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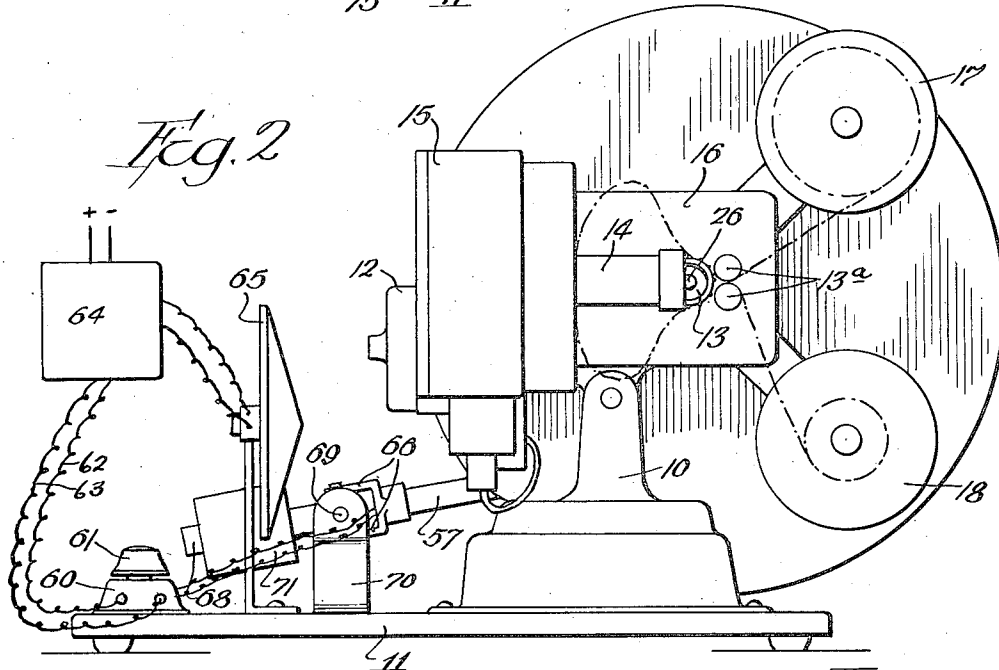
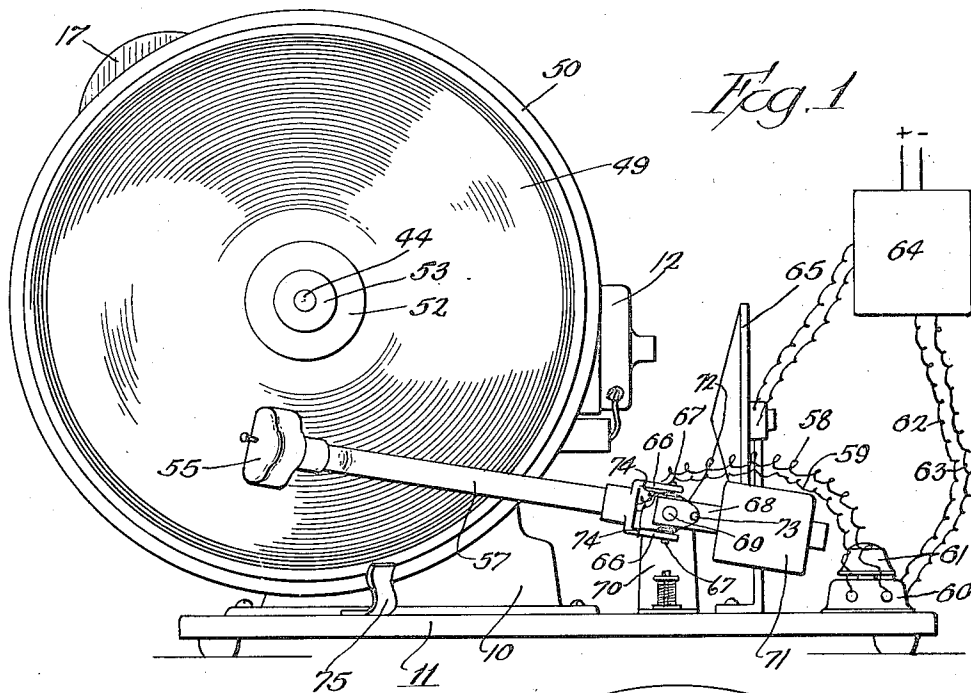
A. F. VICTOR

2,018,043

SYNCHRONIZING MOTION PICTURES AND SOUND RECORDS

Filed July 30, 1931

4 Sheets-Sheet 1



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Fig. 5

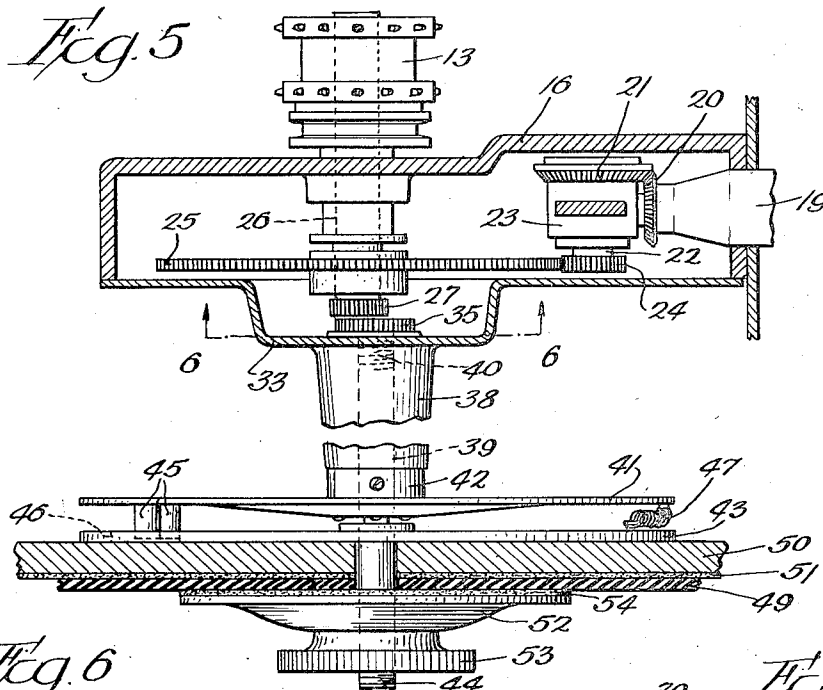


Fig. 6

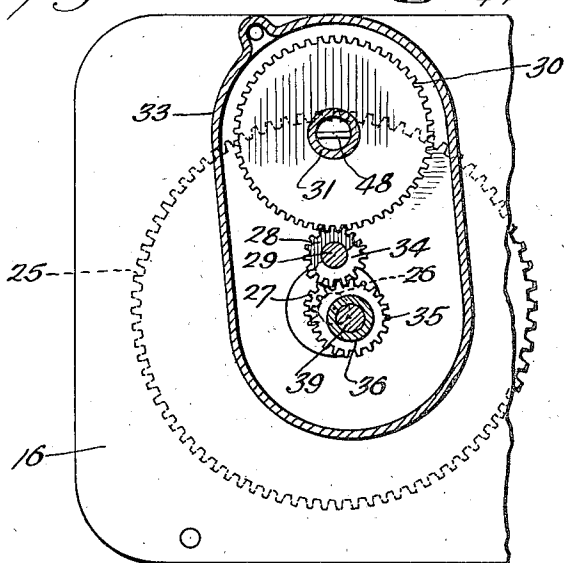
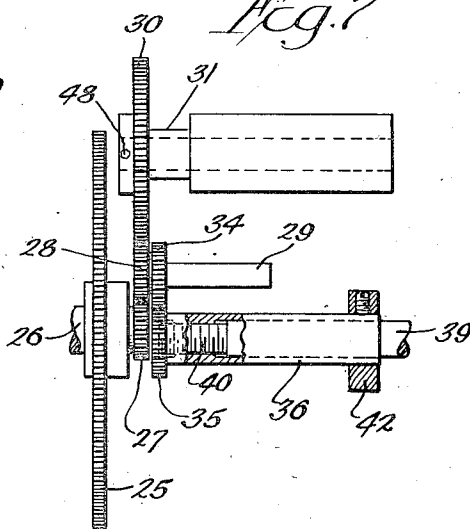


Fig. 7



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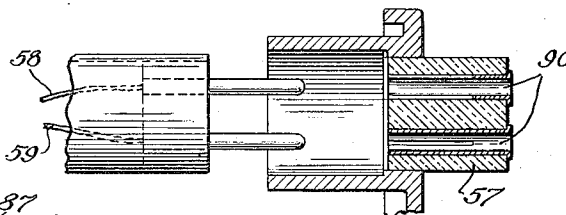
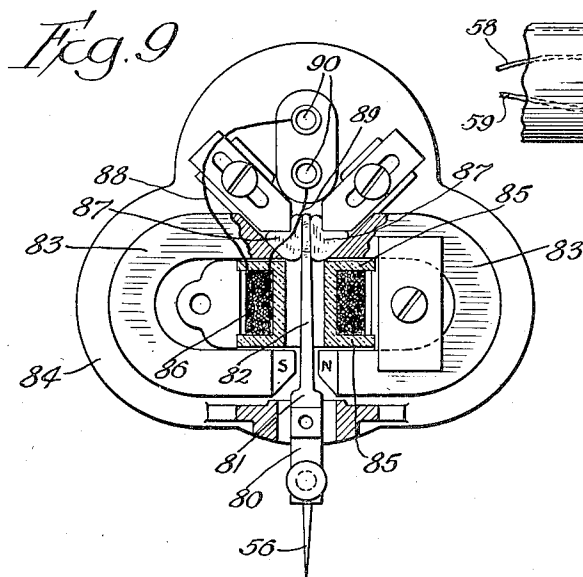
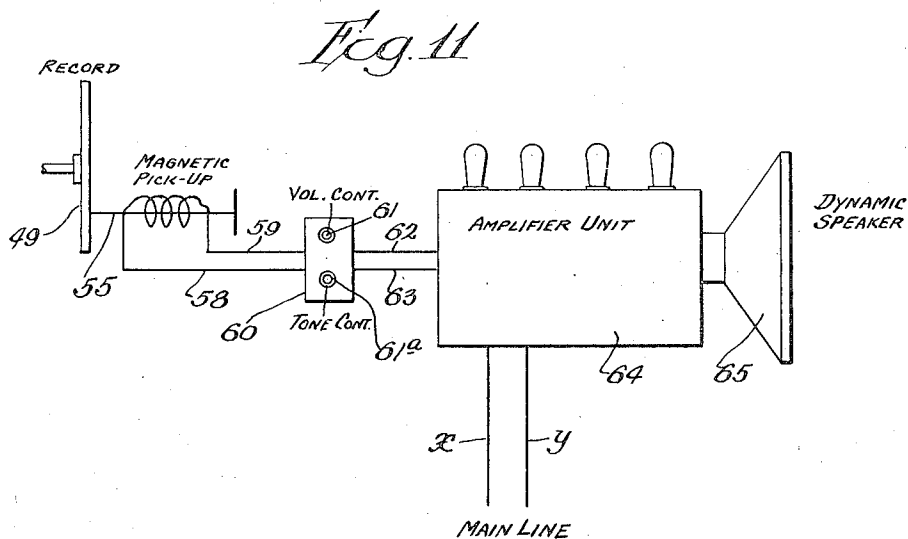
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SYNCHRONIZING MOTION PICTURES AND SOUND RECORDS

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,018,043

SYNCHRONIZING MOTION PICTURES AND
SOUND RECORDS

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Application July 30, 1931, Serial No. 553,971

2 Claims. (Cl. 179—100.4)

My present invention relates to sound reproduction and has especial reference to an apparatus to be attached to or form part of a motion-picture projecting device by which it is actuated so that the sounds reproduced will be synchronized with the movements of the objects in the scene displayed upon the screen by the projector. My invention further especially relates to the use of an electrical "pick-up" in connection with a phonograph sound record and the latter rotated on a horizontal axis.

In my present apparatus the plate or turn table holding the sound record is in a disposed vertical plane and it is mounted upon a spindle having a horizontal axis. The turn-table is preferably actuated by the mechanism that moves the film in the projecting apparatus. The tone arm, which extends alongside the sound record, has an electrically operated "pick-up" on its end nearest the record or sound disk and the structure is yieldably urged towards the record during operation. The arm is counterbalanced to permit ready and continuous engagement of its reproducing needle with the "score" or sound groove upon the phonograph record.

I am aware that sound records in the form of cylinders have heretofore been employed in a manner so that they are mounted upon a horizontal axis and the reproducing box has been allowed to rest on the record or cylinder usually through the action of gravity. Tone arms have also been made of a counterbalanced character. However, so far as I am aware, I am the first to mount a flat disk record with its face in a vertical plane and rotate it on a horizontal spindle, and I believe that I am also the first to combine with such structure a reproducing unit mounted upon the counterbalanced arm and yieldably held against the face of the record. Such being the case I desire it understood that I am herein claiming such arrangement and structure in its broadest sense and the description of the elements contained in the claims herein are to be construed in the broadest possible terms. In this connection I claim the subject matter of this invention broadly, both with and without the motion picture structure.

The structure which I have devised is easy to assemble and may be readily operated by an amateur or persons unfamiliar with the projection and reproduction of so-called sound pictures or "talkies". The arrangement of the parts is extremely compact and may be readily disassembled for storage in a small carrying-case, only slightly larger than is required for the ordinary motion-

picture projector. The parts of my apparatus are made in a sturdy manner which renders them capable of withstanding hard usage.

Among the objects of my invention are the provision of a sound reproducing apparatus that is novel in construction, economical to manufacture, dependable in operation, and capable of being readily attached to a motion picture projector so that the combined structure may be assembled and sold as a unit for a moderate price. Other objects of my invention will be obvious to others after an understanding of the herein disclosed device is understood. The accompanying drawings and the within description are given for the purpose of clearness of understanding only and no restrictions are to be understood therefrom.

Reference will now be made to the accompanying drawings that form a part of this specification, in which,

Figure 1 is a vertical side elevation of my invention showing the same applied to a motion picture projector of a well-known make and looking at the face of the sound record.

Figure 2 is a vertical elevation of the opposite side of the structure shown in Figure 1.

Figure 3 is a top plan of the structure disclosed in Figures 1 and 2.

Figure 4 is an end elevation looking at the apparatus from the left of Figure 3, and looking towards the projection tube.

Figure 5 is a horizontal sectional view showing the manner of connecting the projector drive mechanism with the sound record turn table.

Figure 6 is a vertical section taken on line 5—5 of Figure 4 showing the gears.

Figure 7 is an elevation showing the arrangement of the gears illustrated in Figure 5 in edge elevation.

Figure 8 is a fragmentary detail of the mounting of the tone arm.

Figure 9 is a schematic detail of a typical electrical pick-up device.

Figure 10 is a sectional view on 10—10 of Figure 9.

Figure 11 is a lay-out of the circuit employed in sound reproduction apparatus.

The drawings are to be understood as being more or less schematic for the purpose of disclosing a typical or preferred form in which the apparatus may be made, and in said drawings the same reference characters are employed to designate like parts wherever they appear throughout the various views.

In the drawings I have illustrated the struc-

ture in coordination with a cinematographic projector. The motion picture projector is shown to comprise a support or pedestal 10 mounted upon a base or platform 11 and on the top of the pedestal is an irregular shaped housing or casing containing the operating mechanism, lamp and other usual appurtenances found in a motion picture projector. Included with this casing is an electric motor 12 that drives the film feeding mechanism of which the film engaging sprocket 13 is a part as well as a reciprocating mechanism that is enclosed in the housing for intermittently moving the film in the passageway behind the projecting lens tube 14. The lamp house is designated as 15, and alongside the projecting tube is a rectangular shaped extension 16 of the housing or casing that projects laterally from the portion of the housing within which the intermittent feed mechanism is enclosed.

The film is withdrawn from an upper spool 17 and passes downwardly to the upper segment of sprocket 13 from which it loops upwardly so as to pass vertically down into the film passageway immediately back of the projecting tube and after leaving the passageway the film forms an inverted loop and returns to the lower segment of sprocket 13, from whence it passes to the lower take-up spool 18 and upon this rewind. In moving to and from the sprocket 13 the film engages adjacent segments of idle rollers 13^a immediately in front of the sprocket.

The motor drives a power shaft that is connected by any suitable mechanism with and actuates a shaft 19 (shown in Fig. 5) that has its end extended into the adjacent portion of the rectangular extension 16 where it is connected by beveled gears 20 and 21 to a transverse stub shaft 22 mounted in bearing 23 within the housing extension 16. One end of the stub shaft carries the beveled gear 21 while its opposite end is provided with a pinion 24 that is in mesh with a large gear 25 mounted upon a horizontal spindle 26 having bearings in a side wall of the housing extension 16 and passes through said wall to receive the feed sprocket 13. Spindle 26 passes through the large gear 25 and carries a pinion 27 on its end that is in mesh with an idler 28 on a stud 29 and said idler meshes with a gear 30 on a horizontally disposed hollow shaft 31. The hollow shaft 31 has bearings in a tubular embossment 32 projecting laterally from a shallow oval shaped embossment 33 on the adjacent side wall of the housing extension 16 and opposite the wall on which the sprocket 13 is disposed.

Alongside the idler 28, the stud 29 is provided with a pinion 34 that meshes with a pinion 35 below the same and alongside the pinion 27. This latter pinion 35 is secured upon a tubular shaft or sleeve 36 having bearings in a conical hollow embossment 38 projecting from the oval embossment 33 of the housing wall and below and substantially in vertical alinement with the tubular embossment 32 above mentioned. The horizontal hollow shaft or sleeve 36 extends to the end of the bearing in the tubular embossment 38 and has its bore next the pinion 35 slightly reduced in diameter and is provided with internal threads.

From the foregoing brief description of the gearing, which is shown in Figures 4, 5 and 6 of the drawings it will be seen the film is intermittently moved past the projector tube by means of feed mechanism actuated by the motor 12 and its associated parts; the sprocket 13 advances the film to the intermittent feed mechanism and also acts as the take-off to direct the film to the re-

wind spool 18; and the gear train 27, 28 and 30, and pinions 34 and 35, are actuated by the same mechanism that controls and feeds the film.

It is, of course, one of the purposes of my invention to synchronize the film feeding mechanism with the sound reproducing mechanism that I have devised, as well as to conveniently and effectively mount the film record disk in a vertical plane and rotate it upon a horizontal axis. To this end I provide a spindle 39 having threaded opposite ends, one threaded portion of which, designated as 40, is inserted into the hollow shaft or sleeve 36 and screws into the threads in the inner end of the latter. A disk or circular plate 41 is secured to an intermediate portion of the spindle 39 in such position that when the spindle is screwed into the hollow shaft 36 said disk will abut a collar 42 secured to the outer portion of the hollow shaft.

Alongside the disk 41 and spaced from it is 20 a similarly shaped plate 43 that is mounted upon an extension 44 of the spindle, and the relation of these plates is such that there may be a relative rotative movement between them. To this end, plate 41 is provided with a pair of stop-pins 25 45 that project laterally therefrom into a segmental slot 46 in the other plate 43, and a coiled contraction spring 47 is placed between the plates with its ends connected to the respective plates so as to yieldably maintain the plates in such positions that one of the stops 45 will be in an end of the slot 46 and the other stop about midway the length of the slot. When producing sound and motion pictures together the structure remains the same as above described, but 35 in order to produce silent pictures the disks 41 and 43 and spindle 39 are removed by unscrewing the threaded end 40 of the spindle from the threads on the inner end of hollow shaft or sleeve 36. Thus the mounting which carries the sound record turn table is removed and the apparatus operates in the manner of an ordinary amateur motion picture projector.

To provide a turn-table for the sound record or disk 49 that is to be mounted on the spindle 39 and its extension, I place a large circular plate 50 on the extension of the spindle and move it back onto the latter until it rests flat against and frictionally engages the adjacent or outer disk 43, and I provide a covering of felt 51 for the other or outer face of the turn-table against which the record or sound disk 49 is secured. A spring clamp or bulged washer 52 integral with a hand nut 53 is adapted to be screwed onto the threaded end of spindle extension 44. The spring washer 52 has its central portion bulged away from the record disk as shown in Figure 4 and its face next to the record disk is provided with a covering of felt 54 to frictionally engage the surface of the disk with injury, and when the hand nut is screwed tightly on the threaded spindle the record disk 49 and the turn-table 50 will be clamped in position against the disk 43 and thus all these parts are secured to the rotatable spindle in such manner that they will revolve together.

The turn-table plate 50 is preferably made of thick metal so that it possesses the characteristics of a balance wheel and will create a certain amount of momentum during its rotation and the operation of the apparatus. Because of the yielding relative movement between the two disks 41 and 43 any jar will be taken up incident to the starting of the motor which would cause the disk 41 to move suddenly forward, thus pulling on the

spring 41 and causing a yieldable take-up of the heavy turn-table.

The turn-table and record disk are disposed upon horizontal axes and the plane of the record disk is vertical and upon the side of the projector opposite to the film, the film feeding mechanism, and projection tube. Also it will be seen the rotation of the turn-table and the record disk are coincident with the movement of the film by means of the sprocket and the intermittent feed mechanism through the intermediary of the gear train. By placing suitable designations upon the film ribbon and upon the record disk the places for starting the operation of the combined apparatus may be accurately determined so that the sound reproduced from the record is positively synchronized with the actions or movements of the objects in the picture thrown upon the screen by the projector.

The manner in which I prefer to pick-up the sound waves from the groove on the record disk 49 and to amplify them, is substantially as follows:—A reproducer or pick-up box 55 having a removable needle 56 is mounted upon the outer movable or swinging end of a hollow arm 57. The sound reproducing box 55 may be of any of the well-known types of devices of this character but it is preferred a box of the electrical control type such as an electro-magnetic pick-up. Conductor wires 58 and 59 lead from terminals within the box through the arm 57 to the open end thereof nearest the pivot and after passing out of the hollow arm 57 these conductors lead to terminals on an electrical volume and tone control unit 60 that may be mounted upon the base plate 11. The unit 60 is provided with a rotatable button 61 whereby the volume of the sound may be adjusted and controlled and a second button 61^a for controlling the tone. Passing out of this control unit 60 the current is led through conductors 62 and 63 to an amplifier unit 64 having the usual dynamic speaker or like device 65 in circuit therewith. The electrical current from the main line is led to the amplifier unit structure by means of conductors x and y .

The arm 57 that carries the reproducer upon one end has its opposite end forked and the fork arms 66 are apertured in alignment with each other to receive the trunnions 67 that project respectively upwardly and downwardly from a pivoted and weighted bar 68. The bar 68 is fulcrumed upon a horizontal spindle 69 projecting laterally from the upstanding portion 70 of the L-shaped bracket that is secured to the adjacent portion of the base plate 11. The bar 68 is thus capable of up and down movement and has a weight or counterbalance 71 adjustably secured to it so as to substantially equalize the weight of the hollow arm 57 and the sound reproducing box 55 and permit the arm and box to move in an up and down direction in addition to being capable of horizontal movement towards and away from the phonograph disk. A U-shaped spring 72 embraces a lateral pin 73 on the bar 68 and its members are coiled upon the trunnions 67, while the ends of said spring are bent laterally away from each other to provide fingers or hooks 74 that engage the fork arms 66 and yieldably urge the same and the reproducer box laterally or horizontally towards the rotatable sound record or disk 49. When the record has been played the tone or pick-up arm is lifted away from the same and placed behind the hook shaped end 75 of a stop secured to the base plate

11, after which the clamping washer and nut 52 and 53 are unscrewed and the record removed from the turntable 50.

As stated, the reproducer box is a pick-up device that is preferably of the electro-magnetic type and, for the purpose of a disclosure, a schematic view of a pick-up now available on the market is shown in Figure 9. In this view the box cover has been removed to disclose the interior structure, and it will be seen the stylus 56 is carried in the outer end of a stylus bar 80 fulcrumed adjacent its outer end and its inner portion 81 extends inwardly a distance to provide a vibratory armature 82. This armature is disposed between the pole faces of complementary permanent magnets 83 of the horseshoe type that are secured to the base 84 of the structure, and between the arms of these magnets there is a hollow spool having insulated end pieces 85 between which an electrical conductor 86 is coiled. The armature 82 passes through the center of the spool and its free end is disposed between the upper pole faces of the magnets where its vibratory movement is limited by resilient insulating pads 87 that are maintained in grooves in the adjacent magnet arms and clamped in position by slide plates in the manner shown. The ends of the coil are electrically connected by conductors 88 and 89 to terminal sockets 90 where connection may be made with the conductors 58 and 59 leading through the arm 57 to the control unit 60. The vibrations of the stylus or needle are picked up by the small coil which is located in a magnetic field and produce an electric current with frequencies corresponding to the sounds, after which the current is amplified and used to operate the loud-speaker.

In the structure heretofore described it will be seen the record disk is disposed in a vertical plane, with its axis of rotation horizontal and opposite the film engaging sprocket 13, and the sound reproducer box and its arm are yieldably urged against the record disk in a horizontal direction, while the arm and box are counterbalanced by the bar and weight 68 and 71 and have articulated connection with said bar. This construction permits the reproducer or pick-up needle 56 to engage the sound wave groove in the face of the vertically disposed phonograph record 49 and to follow said groove continuously until the playing of the record has been completed. The sounds reproduced are under control of the operator who may readily amplify or diminish the tone thereof by operating the adjustable button 61 on the control 60.

What I claim is:—

1. A device of the kind described comprising a support, a horizontal rotatable spindle thereon, a phonograph disk operatively connected to and rotated by said spindle, a pivoted arm extended upwardly across a portion of the vertical face of said disk, a counterbalance on said arm, means that yieldably urge said arm normally in a lateral direction towards said disk, an electro-magnetic pick-up on the outer free end of said arm and coacting with the record face of said disk, an electric manually adjustable volume and tone control unit in electrical connection with said pick-up, an amplifying unit in the electrical influence of said control unit, and a dynamic speaker electrically connected to said amplifying unit.

2. A device of the kind described comprising a support, a rotatable horizontal spindle thereon, a disk operatively connected to and rotated by said spindle, a weighted arm fulcrumed for up

and down movement adjacent said disk, a free arm capable of universal movement and extended across a portion of the face of said disk having a sound reproducer adjacent one end co-acting
5 with said disk and having its opposite end portion formed into a yoke, vertical trunnions projecting from said weighted arm adjacent its fulcrum and

upon which said yoke is movably mounted, and a spring having an intermediate coiled portion surrounding a trunnion and having oppositely disposed end members engaged with the respective arms whereby to urge the free arm towards said disk.

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