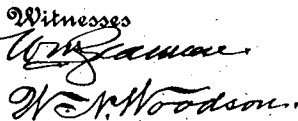


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2 SHEETS—SHEET 1.

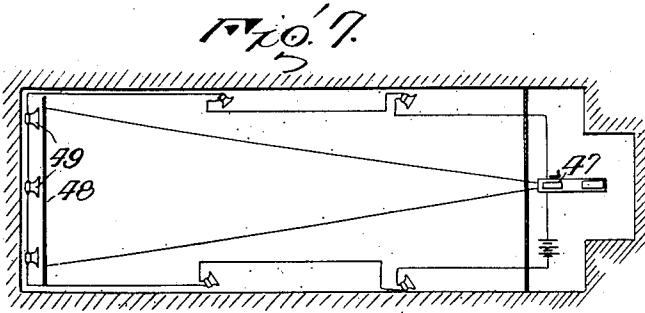
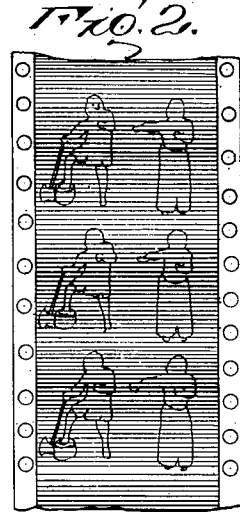
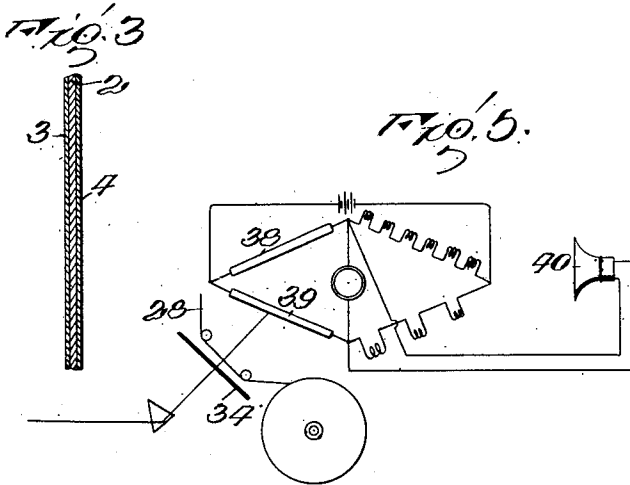
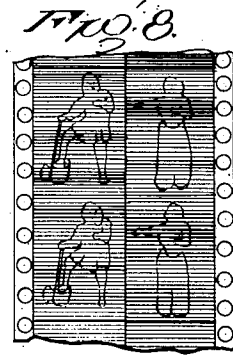
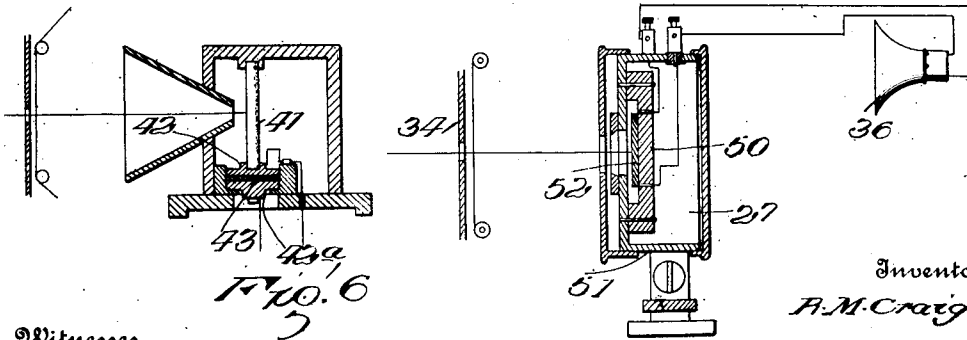


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MOVING PICTURE MACHINE.
APPLICATION FILED AUG. 12, 1914.

1,260,338.

Patented Mar. 26, 1918.
2 SHEETS—SHEET 2.



Witnesses
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By

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UNITED STATES PATENT OFFICE.

RICHARD M. CRAIG, OF SAN ANTONIO, TEXAS.

MOVING-PICTURE MACHINE.

1,260,338.

Specification of Letters Patent.

Patented Mar. 26, 1918.

Original application filed May 8, 1913, Serial No. 765,959. Divided and this application filed August 12, 1914. Serial No. 856,420.

To all whom it may concern:

Be it known that I, RICHARD M. CRAIG, citizen of the United States, residing at San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Moving-Picture Machines, of which the following is a specification.

My invention relates to phonographic or "talking" moving pictures, and more particularly to the art of taking and projecting such moving pictures with the accompaniment of sound recording and sound reproduction respectively.

Many attempts have been made to secure with the reproduction of moving pictures, the reproduction of sounds correlated therewith. Almost all these attempts have been made by operating the moving picture film in conjunction with the ordinary phonograph or gramophone. The difficulty of using an instrument of this character to reproduce sounds correlated with the film is that the phonograph must of necessity be practically a separate machine from either the camera whereby the pictures are taken, or the projector whereby they are thrown upon the screen, and that with either the gramophone or the phonograph it is practically impossible to secure a sound record which shall be contemporaneous with the moving picture film. The maximum sound record as used today will not run for longer than five minutes, whereas the moving picture scene may be very much longer. Further than this, it is practically impossible to run the phonograph or gramophone in synchronism with the film and this is a very vital necessity for the proper correlation of the sound record with the pictures. Again, if the film runs off or breaks, the phonograph must be stopped, and it is almost impossible to again adjust the film in proper correspondence and correlation with the sound record. The mere connecting up of the sound reproducing mechanism with the mechanism of the moving picture machine will not secure a complete correspondence and correlation between the sound and the pictures, for the reason that the film is liable to slip and to tighten or loosen upon the reels, and it would be extremely hard to adjust the film so as to correspond accurately with the motion of the picture. An accurate correspondence of the sound with the event

with which the sound is correlated, is, of course, absolutely necessary to prevent a disjunction which would entirely spoil the effect.

Furthermore, the phonographic record can naturally contain only so many words and this requires the film to be made of a certain length only, this length corresponding with the phonographic record, instead of which the sound record should be made for and with the picture record of any possible scene or happening that might occur, and the sound record should have the same length as the scene record and not be limited as to length.

Again, the process of making phonographic records requires extra care and especially prepared staging. The phonograph requires an extra attendant to place the records thereon. Furthermore, the picture record and the sound record have heretofore been taken separately and could not therefore be in accurate correspondence, nor could they ever be placed in accurate correspondence under these circumstances. It is a very difficult problem and requires elaborate arrangement of costly mechanism to keep a film synchronized with a phonographic record. If the film happens to run off while exhibiting the phonographic record and the pictures on the film get out of time, it is practically impossible to get them in time again. If the film should happen to get torn in two or broken, which sometimes happens, and the film is cemented together, the words corresponding to the part torn out of the film can never be taken from the phonograph record, and this destroys the further use of the two together.

The primary object of my invention is the provision of mechanism whereby a sound record film of the form shown and claimed in my pending application for patent Serial No. 765,959, filed May 8, 1913 (of which case the present application is a division) may be reproduced synchronously with the reproduction of moving pictures.

A further object is to so form sound reproducing mechanism that it will reproduce the films illustrated and described in my above named application with only a slight change being necessary in the mechanism now used for producing moving pictures.

A further object is to provide reproducing means so constructed that a film may be

used as both the picture record carrier and the sound record carrier and in which the pictures and the corresponding sound records are so arranged on the film that they shall be at all times in fixed relation to each other and reproduced simultaneously and without chance of the sound record having its relation to the picture record changed.

A further object is to so form the reproducing apparatus that sound records may be translated into electrical vibrations and these in turn carried to various parts of a hall within which the machine is to be used.

A further object is to so construct the machine for reproducing the picture and accompanying sounds, that the manner of operation shall be extremely simple, both as regards the reproduction of the sound records and the reproduction of the moving pictures.

Still another object is to so construct the mechanism for reproducing the sound record in conjunction with the projection of the moving pictures that while the film shall move at one point intermittently to reproduce the pictures, the film shall move steadily at one point to reproduce the sound record and in this connection to provide mechanism for causing the projection of a certain class of light rays through that portion of the film which is moving intermittently, causing the display of moving pictures, and causing the projection of another class of light rays through that portion of the film which is moved steadily whereby to reproduce the sound record, and further, in this connection, to provide in combination with means for projecting one class of rays through said film, sound reproducing mechanism of such character as to be operated by the action of these rays.

Still another object of my invention is the provision of a machine adapted to project moving pictures and sound records simultaneously, including means for projecting rays of invisible light through a portion of a film and projecting rays of visible light through another portion of the same film, the rays of the visible light producing the ordinary moving pictures on a screen while the rays of the invisible light act upon sound reproducing mechanism.

My invention is illustrated in the accompanying drawings wherein:—

Figure 1 is a view partly in section of my improved apparatus for projecting moving pictures and reproducing sound.

Fig. 2 is a face view of a portion of a combined moving picture and sound record film.

Fig. 3 is a transverse section of such a film.

Fig. 4 is a diagrammatic view partly in section of a "Bi-Ag" thermopile.

Fig. 5 is a diagrammatic view of a

bolometer which may be used for the purpose of translating invisible light variations into sound vibrations.

Fig. 6 is a diagrammatic view of the Edison tasimeter which may be used for the like purpose.

Fig. 7 is a plan view of a moving picture theater, showing the arrangement of the telephone receivers therein.

Fig. 8 is a view similar to Fig. 2, illustrating another form of film.

My invention is based upon the fact that infra-red rays are invisible but that these rays will affect a properly sensitized photographic film, and that these infra-red rays will affect various forms of electrical phonographic receivers or sound transmitting devices. Infra-red rays may be passed through an ordinary photographic film or the film of a moving picture without being visible and without interfering with the proper projection of the picture by moving picture projecting apparatus. If a picture strip is prepared, therefore, having on one side the ordinary photographic reproductions of pictures, and on the other side a phonographic sound record capable of being reproduced only by the infra-red rays, the sound record will not interfere with the passage of white light to and through the pictures and the presence of the pictures will not interfere with the passage of infra-red rays through the strip. On one side of the film, or the strip, therefore, would be the ordinary picture record and on the other side would be a printed photographic record of sound, which record would be transparent to ordinary visible light but which record would more or less intercept the infra-red rays to produce variations in the projection of these rays, these variations being used to affect sound transmitting apparatus as will be later stated. Infra-red rays are below the ordinary visible spectrum. They are invisible to the naked eye and are very penetrating and are subject to the same optical laws as ordinary light.

In my pending application Serial No. 765,959, filed May 8, 1913, I have fully described a film which may be used for this purpose and which carries upon it on one side a sound record through which visible rays may pass without obstruction and upon the other side a picture record through which the invisible rays may pass without obstruction.

In Fig. 3 I show a portion of a film or strip of moving pictures in which 2 designates the body of the film, 3 a coating upon which the photographic print is taken and 4 a coating of substance which is not capable of being acted upon photographically by ordinary light and which will act as a medium to carry a substance which will in turn act to intercept either partially or entirely said

infra-red rays. In said application I have also fully described and illustrated means whereby the combined picture record and sound record are taken.

5 My present invention relates entirely to the means for reproducing the combination sound record and picture film.

Generally speaking, for the reproduction of the picture record and the sound record, 10 ordinary white light is passed through the picture record while the infra-red rays (invisible to the eye) are passed through the sound record and fall upon suitable instruments to be hereafter described whereby 15 these infra-red rays will cause the reproduction of sound vibrations. There are a number of instruments that are sensitive to infra-red rays. The tasimeter invented by Thomas A. Edison will measure heat accurately down to the ten-thousandth part of one degree, but this instrument is probably too sluggish for the purpose of reproducing sound record. The selenium cell 20 when sensitized by Abney's process is sensitive to infra-red rays and may be used for the purpose. I believe, however, that the bolometer is best adapted for the purpose for several reasons, but principally because the element upon which the light falls can 30 be made more nearly to coincide with the small horizontal lines of the photographic sound record. The width of the horizontal lines of the sound record would be regulated according to the speed of the film.

35 In the reproducing apparatus such as is hereafter described, infra-red rays are projected against the film containing the sound record and the picture record by suitable prisms such as prisms of rock salt, fluorite 40 or Jena glass and focused through a narrow slit onto the film and after passing through the film fall on the reproducing instrument such as the bolometer. Connected in series with the bolometer or through similar apparatus would be loud-speaking phones 45 such as the auristophone, the Edison or the Durceret loud-speaking phones.

Moving pictures are reproduced by intermittently moving the film. It is therefore 50 plain that it would be impossible to use this film during its intermittent motion or at the point through which the white light rays are projected for the purpose of reproducing the sound record, it being plain that the 55 sound record must be reproduced as it was taken, namely, by a continuous and unintermittent movement of the film. I overcome this difficulty therefore, by passing the infra-red rays through the film at a point on 60 one side or the other of the point where the picture projecting rays are passing through, that is, at a point where the film is moving continuously and steadily.

An apparatus whereby the moving pictures may be projected and the sound record

synchronously reproduced, is illustrated in Fig. 1. This figure shows an ordinary moving picture projecting apparatus comprising a table or base 26 supported in any suitable manner and supporting upon it the 70 lamp housing 27 wherein there is disposed the ordinary right angle arc lamp 28 such as used in moving picture machines. Such a right angle arc is particularly adapted as a source of infra-red rays, while supplying 75 at the same time the ordinary white light for the pictures. The light is projected from the lamp housing in any usual or suitable manner onto the film 2. This film is unrolled from an upper film reel and passes 80 down through the usual moving picture projector 29. This mechanism contains means for intermittently shifting the film while the shutter of the mechanism is closed. Inasmuch as there are various types of this 85 mechanism and it is thoroughly well known, it is not deemed advisable to describe the mechanism in detail.

The white light after passing through the film 2 is projected onto a screen A 90 in the usual manner. The film after it passes below the aperture plate of the moving picture machine no longer moves intermittently but is shifted continuously and I have illustrated the film 2 as being passed around a 95 series of rollers 30 and in front of the aperture of a selenium cell or like apparatus, this cell being designated 31. After passing in front of the aperture of the selenium cell the film 2 passes around a lower or receiving reel 32 which may be connected up with 100 any suitable mechanism whereby the reel may be rotated continuously in a direction to wind up the reel 2 at a suitable rate of speed. 105

Disposed immediately below and in line with the meeting point between the carbons of the angular arc lamp 28 there are series of lenses 33. These lenses are preferably 110 made of rock salt or fluorite or dense cobalt glass. The infra-red rays passing through these lenses 33 are transmitted by means of prisms 33^a of Jena glass or other suitable material to the aperture of the selenium cell 31. A diaphragm 34 is so disposed as 115 to cause these rays to fall in the form of an elongated narrow or transversely extending beam upon the face of the selenium cell 31. Preferably the lenses 33 and the prisms 33^a are contained within a casing or housing 35. 120

The selenium cell 31 is formed in any usual or suitable manner and requires no particular description as it is the ordinary form of cell except that preferably the cell 125 is treated by Abney's process so as to make it extremely sensitive to the infra-red rays. Mounted behind the screen or in any suitable portion of the exhibition hall is a loud-speaking phone designated 36 in Fig. 1. 130

This is a loud-speaking electric telephone and is connected in circuit with the selenium cell 31.

The operation of the picture and sound reproducing apparatus illustrated in Fig. 1 is of course obvious. The pictures are reproduced in the usual manner, but after the strip or film has passed beyond the specific moving picture mechanism, the strip passes in front of the selenium cell and the transverse bands or lines of the sound record on the film will act to more or less intercept, absorb, reflect or otherwise stop or impede the passage of the infra-red rays. Where the infra-red rays fall with full force upon the selenium cell, the cell will have a certain degree of electrical resistance. Where the infra-red rays are intercepted or their intensity changed in any manner, the electrical resistance of the selenium cell will vary correspondingly. There will therefore be a continual variation of the electrical resistance of the cell as the record film passes in front of the cell, and this continual variation of resistance will, in a manner well known, affect the mechanism of the telephonic translator 36 and thereby cause vibrations of the air corresponding to the sound vibrations and the sound will be reproduced. All of the mechanism heretofore described is well known by itself. The photophone operates on the same principle as the sound reproducing mechanism heretofore described, but using ordinary white light.

Inasmuch as sound reproductions may be secured by a large variety of electrical apparatus, affected by variations of rays falling upon it, I do not wish to be limited to the use of a selenium cell or any other specific apparatus for the purpose of translating the photographic sound records into air vibrations as any other mechanism having the same general function may be substituted for the selenium cell.

For purposes of illustration, I have shown in Figs. 5 and 6 two other forms of mechanism adapted to translate the vibrations of light rays into sound. Fig. 5 illustrates the bolometer as used for this purpose. The bolometer will measure heat accurately down to the ten-millionth of a degree. In Fig. 5, 38 and 39 indicate two thin platinum strips forming the two arms of a Wheatstone bridge normally in perfect balance. The infra-red rays passing through the film 2 in the form of a thin beam fall on one of these arms or strips, namely the strip 39. This disturbs the balance of the bridge. This Wheatstone bridge is connected as illustrated in the diagram to a telephonic translator 40 which is the translating device of any one of the loud-speaking phones previously referred to. The current passing through this translator will vary in corre-

spondence with the variations of the red rays falling upon the strip 39 and therefore the photographic sound record will be reproduced as air vibrations. The action of this instrument is virtually instantaneous in its operation and extremely sensitive.

Fig. 6 is a diagram of the Edison tasimeter which may also be used for the purpose of translating photographic records into sound vibrations. In this figure, 41 illustrates a rod of vulcanite supported against a fixed abutment at one end and at the other end abutting against a movable disk 42. This disk bears in turn against a carbon button 43 disposed between the movable disk 42 and a fixed disk of metal 42^a. The two metal disks 42 and 42^a are connected in circuit to a loud-speaking phone 45 the current passing more or less between the disks 42 and 42^a through the carbon button as it is compressed. The variations in these red rays cause this vulcanite to contract and expand thus compressing the carbon button 43 between the metal pieces 42 and 42^a, causing variations in the current corresponding to the variations in the strength of the rays. This is extremely sensitive and forms one means of translating the photographic record into sound vibrations.

While I have illustrated three forms of electrical sound reproducing apparatus, I wish it understood that I may use other forms. Thus I might use a thermopile, especially a "Bi-Ag," a selenium cell made sensitive to infra-red rays by Abney's process, or any other delicate heat measuring instrument of like character.

While in Fig. 1 and Figs. 4 and 5 I have shown only one telephonic translator, this translator being shown in Fig. 1 as being disposed behind the screen A, it will be understood that with the electrical sound reproducing apparatus I may use a plurality of such translators disposed at various portions of an amusement hall, not only behind the screen but at the sides of the hall. This is obviously of great advantage and is not possible where ordinary sound reproducing mechanism is used.

Such an arrangement of phones is illustrated in Fig. 7 wherein the picture and sound projecting apparatus is designated 47 and illustrated diagrammatically, the picture being received upon the screen 48. As illustrated, there are three loud-speaking telephonic translators 49 disposed behind the screen 48 and a plurality of loud-speaking translators disposed along the side of the hall and facing toward the audience. Thus the sounds reproduced may be distinctly heard by everybody in the audience. While I have illustrated in Fig. 7 all of the phones as being connected in one circuit and as being actuated by one selenium cell, bolometer

or tasimeter, it is to be understood that when a film like that shown in Fig. 8 is used with two records placed in parallel position upon the film, a plurality of sets of sound reproducing apparatus is to be used. Thus, in this last case, there will be two beams of infra-red rays projected through the film, each falling upon a separate bolometer, tasimeter or like apparatus, and each such reproducing mechanism being electrically connected to one of a series of sets of photographic transmitters. By using the film above referred to, a dialogue may be reproduced so that the sounds will issue from translators set at opposite sides of the hall or at opposite points behind the screen, thus causing the dialogue to seem more natural than if it apparently issues from one point only. It is obvious that a larger number of records could be placed upon the same film and thus the sounds be caused to issue from a plurality of points behind the screen or around the hall.

The two main features of my invention upon which the invention is based are in the first place the provision of a film capable of receiving not only the photographic prints of the pictures to be projected, but also the photographic record of the sound and the use with these films of invisible rays for the purpose of reproducing the sound record. The other important and vital feature of my invention resides in the provision of means whereby the sound record may be taken from that portion of the film which is moving continuously while that part of the film through which the rays of white light are projected is moved intermittently.

In printing the sound record upon the strip or film 2, the sound record is started a sufficient distance beyond the starting point of the picture record so that at the instant that any one event is being projected on the line x , the sound record corresponding to this event is passing the axis of line Z . Inasmuch as in taking or making the picture record and the sound record two separate negative films or strips are used, it is entirely possible in printing these records upon the film 2^a to displace the sound record with relation to the picture record in the manner stated. While I have shown the axis Z of the infra-red beam as being about twelve inches below the axis x of the white light beam, I wish it understood that the two axes may be much nearer than this and that the drawing in Fig. 1 is purely illustrative in this regard, and further that I may pass the infra-red rays through the strip 2 above the picture projecting mechanism and above the axis x .

While I have referred to the lenses and prisms for focusing and transmitting the invisible rays as being made of rock salt, or Jena glass, it is of course obvious that they

may be made of other material such as fluorite, or dense cobalt glass, or that I may use metallic reflectors for deflecting the invisible rays along the line Z .

By using a film having thereon a plurality of sound records, great naturalness could be secured as before stated by the fact that the transmitters translating the variations in the sound record into sound vibrations, could be located nearer to or farther from the inner side of the screen, or could be located on opposite lateral sides of the screen or stage so that the voice will apparently be projected in accordance to the position of the actors in the moving picture. It is obvious also that in place of using a camera having a megaphone for transmitting sounds to the "speaking arc" or the manometric flame, sensitive microphone transmitters might be used at various portions of a stage upon which actors were acting a moving picture play, and that the vibrations of these microphones could be transmitted electrically to diaphragms placed within a camera to thereby transmit the sounds proceeding from the several microphones to the several flames or speaking arcs to be recorded in separate columns upon the sound record film.

In Fig. 4 I show diagrammatically a "Bi-Ag" thermopile as above referred to. As this thermopile is well-known an extended description is not necessary. The thermopile consists of a frame having an opening at its middle and extending across this opening are a plurality of couples composed of connected bismuth and silver wires. These couples are joined by overlapping plates of tin, the junctions formed by the plates being covered with platinum black. The frame 50 with its couples of platinum and silver is supported inside of a casing 51 having a narrow slit through which the infra-red rays are projected upon the junction plates. The couples of silver and bismuth are connected in circuit with a receiver of a loud-speaking telephone in the manner heretofore described. A thermopile of this character is fully described in Bulletin No. 4 issued by the Bureau of Standards on Instruments and Methods of Radiometry. Therefore no extended description of the thermopile is necessary.

In case the talking picture machine before described is desired to be used in very large theaters where it would take a sound a perceptible time to travel the distance and where it would be possible to see the picture, therefore, before hearing its corresponding sound, the following arrangement could be made. After the system has been brought to a standard the instrument sensitive to the infra-red rays would always be just a certain distance from the lens or just a certain number of pictures below the lens. In

a large theater, therefore, it would be only necessary to slightly advance the instrument, that is, move it a bit nearer to the lens, in which case the sound of a given event would slightly precede the picture but the sound would reach the observer at the same time that the picture was shown.

Having thus described the invention, what is claimed is:—

1. In apparatus for the reproduction of a sound and picture record in the nature of a film transparent to visible and invisible light, said film having thereon a photographic picture record adapted to permit the free passage of rays of invisible light but to intercept or affect the passage of rays of visible light and having thereon a sound record composed of a substance adapted to permit the free passage of rays of visible light but intercept or affect the rays of invisible light, comprising means for intermittently moving one portion of the film, means for steadily moving another portion of the film, means for projecting a beam of visible light through the intermittently moving portion of the film, means for projecting a beam of invisible light through the steadily moving portion of the film, and means in the path of said last named beam for translating the light variations of the beam into sound vibrations.

2. Means for reproducing moving pictures and corresponding sounds from a film transparent to visible and invisible light rays and having on one side thereof a series of consecutive photographic pictures adapted to permit the free passage of invisible rays but intercept or affect the passage of visible rays of light and on the other side a sound record adapted to permit the free passage of rays of visible light but intercept or affect the passage of invisible rays, including a source of visible light rays, means for intermittently moving the film across a beam of light proceeding from said source to thereby project moving pictures, a source of invisible rays, means for steadily moving the film across a beam proceeding from said source of invisible rays to thereby project the sound record, and means in the path of said last named rays after they pass through the film adapted to translate the variations of intensity in said beam of invisible rays into sound vibrations.

3. Means for reproducing moving pictures and corresponding sounds from a film having on one side thereof a series of consecutive pictures designed to affect the passage of visible rays but permitting the free passage of invisible rays and having on the other side thereof a sound record adapted to affect the passage of invisible rays but permit the free passage of visible rays, including a source of visible rays and a source of invisible rays, means for intermittently mov-

ing the film across a beam proceeding from the source of visible rays, means for steadily moving the film across the beam of rays proceeding from the source of invisible rays, a telephonic translator, and a receiver upon which the beam of invisible rays fall, said receiver being connected in circuit with the telephonic translator, the resistance or conductivity of the receiver being altered by being subject to invisible rays.

4. Means for reproducing moving pictures and corresponding sounds from a film including a source of light, means for projecting visible light rays from the said source of light, means for projecting invisible rays from the said source of light in a path separate from the path of the visible rays, the said film having thereon a series of consecutive photographic pictures adapted to intercept or affect the passage of visible rays and having a sound record adapted to permit the free passage of visible rays but to intercept or affect the passage of invisible rays, means for intermittently shifting the film across the path of the visible rays to thereby project the moving pictures, and means for steadily moving the film across the path of the invisible rays to thereby project the sound record, means for translating the variations in the invisible rays into sound comprising a receiver electrically sensitive to the action of invisible rays, and a translator electrically connected to said receiver.

5. Reproducing apparatus for use in connection with a transparent film having thereon a plurality of sound records formed of a substance intercepting or affecting the passage of invisible rays, including means for steadily moving said film, of a receiver adapted to have its electrical conductivity or resistance varied by the action of invisible rays, means for projecting invisible rays through said film upon said receiver, and a plurality of telephonic translators connected in circuit with said receiver.

6. In an apparatus of the class described, means for projecting visible and invisible light rays synchronously through a film record movable in the path of both of said rays, said film bearing picture and sound records, the picture record being capable of affecting the passage of the visible light rays through the film and the sound record being capable of affecting the passage of invisible light rays through the film, the said sound record permitting the unobstructed passage of the visible light rays through the film.

7. Means for reproducing sound in connection with moving pictures synchronously from a film having a consecutive series of picture records and a correlated sound record, the picture record being transparent to invisible rays but affecting visible rays, the sound record unaffected the visible rays

but affecting the passage of invisible rays, the sound record correlated with any specific event on any one picture of the series being longitudinally spaced therefrom along the film, a source of white light, a source of light rays beyond the visible spectrum, means for passing said film in the paths of the visible and invisible rays, and means acted upon by the invisible rays passing through the film for translating the variations in intensity of said invisible rays into sound vibrations.

8. An apparatus for projecting moving pictures and simultaneously reproducing sound including a source of visible and invisible rays, means for projecting a beam of visible rays, means for projecting a beam of invisible rays, means for passing a combined picture and sound record film successively past the beam of visible and the beam of invisible rays, and means for translating the variations in intensity of the invisible rays into sound vibrations.

9. An apparatus for projecting moving pictures and simultaneously producing sound comprising a source of light, means coacting with the source of light for projecting the visible light rays therefrom, means for intermittently moving a combined picture and sound record film through the beam of visible rays, means for projecting the picture formed by said beam upon a screen, means for projecting a beam of invisible rays, electrical sound reproducing devices including an element sensitive to the action of invisible rays, and means for passing said film intermittently through the beam of invisible rays.

10. An apparatus for reproducing sound from a film having thereon a consecutive series of sound wave impressions, said impressions being adapted to obstruct or impede the passage of invisible light rays, including means for projecting a beam of invisible light rays through said film, means for moving the film steadily past said beam, and means for translating the variations in the intensity of said beam caused by the variations in said record into sound vibrations including an element sensitive to the action of rays of invisible light and reacting according to the intensity of said rays.

11. Apparatus for reproducing moving pictures and related sounds from a moving film record having on one side thereof a picture record designed to affect the passage of visible light rays and having on the other side thereof a sound record designed to affect the passage of invisible light rays and permit the free passage of visible rays, including means for projecting visible light rays through the film, means for projecting invisible light rays through the film, and means for translating the invisible light rays into sound vibrations.

12. Apparatus for reproducing moving pictures and related sounds from a moving film record having photographic and phonographic records designed respectively to affect the passage of visible and invisible light rays, including means for projecting visible light rays through one part of the film, means for projecting invisible light rays through another part of the film, and means for translating the invisible light rays into sound vibrations.

13. The method of translating composite sound and related picture records from a moving picture film having on one side thereof a picture record designed to affect the passage of visible light rays and on the other side thereof bearing a sound record designed to affect the passage of invisible light rays and permit the free passage of visible rays, which consists in intermittently moving the film at one portion thereof, steadily moving the film at another portion thereof, projecting light rays through the film at the intermittently moving portion thereof to display the pictures thereon, and projecting invisible light rays through the steadily moving portion of the film and translating the variations of the invisible rays into sound vibrations.

14. The method of translating composite sound and moving picture film records, which records are designed respectively to affect the passage of invisible and visible light rays through the film, which consists in intermittently moving the film at one portion thereof, steadily moving the film at another portion thereof, projecting visible light rays through the intermittently moving portion of the film, projecting invisible light rays through the steadily moving portion of the film, directing the last-mentioned rays upon an element adapted to have its conductivity or resistance vary to correspond to the variations of said light rays and translating said variations in conductivity or resistance into sound vibrations.

15. Apparatus for reproducing moving pictures and related sounds from a moving film having on one side thereof a picture record designed to affect the passage of visible light rays and on the other side thereof a sound record designed to affect the passage of invisible light rays and permit the free passage of visible light rays including means for suitably moving the film record to permit of translation of the picture and sound records therein, means for projecting visible light rays through the film, means for projecting invisible light rays through the film, and means for translating the invisible light rays into sound vibrations.

16. Apparatus for reproducing moving pictures and related sounds from a moving film having on one side thereof a picture record designed to affect the passage of visi-

ble light rays and on the other side thereof
a sound record designed to affect the pas-
sage of invisible light rays and permit the
free passage of visible light rays including
5 means for intermittently moving a portion
of the film and a take up means for the film
arranged to move the displayed portion con-
tinuously, means for projecting visible light
rays through the intermittently moving por-
10 tion of the film, means for projecting in-
visible light rays through the displayed and
continuously moving portion of the film,
and means for translating the invisible light
rays into sound vibrations.

15 17. Means for reproducing moving pic-
tures and related sounds from a moving film
having on one side thereof a picture record

designed to affect the passage of visible light
rays and on the other side thereof a sound
record designed to affect the passage of in- 20
visible light rays and permit the free pas-
sage of visible light rays including a single
source of light, means for separating the
visible and invisible light rays emanating
from the source of light and directing the 25
same through spaced portions of the film,
and means for translating the invisible rays
into sound vibrations.

In testimony whereof I affix my signature
in presence of two witnesses.

RICHARD M. CRAIG. [L. s.]

Witnesses:

JOSEPH SHORE,
J. W. SCHUCHARDS.