

1,182,897.

T. A. EDISON.
APPARATUS FOR RECORDING AND REPRODUCING MOTION AND SOUNDS.
APPLICATION FILED FEB. 8, 1908.

Patented May 16, 1916.
2 SHEETS—SHEET 1.

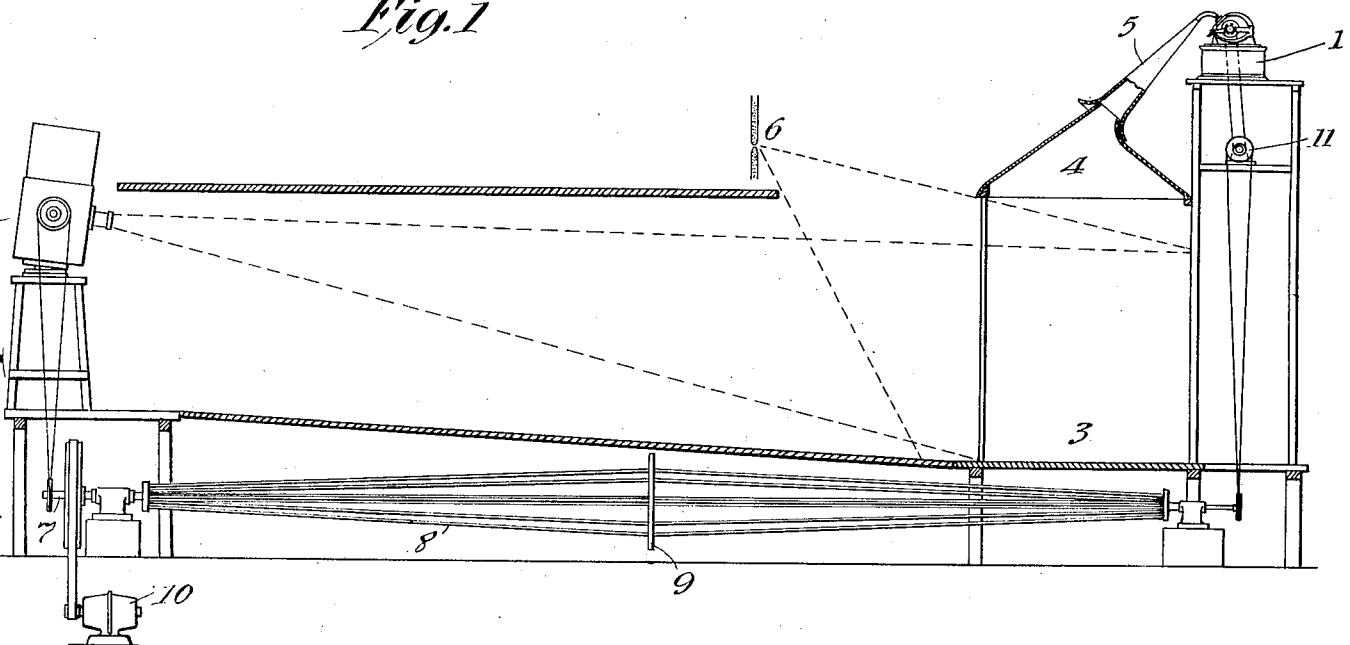


Fig. 1

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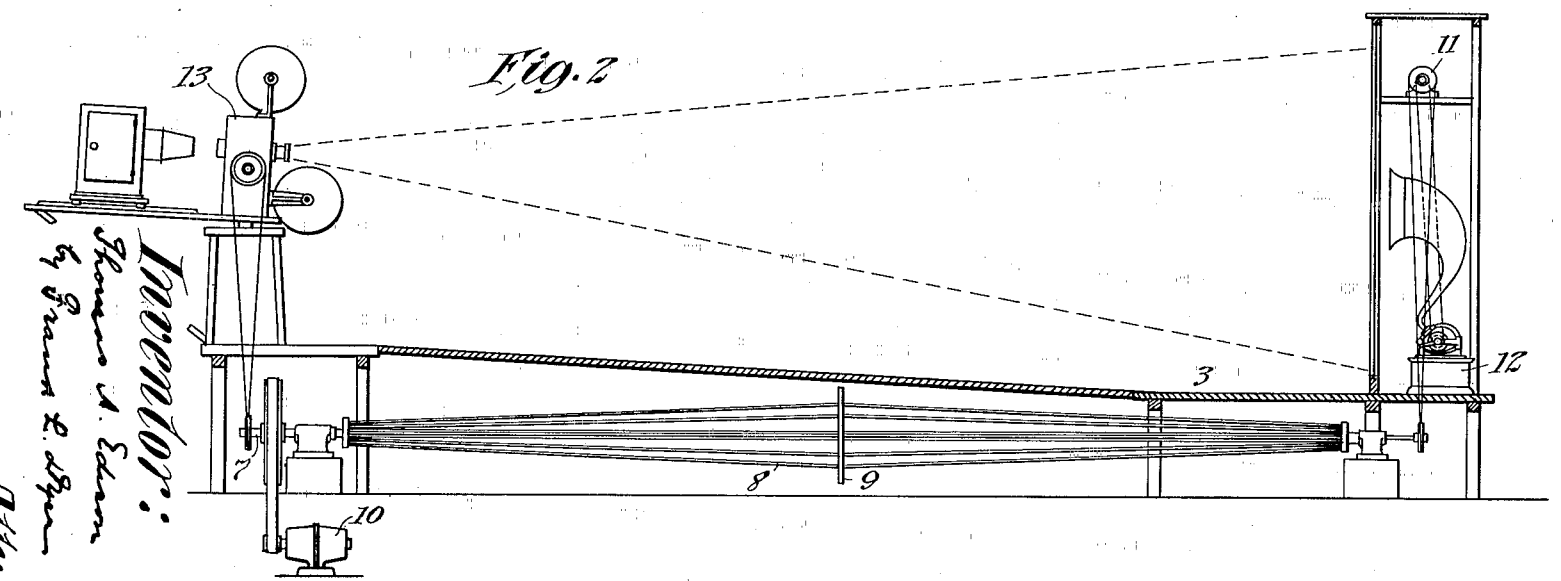
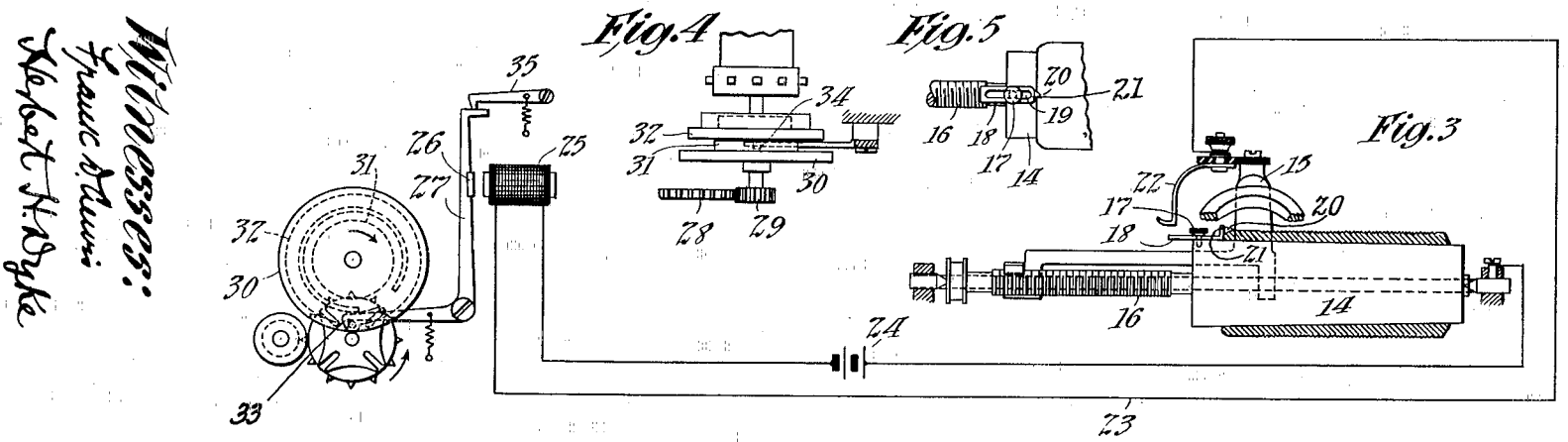
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UNITED STATES PATENT OFFICE.

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APPARATUS FOR RECORDING AND REPRODUCING MOTION AND SOUNDS.

1,182,897.

Specification of Letters Patent.

Patented May 16, 1916.

Application filed February 8, 1908. Serial No. 414,924.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park; Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Recording and Reproducing Motion and Sounds, of which the following is a description.

10 In the representation of animate motion by means of moving pictures, much of the effect of the original portrayal is lost by reason of the fact that the scenes are represented in pantomime merely, without the
15 sound which accompanied them when originally produced. For this reason the choice of subjects for representation by means of moving pictures is limited as only such subjects can be successfully represented in this
20 manner as are accompanied by very little sound, scenes in which sound plays a prominent part being incapable of adequate representation to an audience by the mere pantomime exhibition of moving pictures.
25 Likewise, the choice of subjects to be recorded and later reproduced by the phonograph alone is practically restricted to acts and scenes which are accompanied by little or no motion. The adequate portrayal of
30 the great majority of acts and scenes in which both action and sound are present, as for example, the popular "song and dance" act, or the delivery of a public speech by a speaker who talks and moves about and
35 makes gestures at the same time, cannot be accomplished by either the moving picture machine alone or by the phonograph alone, but only by the simultaneous use of both of these machines.

40 In order to simultaneously make a moving picture negative and phonograph record of an act or scene during its performance, the camera must be placed at a distance equal to substantially its normal focusing distance
45 from the scene, as will be understood, and the recording phonograph must be placed in the immediate neighborhood of the scene being performed so that the sound may be readily collected and conducted to the recording device. Likewise, to secure the
50 realistic reproduction of a scene or act by means of both the moving picture machine and the phonograph, the sounds must appear to emanate from the screen upon which

the moving picture is being exhibited and 55 for this reason the phonograph must be placed in the neighborhood of the screen—usually behind it—so that both in making the original record and negative and in reproducing the act or scene, the two machines 60 are separated by a considerable distance, substantially equal to the normal focusing distance of the camera or projecting machine.

As each movement portrayed upon the 65 screen must be accompanied by the sound originally produced simultaneously therewith, it is necessary that at some time, either at the beginning of the operation of the picture machine and phonograph, or shortly 70 thereafter, the two machines shall be made to reproduce movements and sounds which were originally produced at the same instant, and this same identical relation must be maintained throughout the entire repro- 75 duction of the performance by the two machines. It has been proposed heretofore to synchronize the operation of the picture machine and the phonograph by actuating these machines by means of synchronized 80 electric motors, but such devices are uncertain in operation and likely to get out of order, are extremely expensive and have not been found to produce practical results.

The object of the present invention is to 85 provide a novel process and apparatus for making simultaneously a moving picture negative and a phonograph record of sound producing objects in motion and thereafter simultaneously reproducing the sounds re- 90 corded by the phonograph and exhibiting the objects in motion by means of moving pictures, the apparatus which I have devised for this purpose being simple and inexpensive to manufacture and certain and reliable 95 in its operation.

In a device constructed and operated in accordance with my invention, a simple mechanical form of driving mechanism is provided to drive both the phonograph and the 100 moving picture camera or projecting machine, according as the device is to be used for recording or reproducing acts and scenes. The form of drive which I have found best adapted for this purpose com- 105 prises a long shaft whose length is substantially equal to the distance between the two machines and which may be arranged in

any convenient location, as for example, beneath the floor of the room, the phonograph being driven from one end of this shaft and the moving picture camera or projecting machine from the other. If the location of the device is such that a single, straight shaft cannot be used, shorter shafts geared together by bevel or other gears or connected together by universal joints may be used, as will be understood. The shaft may be driven from any convenient source of power, as for example, from an electric motor.

In accordance with my invention, either in making the original record and negative, or in the reproduction of the scene or act, either the phonograph or else the moving picture camera or projecting machine, as the case may be, is first set into operation and the remaining machine is automatically set into operation therefrom. I prefer and have here illustrated the moving picture camera or projecting machine as being started from the phonograph. I consider this the preferable arrangement because the intermittently operating mechanism of the moving picture camera or projecting machine is practically without mass and may be started or stopped substantially instantaneously. With this arrangement I preferably provide means whereby when the recording or reproducing stylus of the phonograph has been carried by the carriage moving transversely of the phonograph record, to a determinate distance from the end of the phonograph record cylinder, the moving picture camera or projecting machine will be automatically set into operation. The operation of the mechanism for this purpose which will hereafter be fully described, is independent of any variation in the longitudinal position which the record cylinder may occupy on the phonograph mandrel. I also provide means whereby the angular position of the master record upon the mandrel of the phonograph, during the making of the original record, is indicated, and thereby the record or duplicates thereof may be replaced upon the said mandrel in precisely the same angular relation thereto as originally existed between the master record and the mandrel.

In order that my invention may be more clearly understood, I have shown in the accompanying drawings apparatus by which my improved process may be carried into effect.

In the figures of the drawing, wherein the same reference numerals are used uniformly to designate the same parts throughout, Figure 1 is a view, partly in longitudinal vertical cross-section, of an apparatus for simultaneously making a moving picture negative and a phonograph record; Fig. 2 is a view similar to Fig. 1 but showing a moving picture projecting machine

and a reproducing phonograph instead of a moving picture camera and a recording phonograph respectively; Fig. 3 is a diagrammatic view of one form of means for setting one of the machines into operation from the other, the moving picture camera or projecting machine being here shown as set in operation from the phonograph, and Figs. 4 and 5 are detail sectional views of portions of the moving picture camera or projecting machine and the phonograph respectively.

Referring to Fig. 1 of the drawings, a recording phonograph is shown at 1 and a downwardly directed moving picture camera at 2. The phonograph is situated in the immediate neighborhood of the stage 3, preferably behind and above it. Immediately above the stage is provided a funnel 4 which collects the sound and conducts it into the receiving horn 5 of the phonograph. The phonograph 1, funnel 4, and horn 5, are all preferably located without the field of the camera, as shown in Fig. 1. Other means for collecting the sound and conducting it to the phonograph may of course be used. The stage 3 is illuminated from a source of light 6. A long drive shaft 7 is used to drive both the camera and the phonograph and it extends from the neighborhood of the phonograph to the neighborhood of the moving picture camera, and may be placed in any convenient position, as for example, in the construction shown in the drawing, it is placed beneath the floor of the room. This shaft is mounted in bearings at either end and in order to give it rigidity, render it substantially non-torsional and at the same time make it as light as possible, it may be provided with a number of stays 8 which are secured to the shaft near its ends and are held apart near the middle of the shaft by a plate or frame work 9. Any form of light rigid shaft may be used, however, as for example, the compound shafting shown in my patent No. 271,614 dated February 6, 1883. The shaft 7 is driven from any convenient source of power, as for example, an electric motor 10, the speed of which is regulated in any suitable way so as to be always uniform, as for instance in the regulation of electric motors for operating phonographs; and the motor is several times more powerful than is necessary for driving the load, in order that its speed may not be momentarily checked when the moving picture machine is instantaneously started, as will be explained. One end of the shaft 7 is connected up to drive the moving picture camera or projecting machine and the other end the phonograph. The power is preferably transmitted from the shaft through sprocket chains and sprocket wheels, so that all possibility of slip may be obviated, although it

is obvious that pulleys or gears might be used. The proportions of the power transmitting devices are such that the moving picture camera or projecting machine and the phonograph is each operated at its own proper speed. In transmitting the power to the phonograph a counter-shaft 11 is preferably provided so that the phonograph may be placed in slightly different positions as shown in Figs. 1 and 2.

Referring now to Fig. 2, 12 represents a reproducing phonograph and 13 a moving picture projecting machine. The driving apparatus for these two machines is the same or precisely like that for the recording phonograph and the moving picture camera, so that when the two machines have once been gotten to working in unison they will continue to operate in unison and the sounds and motions will be reproduced simultaneously as they were originally produced.

The mechanism for automatically setting the moving picture camera into operation from the recording phonograph and for setting the moving picture projecting machine into operation from the reproducing phonograph, is shown in Fig. 3. In this view 14 represents the phonograph mandrel, 15 the carriage which is movable transversely of the phonograph mandrel and the cylindrical blank or record thereon, under the control of the rotating feed screw 16. These parts are of ordinary construction. The carriage 15 carries a recorder when the instrument is used for recording and a reproducer when it is to be used for reproducing, as will be understood. Near the larger end of the mandrel 14 and adjustably secured thereto by means of a screw 17 is a small bracket 18 provided with a longitudinal slot 19 through which the screw 17 is passed. The end of this bracket next to the record or blank cylinder is formed with a sharp edge 20 and an upward projection 21 forming a contact point. Secured to the carriage 15, and insulated therefrom, is a contact piece 22. This contact piece may be made of light metal so that it may be easily adjusted by bending; or other means for adjusting it may be provided. The branches of an electric circuit 23 are connected respectively to the mandrel 14 and the contact piece 22, so that when the contact piece 22 strikes the extension 21 of the bracket 18, the circuit will be closed. This circuit includes the coils of an electromagnet 25. The armature 26 of the magnet 25 is carried upon a lever 27 here shown as a bell-crank lever, forming a part of the device used when the electric circuit is closed as above described, to set into operation the moving picture camera or projecting machine, a sectional plan view of which is shown in Fig. 4. 28 indicates a gear wheel operatively connected to the shaft 7 and meshing with a pinion 29, which operates to

continuously rotate a disk 30 carrying a friction member such as a friction disk 31. The friction disk 31 bears against the actuating disk or pin wheel 32 which when rotated actuates the intermittent feed device of the moving picture camera or projecting machine. The disk 32 is normally held from rotation by a hook 33 on the lever 27 and engaging a pin 34 on the said disk 32.

When the circuit 23 is closed by the contact pieces 21 and 22, the magnet 25 being energized, the hook 33 is drawn away from in front of the pin 34, and the intermittent feed device of the camera or projecting machine is permitted to rotate under the control of the friction member 31. A spring actuated pawl 35 automatically interlocks with the lever 27 and holds the same retracted when drawn back by the magnet 25.

The operation of the devices which have been described is as follows: When the original performance of the act or scene is to be recorded upon the phonograph and photographed by the moving picture camera, a record blank is placed upon the tapering mandrel 14 of the phonograph and pushed thereon until it binds. The bracket 18 is then pushed against the end of the record blank and secured in place by means of the screw 17, the sharp edge 20 making a slight but readily visible mark in the end of the blank. A sensitized film is placed in the camera with a previously marked portion thereof opposite the light aperture. The stage is now illuminated and when the performers are ready to begin the performance the electric motor 10 is set into operation and the phonograph is driven thereby. As the phonograph is operated the contact piece 22 is moved transversely of the mandrel and record blank by means of the carriage 15 and comes into contact with the projection 21, and the circuit 23 being thus closed the camera is automatically set into operation by the mechanism already described, whereupon the act or performance which is to be photographed and recorded phonographically is commenced. Ordinarily an announcement of the act or scene to be recorded will be made on the phonograph before the circuit is closed and the moving picture camera is started. With some practice this announcement may be made to immediately precede the actual record, so that there will be no undesirable hiatus.

In order to reproduce the scenes and movements thus recorded and photographed, a positive film is made from the negative film by a direct printing process so that it is an exact duplicate thereof, and this positive film is placed in a projecting machine which is substituted for the moving picture camera, with the same point of the film opposite the projecting aperture as was opposite the exposure aperture when the camera was start-

ed to take the picture. A duplicate record made from the original master record is placed on a reproducing phonograph which is substituted for the recording phonograph in use during the original production of the act or scene, and the bracket 18 upon this phonograph is secured against the end of the record by means of the screw 17, the record having been turned to the same angular position upon the mandrel as was occupied by the master record. The original record may be used for reproduction upon the phonograph, in which case a phonograph with a feed screw having precisely the same pitch as that on the original recording phonograph will be used. If, however, a duplicate record made by the usual molding process is used for reproduction, (since the material from which such duplicate molded records are made, shrinks somewhat during the process of cooling, and the record is therefore somewhat shorter than the original master record,) a phonograph is used having a feed screw of somewhat smaller pitch than that of the phonograph used for recording. Such records shrink symmetrically throughout their length and the amount of such shrinkage is definitely known and may be accurately compensated by a change in the pitch of the feed screw as above indicated. The machines having been thus arranged, the phonograph is set into operation by starting the motor 10 and when the contact pieces 21 and 22 strike against one another the moving picture projecting machine will be set into operation when the reproducing stylus of the phonograph has reached a point on the record corresponding precisely with the point on the positive film at which the latter is set into motion, the announcement of the act or scene having first been reproduced phonographically, as will be understood. The two machines having been set into operation in the desired relation and being driven by driving mechanism identical with that used during the performance of the original act or scene, this desired identical relation will continue throughout the reproduction of the act or scene. Portions of the film corresponding to the successive phonograph records may be joined together by blank pieces of film, and as soon as the display of one such section has been completed, the lever 27 may be released from the pawl 35, when the moving picture machine will come to a stop. The record cylinder upon the phonograph may now be replaced by the record cylinder corresponding to the succeeding portion of film and the new section of film properly positioned upon the projecting machine, the bracket 18 properly adjusted and, as soon as the contact piece 22 strikes the contact piece 21 the projecting machine will again be set into operation,

and the performance can thus be continued until the entire length of film in the magazines of the moving picture projecting machine and the corresponding records have been exhausted.

Having thus described my invention, I claim:

1. In a device of the class described, the combination with a phonograph mandrel and carriage, and means for operating them, of a contact device carried by said mandrel, and adapted to engage the end of a record or blank placed upon said mandrel, a contact device carried by said carriage and adapted to contact said first named contact device at a fixed point in the travel of said carriage over said record or blank, a moving picture machine, and means for setting the same in operation automatically upon the contacting of said contact devices, substantially as set forth.

2. In a device of the character described, the combination of a phonograph comprising a rotatable support adapted to carry a sound record or blank, a contact piece carried by said support, a movable contact piece secured to a permanent part of the phonograph and adapted to be struck by the first named contact piece in its rotation by the support, an electric circuit normally open and adapted to be closed by the said contact pieces, an electromagnet, the coils of which are included within the electric circuit, a moving picture machine, common actuating means for the said phonograph and moving picture machine positively geared to the phonograph, means under the control of said magnet for preventing the operation of the moving picture machine, the movable contact being actuated by the phonograph to automatically effect the closing of said circuit to thereby energize said magnet for releasing the said preventing means, and means for automatically locking the said preventing means in releasing position upon the release thereof, substantially as described.

3. In a device of the class described, the combination with a phonograph mandrel and carriage and means for operating them, of an adjustable contact device carried by said mandrel and adapted to be adjusted with respect to the mandrel into a predetermined position relative to a record or blank placed upon the said mandrel, a contact device carried by the said carriage adapted to contact said first named device at a fixed point in the travel of said carriage over said record or blank, a moving picture machine and means for setting the same in operation automatically upon the contacting of said contact devices, substantially as set forth.

4. In a device of the class described, the combination with a phonograph mandrel and carriage and means for operating them,

of an adjustable contact device carried by said mandrel and adapted to be adjusted with respect to the mandrel into position against the end of a record or blank placed upon the said mandrel, a contact device carried by the said carriage adapted to contact said first named device at a fixed point in the travel of said carriage over said record or blank, a moving picture machine and means for setting the same in operation automatically upon the contacting of said contact devices, substantially as set forth.

5. In a device of the class described, the combination of a phonograph comprising a rotating mandrel adapted to carry a sound record or blank and a traveling carriage, a contact piece secured to said mandrel and a coacting contact piece upon said carriage, an electromagnet, a normally open electric circuit including the said contact pieces and the coils of the electromagnet, a moving picture machine located at substantially its focal distance from said phonograph, actuating means comprising a long substantially non-torsional shaft extending from the phonograph to the moving picture machine, and means under control of the said magnet for operatively connecting said projecting machine to the said actuating means, substantially as described.

6. The combination of a stage, a moving picture camera focused upon said stage, a recording phonograph adjacent said stage, a funnel connected with said phonograph and having a downwardly directed exit portion placed above the stage, said phonograph and funnel being located without the field of the camera, and means connecting said phonograph and camera for actuating the same in synchronism, substantially as set forth.

7. In a device for simultaneously reproducing sounds and exhibiting motion pictures the combination of a reproducing phonograph, a moving picture projecting machine, actuating means for the said pho-

nograph and projecting machine, means for preventing the operation of the projecting machine, a device secured to the record carrier of the phonograph, and means under the control of said device for releasing the said preventing means at a predetermined point in the operation of the phonograph; substantially as described.

8. In a device of the character described, the combination of means adapted to render a moving picture machine inoperative, and means for actuating said first means to render said moving picture machine operative comprising an electric circuit, an electro-magnet in said circuit, and a talking machine having a record carrier, and a device upon said carrier for closing said electric circuit, substantially as described.

9. In a device of the character described, the combination of a clutch adapted to lock a cinematograph mechanism against operation, and means controlling the operation of said clutch to release said cinematograph mechanism comprising an electric circuit, an electro-magnet in said circuit, and a talking machine having a record carrier and a device upon said carrier for closing said electric circuit.

10. In a device of the character described, the combination of a clutch adapted to lock a cinematograph mechanism against operation, and means controlling the operation of said clutch to release said cinematograph mechanism comprising an electric circuit, an electro-magnet in said circuit, and a talking machine having a record carrier, means upon said carrier for indicating the position for a sound record thereon, and a device upon said carrier for closing said electric circuit.

This specification signed and witnessed this 4th day of Feb., 1908.

THOMAS A. EDISON.

Witnesses:

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