, how the same signals are impressed on the sound tape either magnetically or visibly.

Preferably the three cameras are electrically interlocked by synchronous motors so that the footage records on the three films are not only synchronous in the time sense but also synchronous in the sense of measuring absolutely equal distances on the three films. In some of the more simple practices of my invention, the camera mechanisms may run independently of each other, since, regardless of minor differences in camera speeds, the footage records will be synchronous in time and all synchronized with the performance by the players.

A system for indicating the film progress visually

In the preferred practice of my invention suitable means is provided in the control room to inform those present of the progress or footage of the film in the course of the performance. The sensible indications created for this purpose may be either visual or audible but visual indications are preferred. Any number of such indicating means may be operated simultaneously at different locations if desired.

Fig. 1 shows such a footage indicator **130** adjacent the master electronic viewer **53** in the control room, which indicator has four boxes for indicating the digits in the footage numerals, the right hand box having a permanent zero and the other three boxes being controlled by the previously mentioned counting wheels **112, 113** and **114**. It may be readily understood by referring back to Fig. 9 that the three changeable digits may be controlled directly by the three counting wheels **112, 113** and **114** in a simple mechanical manner, since a new digit appears for each tenth of a rotation of each of the three wheels and it may be further appreciated that only a simple telemetric means is required for remote operation of the footage indicator **130** in the control room. There are certain advantages, however, in using a telemetric system that is operated not by the counting wheels directly but by the signal pulses, since the signal pulses may be derived either from the counting wheels **112, 113** and **114** or from the record of such signal pulses on the developed film. Such a pulse-responsive sytem is included, by way of example, in Fig. 8, as will now be explained.

As previously stated, the footage indicator generally designated **130** in Fig. 7, which is the same as the indicator **130** in Fig. 1, has four numeral or digit boxes, namely, three digit boxes **132, 133** and **134** corresponding to the three counting wheels **112, 113** and **114**, and a fourth digit box **135** whose sole function is to show a constant or permanent zero. Any suitable pulse-counting arrangement may be used to actuate the three digit indicating boxes **132, 133** and **134**, including various pulse-counting relay systems well known to the art but, for simplicity, Fig. 7 shows solenoid-operated step-by-step mechanisms for this purpose.

Whenever the three relay boxes **122, 123**, and **124** deliver pulses of electric current to the two wires **84** for energizing the recording elements **83** in the three cameras, they simultaneously send corresponding pulses through cables **136** to three solenoids **137, 138** and **139** corresponding to the three relay boxes respectively. The three solenoids **137, 138** and **139** actuate suitable corersponding pawls **141** by means of which they advance in a step-by-step manner three corresponding longitudinally movable rack-bars **142, 143** and **144** respectively. The three rack-bars continuously tend to retract by gravity or by spring action when they are advanced by the pawls **141**, but are normally prevented from retracting by suitable latching pawls **145** that are urged into engagement with the rack-bars by suitable springs (not shown).

Each of the three rack-bars **142–144** carries a contact **146** that brushes against a series of ten fixed contacts **147** in a step-by-step manner as the rack-bar is advanced step-by-step by the corresponding pawl **141**. Each of the three series of fixed contacts **146** is carried by a corresponding control box **148** which has a wire connection **149** with the corresponding movable contact **146** and has a cable connection **150** with the corresponding digit box of the footage indicator **130**. Each of the three digit boxes **132, 133** and **134** is adapted to display a digit in accord with the number of staitonary contacts **147** traversed by the corresponding movable contact **146** or according to the furthermost stationary contact reached by the movable contact in the step-by-step advancement or the corresponding rack-bar.

It is desirable that the footage indicator **130** have the character of an illuminated sign and flash off and on periodically, being off when the digits are being changed and being on for the rest of each recording cycle. For the purpose of such on and off action, Fig. 7 includes what may be termed a cycle control box **153** which not only controls the illumination of the footage indicator **130** but also controls the return of each of the rack bars **142, 143** and **144** at the end of each operating cycle.

To make it possible for the three rack-bars **142, 143** and **144** to return to their initial retracted positions by gravity or by spring action, the three solenoids **137, 138** and **139** may be mounted on suitable pivots **154** to permit such swinging movement on the part of the solenoids as will carry the three actuating pawls **141** out of engagement with the three rack-bars. The required swinging action may be controlled by release solenoids **155** pivotally connected to each of the three solenoids **137, 138** and **139**, as shown in the drawing. To free the rack-bars for return movement, it is also necessary to swing latch pawls **145** out of engagement with the three rack-bars and for this reason a release solenoid **156** may be connected to each of the latching pawls **145** as shown.

The wiring diagram in Fig. 7 includes two leads **158** and **159** from a suitable source of electrical current, lead **158** being connected to each of the digit boxes **132–134** and also to the cycle control box **153**. The second lead **159** is connected to the three digit boxes by a wire **160** and is connected by a wire **161** and branches thereof to one side of each of the three release solenoids **155** and the three release solenoids **156**.

The cycle control box **153** which is, in effect, a switch means is connected to the second side of each of the six release solenoids by a wire **162** and has a cable connection **163** with each of the three digit boxes. The cycle control box **153** is also connected by a wire **165** to a second contact **166** on the rack-bar **142** and by a wire **167** to a fixed contact **168**, these two contacts being positioned to close a circuit through the two wires **165** and **167** as soon as the rack-bar **142** makes its first advance step at the beginning of a cycle of the step-by-step mechanism. When the contact **166** brushes the contact **168** at the beginning of a cycle, the cycle control box **153** darkens the footage indicator **130** and operates with a time delay action to keep the indicator darkened for a sufficient period of time to permit the three rack-bars **142, 143** and

144 to complete their successive step-by-step movements by the actuating pawls 141.

In the latter part of the operating cycle, the cycle control box 153 causes the footage indicator 130 to light up and then, after further delay, closes the circuit through the six release solenoids 155 and 156. When the release solenoids 155 swing the pawls 141 away from the rack-bars and simultaneously the solenoids 156 swing the three latching pawls 145 away from the rack-bars 142, 143 and 144 the three rack-bars immediately return to their retracted positions in preparation for the start of another cycle.

To provide for controlling the footage indicator 130 in response to the footage signals on a piece of film being run through a projector, Fig. 7 includes what may be termed a distributor box 170 that is connected to a film-dot pickup unit 171 by a suitable cable 173 and is connected to the three step-by-step solenoids 137, 138 and 139, respectively, by cables 173. The pickup unit 171 which is mounted in a motion picture projector includes a photoelectric cell in the path of a light beam that is modulated by the footage track of dots and dashes 82 recorded on the margin of the film. The interruptions of the light beam caused by the movement of the opaque dots on the film result in electric pulses which are transmitted through the cable 172 to the distributor box 170. The distributor box 170 routes the first group of pulses to the solenoid 137 and then, in response to the time space between the groups of signals represented by the distance L in Fig. 10, the distributor box switches the second group of pulses to the solenoid 138 and again in response to a time space sends the third group of pulses to the third solenoid 139. As soon as actuation of the first solenoid 137 by the first pulse from the distributor box 170 brings the contact 166 against the contact 168, the cycle control box 153 begins an operating cycle in the manner heretofore described.

Fig. 7 shows a second pickup unit 174 that is similar to the first pickup unit and is connected to the same cable 172 for the convenience of a film editor or film cutter. When any piece of film 58 selected at random is moved past the pickup unit 174, either manually or by some convenient mechanism, the footage record on the film will be immediately translated into footage numerals on the footage indicator 130. Thus this second pickup eliminates the necessity of deciphering the record of dots on a piece of film.

The diagram also shows a tape recorder play-back 175 connected to the cable 172 and adapted to deliver electric pulses to the cable 172 in response to the magnetically recorded footage signals 88 (Fig. 12) recorded on the sound tape 85.

For further convenience, Fig. 7 also includes what may be termed a precision tape-marker 177 which may be incorporated in the playback 175 and may be connected to the distributor box 170 by a cable 178. When a suitable switch (not shown) is manipulated in the distributor box 170, the distributor box acts to route the electric pulses received from the tape-recorder play-back 175 back through the cable 178 to the tape-marker 177. The tape-marker 177 has suitable means to make a visible mark on the traveling sound tape 85 and for that purpose may incorporate a recording element such as the previously described recording element 92 shown in Fig. 11. Thus a sound tape having a magnetic record of footage may be passed through the tape recorder play-back 175 to be marked by the tape marker 177 with visual indications of the footage record and the visual indication may either be accurately placed at the same longitudinal positions as the magnetic impressions on the tape or may be displaced longitudinally therefrom by a definite predetermined distance that will make accurate cutting of the tape possible.

Screen projection controlled by original monitor record

Fig. 13 shows diagrammatically an arrangement of three projectors 180 and three corresponding projection screens 181 that may be conveniently used in two different ways to review the three developed films under the control of the monitoring record created during the original photography. In one of these projection procedures the three projectors 180 direct their light beams 182 onto the central screen 181 as indicated by the solid lines, and the light beams are so controlled by the monitoring records on the films that only one projector representing the currently selected camera viewpoint projects its light beam on the central screen at any one time. In the other projection procedure, each of the three projectors 180 directs its light beam 182 on the corresponding screen 181 as indicated by the broken lines in Fig. 13 thus presenting three images simultaneously for comparison, and three signal lamps 183 positioned adjacent the three screens, respectively, indicate which of the three images is designated at the moment by the monitoring record on the three films.

These two projection procedures may be carried out in a fully automatic manner by the relatively simple arrangement shown diagrammatically in Fig. 14. Each of the three projectors 180 has an auxiliary shutter 185 associated with its lens system 186 to cut off the light beam 182 (Fig. 13) when desired. Any suitable means may be employed to actuate this auxiliary shutter in response to the record on the film 58 in the projector.

In this particular arrangement, the auxiliary shutter 185 has a shutter blade 188 that is operated by a suitable solenoid 190, the arrangement being such that the shutter blade 188 is in its lowermost position shown in Fig. 14 thus cutting off the light beam whenever the solenoid 190 is de-energized and energization of the solenoid 190 lifts the shutter blade to release the light beam.

For automatic control of the solenoid 190 as well as the corresponding signal lamp 183 a small lamp unit 192 in the projector directs a pencil of light through the monitor track 63 (Fig. 3) on the film 58 towards a photoelectric pickup unit 193 on the opposite side of the film. The pickup unit 193 controls a suitable switch 194 which in turn may control either the solenoid 190 or the signal lamp 183 associated with the projector, as desired.

The wiring diagram in Fig. 14 shows two leads 195 and 196 from a suitable source electric current with lead 195 connected to one side of the switch 194 and the other lead 196 connected to the lamp 183 and solenoid 190 by wires 197 and 198 respectively. The second terminal of the solenoid 190 is connected to the second terminal of the control switch 194 by a wire 199 and the second terminal of the corresponding indicating lamp 183 is connected to the second terminal of the control switch 194 by a wire 200, a switch 201, wire 202 and the previously mentioned wire 199.

Suitable means is provided to keep the shutter blade 188 raised independently of the operation of the control switch 194 and such means may be either mechanical or electric. A simple expedient for this purpose comprises a switch 205 that may be closed to connect the wire 199 to the lead 195 thus energizing the solenoid 190 independently of the control switch 194.

When it is desired to carry out the first mentioned projection procedure, with the three projectors 180 throwing their respective means on the central projection screen 181 in the predetermined sequence represented by the monitoring record on the three films, both switch 201 and switch 205 are open as shown in Fig. 14. Whenever the monitor track 63 on the film in a projector is clear so that the pencil of light from the lamp unit 192 reaches the pickup unit 193 with no substantial modification, the control switch 194 remains open to permit the shutter blade 188 to remain in its lowermost position to cut off the light beam from the projector. On the other hand,

whenever the monitoring track **63** is opaque, the resultant modification of the pencil of light reaching the pickup unit **193** automatically causes the switch **194** to close, thereby energizing the solenoid **190** to lift the shutter blade for release of the light beam. Since the monitoring track **63** is broken by the sprocket holes of the film the pencil of light reaching the pickup unit will flicker when the track is opaque but sufficient time delay is provided in the response of control switch **194** to avoid switch reaction to the flicker.

When it is desired to carry out the second monitoring procedure, using the three projectors **180** to produce their images simultaneously on the three screens **181** in conjunction with automatic operation of the three indicating lamps **183**, both switches **201** and **205** will be closed in each projector. The closing of the switch **205** in a projector causes the solenoid **190** to be energized constantly thus to hold the shutter blade **188** out of path of the projection beam independently of the operation of the control switch **194**. The closing of the switch **201** places the corresponding indicating lamp **183** under direct control of the pickup unit **193**, the control switch **194** closing the circuit through the indicating lamp whenever the monitoring track **63** is opaque on the film in the projector and turning off the lamp whenever the monitoring track is clear.

In the first described projection procedure, the observor sees an uninterrupted sequence of images on the central projection screen **181** in accurate accord with the selections of viewpoints or camera positions made by the director in the course of the original performance. In the second projection procedure the three images are shown side by side for comparison at each point of the performance and the director's previous selections in view point or camera position are indicated automatically by energization of the corresponding signal lamp **183**. Either of these two procedures makes it possible to arrive quickly at all decisions necessary in preparation of assembling the final composite film.

The three projectors are preferably, operated by electrically interlocked synchronous motors to run all three films in close synchronism. The footage record on one of the three films may be used to control a footage indicator such as the previously mentioned footage indicator **130** (Figs. 1 and 8) for the information of those present during the projection run.

Screen projection responsive to a revised monitoring record

If the selected sequence of viewpoints as recorded by the director during the original performance does not meet the director's approval as he sits through either of the above-described projection procedures, he may make pencil notes for guidance in revising his sequence of selections or may dictate such instructions to an assistant. In the practice of the invention represented by Figs. 15 and 16, however, the director makes a second revised monitoring record synchronized with the running of the three projectors for subsequent monitoring use in subsequently re-running the three films through the three projectors.

Any suitable means may be used for such a revised monitoring record. For example, the revised record may be made on sound tape by a sound recorder arranged as shown in Fig. 15. The sound recorder **207** directs the sound tape **208** past three sound recording elements **211**, **212**, and **213** corresponding to the three projectors and past a fourth sound recording element **214**. This last sound recording element is operated by an amplifier **215** under the control of the previously mentioned film computer **95**. The first three sound recording elements **211–213** are operated by three corresponding amplifiers **216**, **217** and **218**, respectively, which amplifiers are in turn controlled by a monitoring recorder indicated by the dotted rectangle **220**.

The relative positions of the sound tracks produced by these four sound recording elements is indicated on the fragments of sound tape **208** in Fig. 16. The sound tracks **221**, **222** and **223** are produced by the recording elements **211**, **212** and **213** respectively, and the impressions **224** are recorded on the margin of the tape by recording element **214** in response to the pulses from the film computer **95**. No actual sounds need be produced, of course, in making these four magnetic records on the tape.

The director in the course of viewing the first projection of the finished film merely shifts a selector switch **225** of the monitoring recorder to one or another of its three positions in accord with revisions of selections in viewpoint that he may decide upon from time to time. The diagram in Fig. 15 shows the selector switch **225** connected by a wire **226** to the three amplifiers **216**, **217** and **218** and shows the three contacts associated with the selector switch connected to the three amplifiers by three wires **227**, **228** and **229**, respectively. It is apparent that the film computer **95**, operating in response to the footage record on one of the films being run through the projectors will make the footage impressions **224** on the tape **208** in exact synchronism with the footage records on the three films and that the monitoring recorder **220** will make the monitoring tracks **221**, **222** and **223** on the tape in accord with the director's judgment as expressed by manipulating the selector switch **225**.

Fig. 16 shows diagrammatically a monitoring control system that is highly versatile in that it may be used in various ways for carrying out various procedures in cooperation with the revision monitoring tape **208**. The diagram includes the previously mentioned signal lamps **183** associated with the three projection screens **181** and also shows the solenoids **190**, pickup units **193** and control switches **194** that are incorporated in the three projectors **180**, respectively. For energizing the three solenoids **190** independently of the rest of the system when desired, two wires **230** from a source of electric current are connected to the two sides of each solenoid and a suitable switch **231** is provided an shown.

The diagram in Fig. 16 also includes a second signal lamp **232** for each of the three projection screens **181**, these three lamps being provided for a purpose that will be explained later.

A magnetic pickup unit **233** in Fig. 16 is connected to an amplifier **234** and the amplifier is in turn connected to the previously mentioned film computer **95** by a pair of wires **235** for the purpose of operating a suitable visual footage indicator in response to the footage impressions **224** in the manner heretofore explained.

Three magnetic pickup units **241**, **242** and **243** are shown in position to respond to the three sound tracks **221**, **222** and **223**, respectively, corresponding to the three projectors and the three original camera positions A, B and C. These three pickup units are connected directly to three corresponding amplifiers **244**, **245** and **246**. To provide the desired versatility in the operation of the system, Fig. 16 also shows two gang switches generally designated **248** and **249**, respectively, and what may be termed a gang relay, generally designated **250**.

The gang switch **248** has three switch arms **251** that are interconnected to operate in unison as indicated by the dotted line, each of these switch arms being movable between two contacts. In like manner, the gang switch **249** includes three mechanically interconnected switch arms **252**, each of which is movable between two contacts. The gang relay **250** which may be operated by any one of three relay coils **254** carries three contactors **255** each of which normally bridges a pair of corresponding contacts when all three of the relay coils **254** are de-energized but is moved away from the two contacts when any one of the relay coils is energized.

In a first procedure for using the system shown in Fig. 16, it is contemplated that in the re-running of the

three projectors 180 under the control of the revised monitoring record on the sound tape 208, the three projectors will show their corresponding images simultaneously on the three screens 181 and the previously mentioned signal lamps 183 will indicate which of the three images is selected for the final composite film. The signal lamps 183 will respond to the monitoring track 63 on the films in the projectors except when the monitoring tracks 221, 222 and 223 on the sound tape 208 conflict with the selections recorded on the film, in which event the revision record on the sound tape will automatically supersede and dominate the monitoring records on the film. To carry out this procedure the movable parts in Fig. 16 are positioned as shown, with the upper gang switch 248 in its righthand position and the lower gang switch 249 in its lefthand position. Also each of switches 231 is closed to hold open the auxiliary shutters 185 (Fig. 14) of the three projectors.

The operation of the system in Fig. 16 when adjusted in this manner may be understood by tracing the circuits controlled by the magnetic pickup unit 241 that responds to the magnetic monitoring track 221 representing camera position A. So long as the magnetic pickup unit 241 is not energized by the presence of the magnetic track 221 on the tape 208, the corresponding signal lamp 183 is under control of the pickup unit 193 in the corresponding projector. Whenever the monitoring track 63 appears on the film in this projector, the signal lamp 183 will be energized by a suitable circuit that includes the following: wire 258 on one side of the lamp, switch 194 controlled by the pickup unit 193, wire 259, contactor 255 of the gang relay 250, wire 260, switch arm 251 of the gang switch 248 and wire 261 to the other side of the lamp. Whenever the magnetic monitoring track 221 appears on the traveling tape 208, the pickup element 241 is energized to set up a suitable circuit including the following elements for lighting the lamp 183: wire 263 from the amplifier 244 associated with the pickup 241, wire 264, the previously mentioned wire 258 to one side of the lamp, wire 261, switch arm 251, wire 260, wire 265, wire 266, switch arm 252 of the gang switch 249, and wire 267 back to the amplifier 244. At the same time all of the pickup units 193 in the three projectors are cut off from the control of the corresponding lights 183 by energization of the gang relay 250 through the following circuit: wire 263 from one side of the amplifier 244 that is controlled by the pickup unit 241, wire 269, a coil 254 in the gang relay 250, wire 266, switch arm 252 in the gang siwtch 249, and wire 267 back to the amplifier 244.

Since each of the other two magnetic pickup units 242 and 243 will operate in the same manner as the pickup unit 241 to control the other two signal lamps 183, it is not necessary to describe the corresponding circuits in the diagram.

It is apparent that the three projectors used with this system will operate the signal lamps 183 selectively and automatically in response to the monitoring tracks 63 on the film being run through the three projectors, but any time a magnetic monitoring track appears on the sound tape 208 that is being run synchronously with the three projectors, control will be shifted automatically from the film in the projectors to the magnetic tape 208 and the lamps 183 will then indicate the revised selections of viewpoint or camera positions.

An important advantage of the system in Fig. 16 is that it makes possible re-running the three projectors under the control of the revised monitoring record immediately and without loss of time following the first running of the projectors under control of the monitoring tracks on the developed film. Thus in a typical practice with this system, the director watches the first run of the three films on the three screens with attention to the image selections indicated by the three signal lamps 183 and simply records any revisions he would care to make by corresponding movement of the selector switch 225 of the monitoring recorder 220. Then at the same setting with the first review still fresh in mind the magnetic monitoring record produced by the monitoring recorder 220 of Fig. 15 would immediately be used in re-running the three films for the director and on this second showing the lamps 183 would light up automatically in the proposed revised sequence.

During this re-run of the three films the director may again record revised selections on a sound tape in the same manner and such recording of selections followed by re-running of the three films may be repeated as often as desired to reach a final decision as to what is to be included in the final composite film. The final sound tape carrying the finally approved revision record may then be run through the tape recorder playback 175 of Fig. 7 to have the precision tape marker 177 make a visible record on the tape corresponding to the magnetic footage record on the tape, thus facilitating the matching of the monitoring record with the three films.

It is to be noted that during each re-run of the finished film the footage indicator 130 may be operated either by the sound tape 208 or one of the films being projected and that those present may make notes about the footage points at which selections are shifted from one film to another. It is also to be noted that the same combination of tape recorder playback and tape precision marker may be employed to make each of the magnetic monitoring records 221, 222 and 223 visible by using a recording element such as the previously described recording element 92 for marking the tape with ink.

In a second procedure that may be followed with the system shown in Fig. 16, it is contemplated that the three lamps 183 will be operated selectively by the monitoring tracks on the three films to indicate which of the three simultaneously appearing screen images is selected for each portion of the performance during the actual shooting of the performance, and that the previously mentioned second set of signal lamps 232 will be operated independently by the sound tape 208. Thus the signal lamps 183 would indicate the original selections and for comparison, the lamps 232 would simultaneously indicate revised selections made during the first projection of the three finished films.

To prepare the system in Fig. 16 for carrying out this second procedure, it is necessary merely to shift the lower gang switch 249 from its leftward position shown on the drawings to its alternate rightward position. This shift operatively disconnects the three magnetic pickups 241, 242 and 243 from the three corresponding coils 254 of the gang relay 250 and thus places the three signal lamps 183 under sole control of the three pickup units 193 in the three projectors so that the lamps 183 will follow the sequence of the original monitoring record on the three films as heretofore described.

The manner in which each of the magnetic pickups 241, 242 and 243 actuate the second set of three lamps 232 may be understood by tracing the following suitably energized circuit from the amplifier 244 controlled by the pickup unit 241: wire 263 from the amplifier, wire 270 to one side of the lamp 232, wire 271 from the lamp, switch arm 252 of the gang switch 249, and wire 267 back to the amplifier.

A feature of the system as adjusted in this manner is that it can be used to record and to indicate for comparison the opinions of different people and as many sets of three lamps may be operated simultaneously and independently by as many corresponding magnetic record tapes 208 as may be desired. To give one example, the three finished films may be projected on the three screens with or without simultaneous operation of the three signal lamps 183 and an expert in audience reaction may manipulate the selector switch 225 of the monitoring recorder 220 to record his judgment in regard to the three images on the screens. Then in re-running the

films with this monitoring tape **16** in the manner just described the director would be given the opportunity to compare his own selections side by side with the selections made by the expert in audience reaction.

In a third procedure using the system shown in Fig. 16 it is contemplated that the three projectors **180** will all be trained to the one central projection screen **181** and that the shutter solenoids **190** in the three projectors will be controlled by the monitoring records on the film except when the film monitoring records conflict with the monitoring records on the tape **208**, in which event the tape **208** will take over control of the projector shutters.

To prepare the system of Fig. 16 for this third procedure, both the upper gang switch **248** and the lower gang switch **249** are placed in their leftward positions and the three switches **231** are opened to permit the three corresponding shutter solenoids **190** in the three projectors to be controlled solely by the corresponding pickup units **193** in the projectors.

The suitably energized circuit for controlling the shutter of the projector running the film corresponding to the A camera position in response to the monitoring track **63** on the film includes the following: wire **272** from one side of the solenoid **190**, wire **264**, control switch **194** operated by the pickup **193**, wire **259**, relay contactor **255**, wire **260**, wire **265**, wire **266**, switch arm **252** of the gang switch **249**, wire **267** and wire **273** back to the second side of the solenoid **190**.

Whenever any one of the magnetic pickup units **241**, **242** or **243** responds to a magnetic monitoring track on the tape **208**, one of the relay coils **254** is actuated to cut off the pickup units in all three projectors and control of the shutter solenoids **190** in the projectors is transferred to the tape **208**. Thus if the magnetic pickup **241** responds to the monitoring tape **208**, the gang relay **250** is opened by the following previously described circuit that includes: wire **263**, wire **269**, relay coil **250**, wire **266**, switch arm **252** of gang switch **249** and wire **267** back to the amplifier **244**. At the same time the shutter solenoid **190** corresponding to the magnetic pickup unit **241** is operated by the following suitably energized circuit: wire **263** from the amplifier **244**, wire **272**, solenoid **190**, wire **273** and wire **267** back to the amplifier **244**.

Here again the promptness with which the three films can be re-run under the control of a revision record is an important advantage of the invention. In the first projection of the finished films the director may view on the single screen the sequence of selections made during the original photography and may record his revised selections at this time by means of the monitoring recorder **220**. Then, immediately while the first projection is still fresh in his mind the director may view a re-run of the three films with the sequence on the single screen following the selections recorded on the film monitoring record as modified and automatically superseded by the selections on the tape **208** for final approval of the sequence.

It is also to be noted that the director may first use the three projection screens for three simultaneous images for his guidance in making a revision record and then to get a single impression of his revised sequence may switch the system over to the use of a single projection screen with the shutter solenoids of the projectors controlled by the film monitoring records as modified by the magnetic tape monitoring record. Or he may choose first to view the selected sequence on the single screen to get an initial overall impression and then re-run the films with three screens simultaneously, perhaps re-running only questioned parts of the films.

One entirely different procedure carries out all the monitoring in the projection room. Thus three camera crews are assigned to photograph the performance without attempting to select viewpoints during the photography. The electronic cameras are not necessary. Then monitoring begins by projecting the images from the developed films onto three screens for comparison and the system shown in Fig. 16 is used to produce a monitoring record at this stage for the first time. The films are then re-run with the image selections shown in sequence on one screen under control of the monitoring record on sound tape for final approval of the selections.

It is apparent that any of the suggested or similar procedures using the described or similar apparatus may be used with exceptional advantage in carrying out the various steps of motion picture production and that the choice of procedures will depend upon the circumstances in each instance as well as the judgment of those experienced in this art. Thus what often takes months in the shooting, cutting and editing of motion picture film may be reduced to a matter of hours.

My disclosure of preferred practices of the invention by way of example and illustration will suggest various changes, substitutions and other departures from the disclosure that properly lie within the scope and spirit of the appended claims.

I claim:

1. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a running record on at least one of said films of selections among said viewpoints for different portions of the performance, developing said films, running said plurality of films or copies thereof synchronously through a corresponding plurality of projectors while, in response to said record on said film, projecting only one of the images from said projectors at one time in accord with the record to facilitate arriving at an approved sequence of images for the final film.

2. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a track photographically on at least one of said films to record selections among said viewpoints for different portions of the performance, developing said films, running said plurality of films synchronously through a corresponding plurality of projectors, simultaneously directing a light beam through said track to obtain a signal for guidance in viewing the images from said projectors in accord with the sequence of said selections to facilitate arriving at an approved sequence of images for the final film.

3. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a running monitoring record of selections among said viewpoints for different portions of the performance, developing said films, projecting said plurality of films or copies thereof synchronously on a corresponding plurality of screens to produce simultaneously a corresponding plurality of images of the performance, simultaneously signaling the selections among said plurality of images on the screens in accord with said record to arrive at an approved sequence of images for the final film.

4. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a running monitoring record of selections among said viewpoints for different portions of the performance synchronized with said films, developing said films, running said plurality of films or copies thereof synchronously to produce a corresponding plurality of images for comparison, simultaneously mak-

ing a second running monitoring record of selections among said images for different portions of the performance synchronized with said films, re-running the films to reproduce the images for comparison a second time, running both of said records synchronously with the re-running of the films, and signaling the selections among said images in response to both said records during said re-running for comparison of the records to arrive at an approved sequence of images for the final film.

5. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, making a plurality of running records of selections among said viewpoints for different portions of the performance synchronized with said films, developing the films, running said plurality of films or copies thereof synchronously to produce corresponding images for comparison, simultaneously running said records synchronously with said films, signaling the selections among said images in accord with said plurality of records during said running for comparison to arrive at a final sequence of images for the final film.

6. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a running record of selections among said viewpoints for different portions of the performance synchronized with said films, developing said films, running said plurality of films or copies thereof synchronously to produce corresponding images for comparison, simultaneously running said record in synchronism with said films to produce indications of the original choices of viewpoints, simultaneously making a revised record of changes in selection among said viewpoints, re-running said films and both said records simultaneously to ascertain the selections among the films in accord with said first record as corrected by said revised record to arrive at a final sequence of images for the final film.

7. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a synchronized running monitoring record on a running record strip of choices among said viewpoints for different portions of the performance, developing said films, running said plurality of films or copies thereof synchronously through a corresponding plurality of projectors all directed towards the same projection area of a large screen for observation of the sequence of choices, simultaneously re-running said record strip in synchronism with the plurality of films, and in accord with said record strip projecting only one image at a time from said running films onto said area to facilitate arrival at an approved sequence of images for the final film.

8. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a sound record of selections among the camera viewpoints in the course of the performance, developing said films, projecting said plurality of films or copies thereof synchronously to review the images thereon, simultaneously running said sound record synchronously with said films to reproduce said record audibly for guidance in reviewing the images in accord with said selections to facilitate arriving at an approved sequence of selections, cutting portions from said plurality of films corresponding to said sequence, and assembling said portions in sequence to make the finished film.

9. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, developing said films, running said plurality of films or copies thereof simultaneously to produce a corresponding plurality of images for comparison, simultaneously making a running monitoring record of selections among said images for different portions of the performance synchronized with said films, re-running the films through a plurality of projectors and running said record synchronously therewith to follow the selections in sequence to facilitate arriving at an approved sequence of images for the final film.

10. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously producing a corresponding plurality of electronic images of the performance from adjacent viewpoints for guidance in selecting viewpoints for different portions of the performance, simultaneously making a record of selections among said viewpoints on at least one of said films for guidance in subsequently projecting the developed film, developing said films, running said plurality of films or copies thereof synchronously while shifting from viewing the images on one film to the images on another of the films in response to said record to facilitate arriving at an approved sequence of images for the final film.

11. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously producing a corresponding plurality of electronic images from approximately the same viewpoints for guidance in choosing viewpoints for different portions of the performance, simultaneously making records on said films of choices among said viewpoints for different portions of the performance for guidance in assembling the final film.

12. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously producing a corresponding plurality of electronic images from approximately the same viewpoints for guidance in selecting viewpoints for the finished film, simultaneously making a track on at least one of said films to record a selected sequence of selections among said viewpoints for different portions of the performance, developing said films, and running said plurality of films or copies thereof synchronously while simultaneously indicating said sequence of selections among the images from said films in response to said track to facilitate arriving at an approved sequence of selections for the final film.

13. A method of producing a finished motion picture film that includes the steps of: photographing a performance with a motion picture camera, simultaneously making a record on the film being run in the camera of the running progress of the film for subsequent guidance in editing and cutting the film, developing the film, projecting the developed film or a copy thereof, simultaneously making a running monitoring record synchronized with said film for guidance in film revision, and during such projection transferring the progress record from the running film to the running monitoring record.

14. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras trained on the same setting for photographing a performance simultaneously from different viewpoints, means remote from said cameras for indicating selections in viewpoints among said cameras during a performance, means in each of said cameras to make a record on the film therein for future reference, means responsive to

said remote means to actuate said recording means selectively, counting means to measure progress in photographing a performance, means in each of said cameras to make a progress record on the film therein in response to said counting means, means to make a sound recording of the performance, and means responsive to said counting means to make a progress record on said sound recording.

15. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras trained on the same setting for photographing a performance simultaneously from different viewpoints, a corresponding plurality of electronic cameras trained on the same setting from approximately the same camera positions, a corresponding plurality of electronic viewers to reproduce the images taken by the electronic cameras for guidance in selecting viewpoints for different portions of the performance to be used in the final film, and means operatively connected to each of said motion picture cameras to indicate on the running film therein independently of the other running film when that film is selected for a portion of the performance.

16. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras trained on the same setting for photographing a performance simultaneously from different viewpoints, a corresponding plurality of electronic cameras trained on the same setting from approximately the same camera positions, a corresponding plurality of electronic viewers to reproduce the images taken by the electronic cameras for guidance in selecting viewpoints for different portions of the performance to be used in the final film, means to mark the films in said cameras selectively and independently of each other during the performance for subsequent guidance in identifying portions of the films to be used in a finished film, and means for making synchronized records on all the films on the progress of the films through the cameras for subsequent guidance in cutting and matching said portions of the films.

17. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras trained on the same setting for photographing a performance simultaneously from different viewpoints, a corresponding plurality of electronic cameras trained on the same setting from approximately the same camera positions, a corresponding plurality of electronic viewers to reproduce the images taken by the electronic cameras for guidance in selecting viewpoints for different portions of the performance to be used in the final film, means at each camera to mark the film therein, and remote control means operatively connected with each of said marking means to operate the marking means selectively during the performance period.

18. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras trained on the same setting for photographing a performance simultaneously from different viewpoints, a corresponding plurality of electronic cameras trained on the same setting from approximately the same camera positions, a corresponding plurality of electronic viewers to reproduce the images taken by the electronic cameras for guidance in selecting viewpoints for different portions of the performance to be used in the final film, means at each of said motion picture cameras to indicate on the film therein portions of the film selected in the course of the performance, means to operate said indicating means selectively, and means to record on all of the films in the cameras simultaneously a running record of the progress of the films through the cameras for guidance in subsequently cutting and matching the selected portions of the films.

19. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras for photographing a performance on motion picture film from a plurality of viewpoints simultaneously, means remote from said cameras for indicating selections of viewpoints among the cameras in the course of photography, means responsive to said remote means to record said selections on the films in said cameras selectively during the photographing of a performance, a plurality of projectors to run the developed films or copies thereof simultaneously, and means responsive to said records on the finished films to indicate the selected viewpoints during the projection of the films.

20. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras for simultaneously photographing a performance from different viewpoints, means apart from said cameras for indicating selections in viewpoints during photography, means in each of said cameras to make a record on the film therein in the course of photography for future reference, means responsive to said remote means for actuating said recording means selectively during photography, a plurality of projectors for producing images from film exposed in said cameras, and means on each of said projectors responsive to said record on the film therein to control the projection of images from the film.

21. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras for simultaneously photographing a performance from different viewpoints, means apart from said cameras for indicating selections in viewpoints during photography, means in each of said cameras to make a record on the film therein in the course of photography for future reference, means responsive to said remote means for actuating said recording means selectively during photography, a corresponding plurality of projectors for producing images from the corresponding finished films exposed in said cameras, a corresponding plurality of signal means, and means carried by each of said projectors to operate the corresponding signal means in response to the record on the film in the projector.

22. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras for photographing a performance on motion picture film from a plurality of viewpoints simultaneously, means remote from said cameras for indicating selections of viewpoints among the cameras in the course of photography, means responsive to said remote means to record said choices selectively on the films in said cameras during the photographing of a performance, a plurality of projectors for running the finished films or copies thereof simultaneously, means responsive to the records on the films to indicate the selected viewpoints in the course of the running of the films, means to make a running record of additional selections of viewpoints during the running of the finished film through the projectors, and means operative during the re-running of the films through the projectors to indicate selections in response to said records on the films and also to indicate selections in response to said running record.

23. In an apparatus for producing motion picture film, the combination of a plurality of motion picture cameras for photographing a performance on motion picture films from a plurality of viewpoints simultaneously, means remote from said cameras for indicating selections of viewpoints among the cameras in the course of photography, means responsive to said remote means to record said choices selectively on the films in the cameras, a plurality of projectors for running the finished films or copies thereof simultaneously, means responsive to the records on the films to indicate the selected viewpoints in the course of the running of the films through the projectors, means to make a running record of additional selections of viewpoints during the running of the finished film through the projectors, and means responsive both to said records on the films and said running record to indicate during re-running of the films the selections made during photography as revised during running of the films through the projectors.

24. A method of producing a finished motion picture film that includes the steps of: photographing a performance simultaneously from a plurality of viewpoints to produce a plurality of motion picture films of the performance, simultaneously making a running monitoring record synchronized with said films of selections among said viewpoints for different portions of the performance, developing said films, projecting said films or copies thereof simultaneously and synchronously for simultaneous observation, and running said record synchronously with the projection of said films to indicate in sequence the images from the running films selected for the record to facilitate arriving at an approved sequence of images for the final film.

References Cited in the file of this patent

UNITED STATES PATENTS

1,810,002	Arnold	June 16, 1931
1,839,318	Jennings	Jan. 5, 1932
1,865,028	Mallina	June 28, 1932
1,926,879	Miller et al.	Sept. 12, 1933
1,948,319	Spence	Feb. 20, 1934
1,950,091	Owens	Mar. 6, 1934
2,040,244	Ceccarini	May 12, 1936
2,044,333	Schmidt	June 16, 1936
2,147,499	Ross	Feb. 14, 1939
2,227,201	Ross	Dec. 31, 1940
2,282,957	Fields	May 12, 1942
2,301,935	Ehringhaus	Nov. 17, 1942
2,354,583	Eddy	July 25, 1944
2,385,861	Jones	Oct. 2, 1945
2,419,041	Stewart	Apr. 15, 1947
2,420,197	Rosenthal	May 6, 1947
2,523,662	Miller	Sept. 26, 1950
2,581,079	Coutelen	Jan. 1, 1952
2,649,016	Fairbanks	Aug. 18, 1953
2,706,218	Wootten	Apr. 12, 1955

FOREIGN PATENTS

604,860	France	Feb. 6, 1926
377,944	Great Britain	Jan. 28, 1931
687,959	Germany	July 26, 1940

OTHER REFERENCES

"Multiple-Film Scene Selector," H. W. Leasim, Journal Society Motion Picture Engineers, vol. 41, September 1943, pages 246–250.