Oct. 18, 1932. H. E. CHIPMAN 1,883,560

ELECTROMAGNETIC SOUND RECORDING AND REPRODUCING MACHINE

Filed Oct. 10, 1929 5 Sheets-Sheet 1

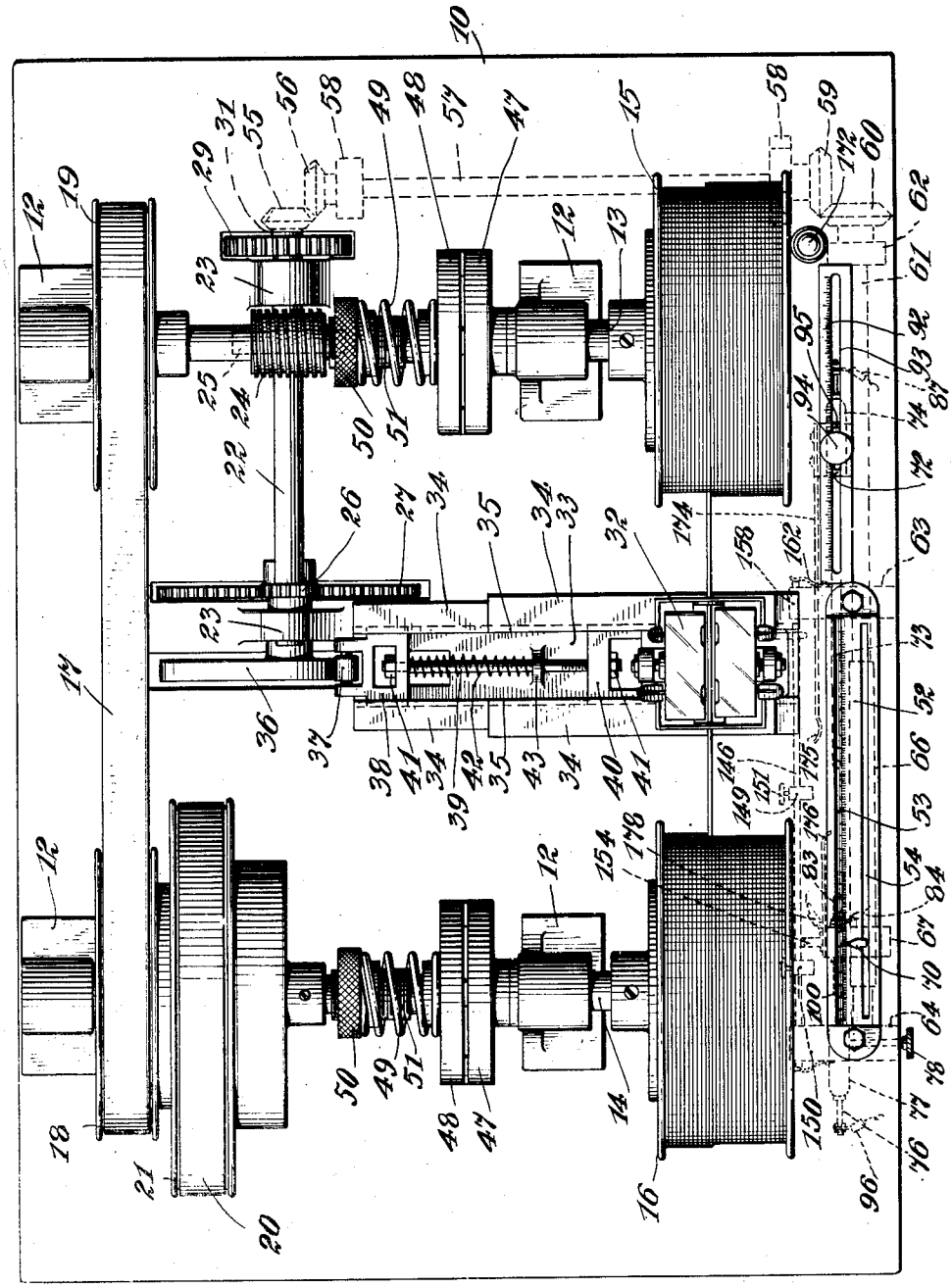


Fig. 1.

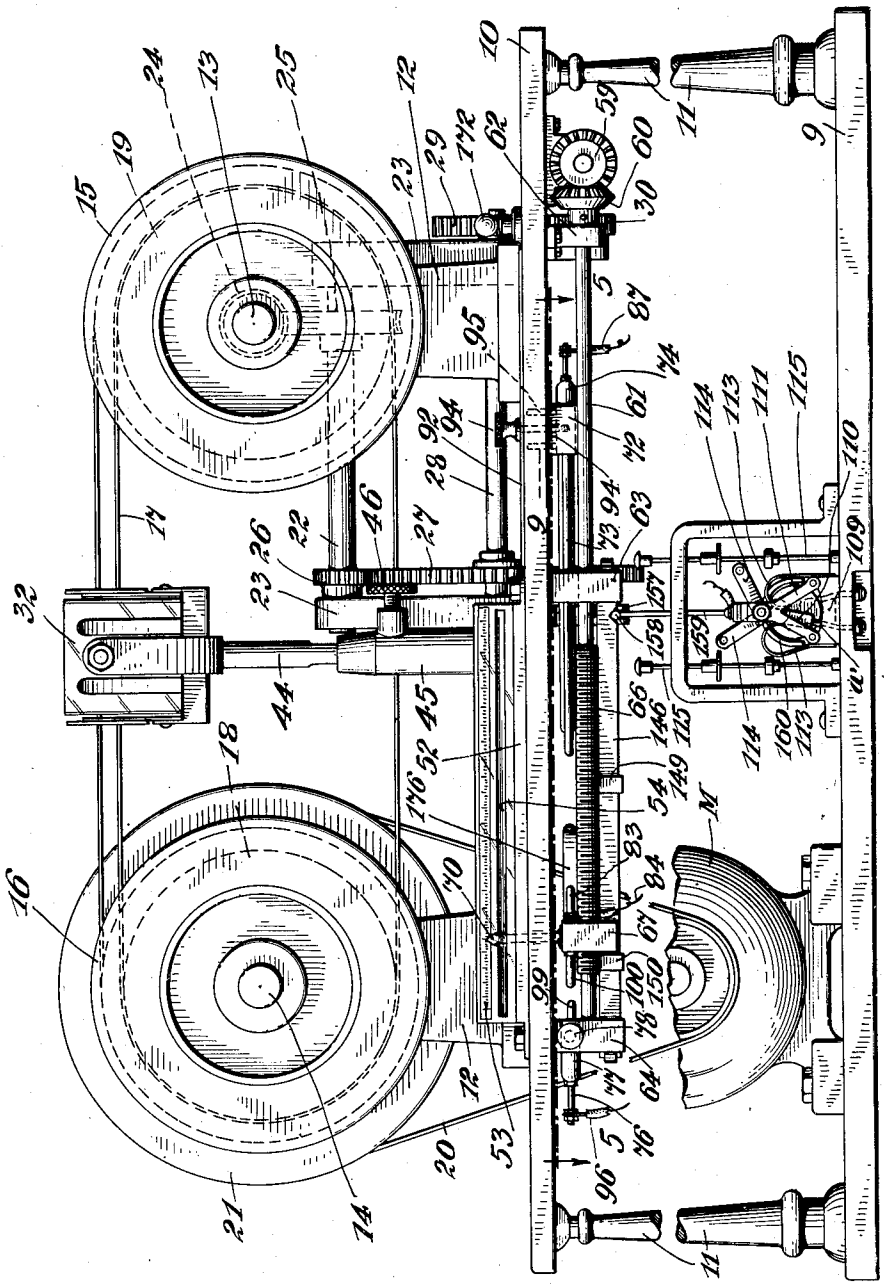
INVENTOR
Harry E. Chipman
BY
Henry Van Arsdale
ATTORNEY

Oct. 18, 1932. H. E. CHIPMAN 1,883,560

ELECTROMAGNETIC SOUND RECORDING AND REPRODUCING MACHINE

Filed Oct. 10, 1929 5 Sheets-Sheet 2

Fig. 2.



INVENTOR
Harry E. Chipman
BY Henry Van Arsdale
his ATTORNEY

Oct. 18, 1932. H. E. CHIPMAN 1,883,560

ELECTROMAGNETIC SOUND RECORDING AND REPRODUCING MACHINE

Filed Oct. 10, 1929 5 Sheets-Sheet 3

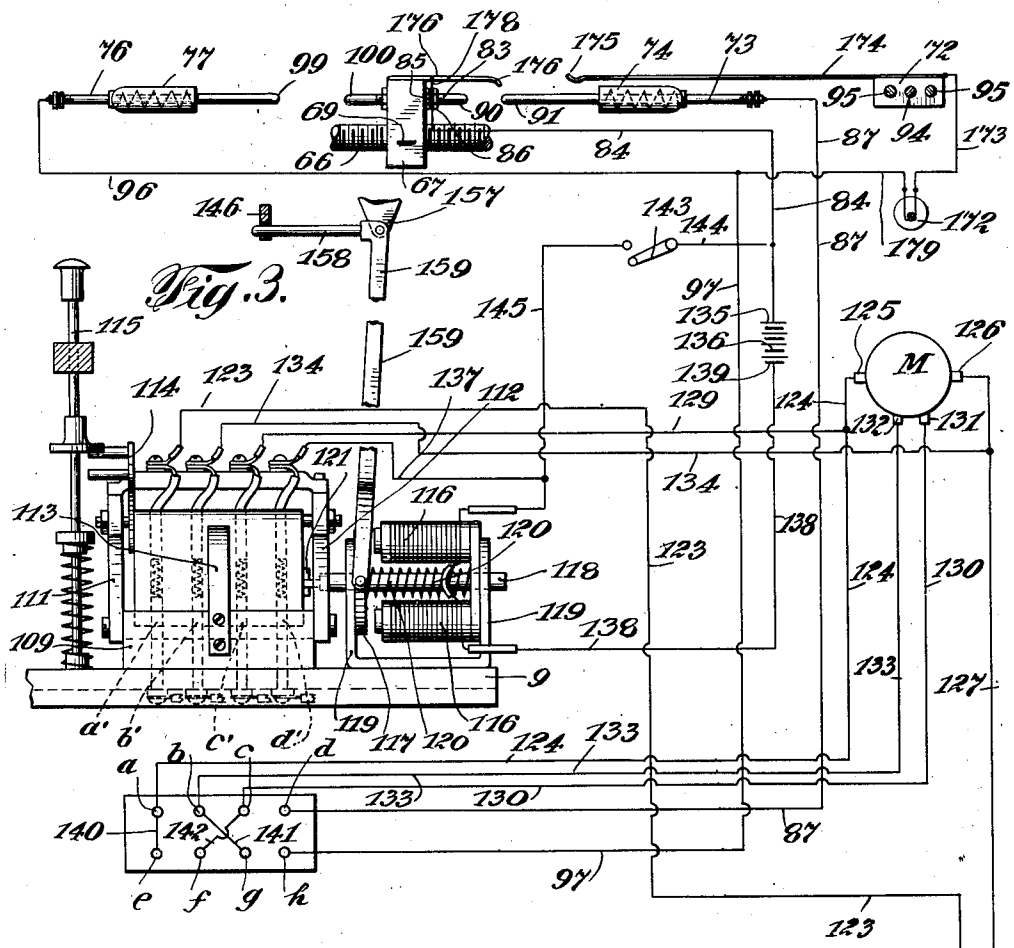


Fig. 3.

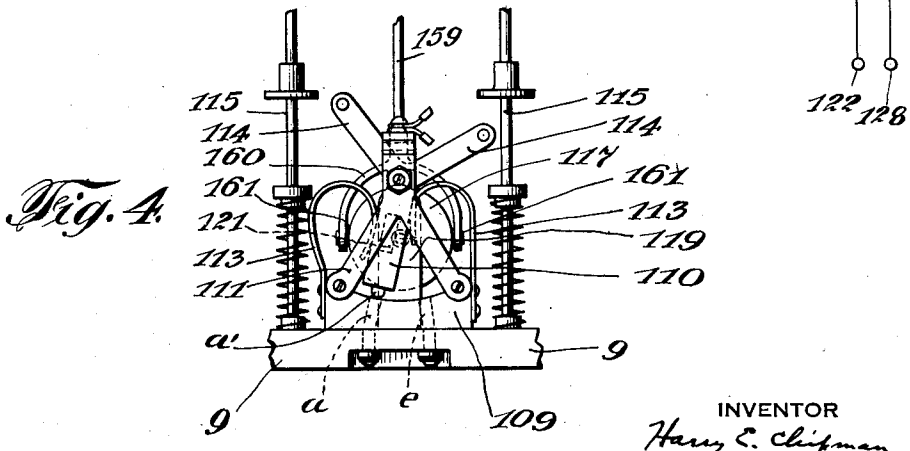


Fig. 4.

INVENTOR
Harry E. Chipman
BY Henry Van Arsdale
his ATTORNEY

Oct. 18, 1932. H. E. CHIPMAN 1,883,560

ELECTROMAGNETIC SOUND RECORDING AND REPRODUCING MACHINE

Filed Oct. 10, 1929 5 Sheets-Sheet 4

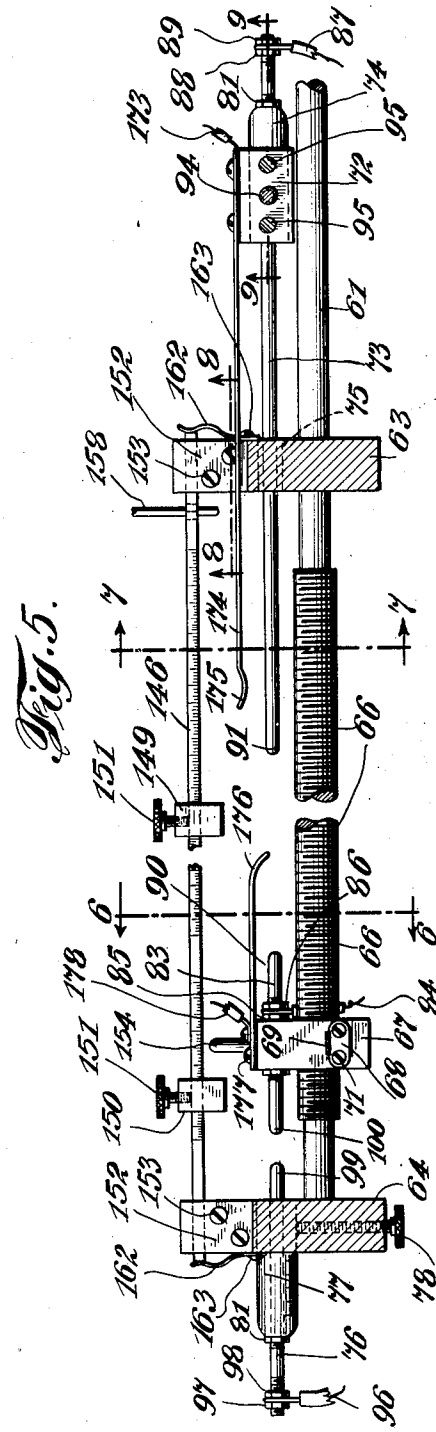


Fig. 5.

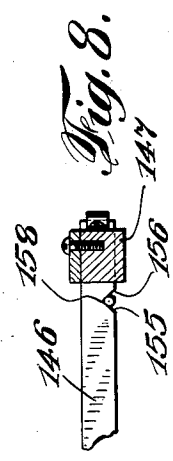


Fig. 8.

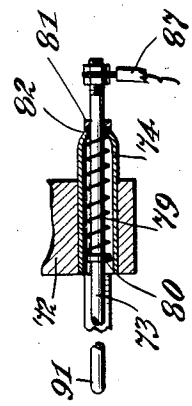


Fig. 9.

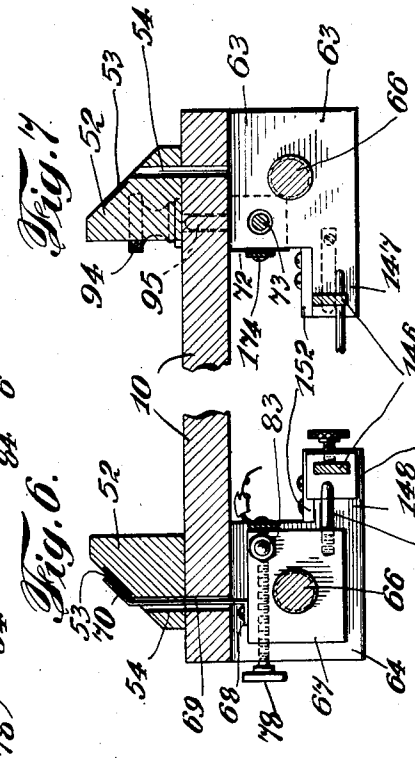


Fig. 7.

Fig. 6.

INVENTOR
Harry E. Chipman
BY Henry Van Arsdale
his ATTORNEY

Oct. 18, 1932. H. E. CHIPMAN 1,883,560

ELECTROMAGNETIC SOUND RECORDING AND REPRODUCING MACHINE

Filed Oct. 10, 1929 5 Sheets-Sheet 5

Fig. 10.

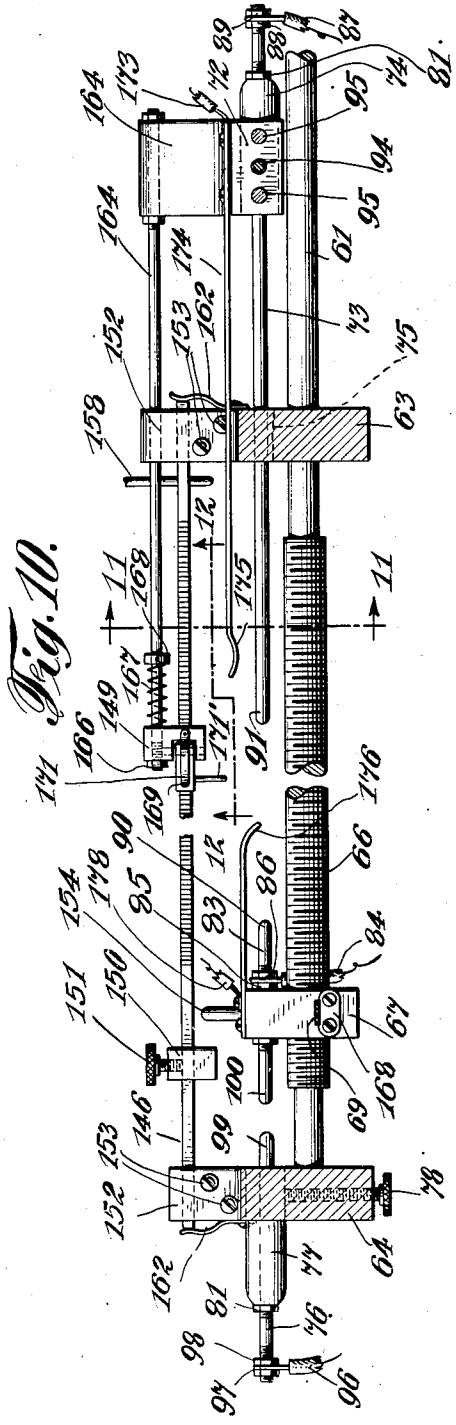


Fig. 12.

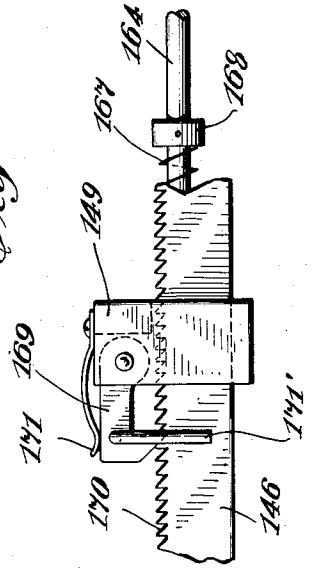
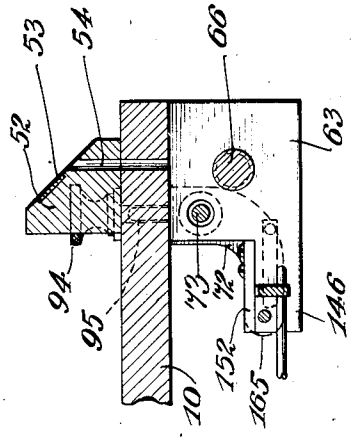


Fig. 11.



INVENTOR
Henry E. Chipman
BY
Henry Van Arsdale
his ATTORNEY

Patented Oct. 18, 1932 1,883,560

UNITED STATES PATENT OFFICE

HARRY E. CHIPMAN, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO ANDREW LE ROY CHIPMAN, OF NEW YORK, N. Y.

ELECTROMAGNETIC SOUND RECORDING AND REPRODUCING MACHINE

Application filed October 10, 1929. Serial No. 398,585.

This invention relates to machines for recording and reproducing sounds electro-magnetically, and more particularly relates to an indicator and associated control devices operative to indicate the passage of any predetermined section of the sound band or wire through the sound recording and reproducing unit, and to control the driving mechanism accordingly.

In sound recording and reproducing machines operating upon the magnetic sound band or wire principle, it is often desirable to impress a series of consecutive talks or musical selections upon the same continuous wire. Before an additional talk or musical selection can be impressed upon an unused portion of the sound wire, it is necessary that some means be provided for indicating the ending point of the talk or musical number last impressed upon the wire. Again when a particular talk or musical selection is to be reproduced, it is also necessary that some means be provided to locate the same upon the sound wire. Since the external appearance of the wire gives no indication of the sound characteristics impressed upon the wire, it is necessary that some indicating device be provided to locate and determine the predetermined talk or musical number desired so that the proper section of sound wire may be placed directly in operative relationship with the sound recording and reproducing unit. Heretofore it has been necessary to explore the sound wire to discover the particular section desired by running the magnetized sound wire through the recording and reproducing unit, and listening in to determine when the desired section is being reproduced. When the machine is used as a dictaphone in offices, for example, valuable time is lost by such exploring expeditions, the sound wire is liable to become damaged by such treatment, and great annoyance and trouble generally results. When the sound recording and reproducing machine is to be used in theatres or other places where the particular talk or musical number desired must be reproduced at a moment's notice, it is imperative that some reliable means be provided for making this location rapidly and without disturbance to the audience. No means have heretofore been provided for accurately and quickly locating any particular section of the sound wire having the particular talk or musical number desired impressed thereon. The provision of some means for automatically stopping the machine when the end of any selected program or musical number is reached is also highly desirable.

An object of my invention is to provide a complete operative sound recording and reproducing machine, having associated therewith an indicating device operative to indicate the passage of any predetermined section of the sound band or wire through the sound recording and reproducing unit.

Another object of this invention is to provide a sound recording and reproducing machine, having an indicator operative to indicate the passage of the beginning and the end of any predetermined section of the sound wire through the sound recording and reproducing unit.

Another object of my invention is to provide a sound recording and reproducing machine, having associated therewith an indicator operative to indicate the passage of any predetermined section of the sound wire through the sound recording and reproducing unit, and control devices operative to control the driving mechanism accordingly.

Still another object of this invention is to provide an indicator adapted to be operatively connected to a moving element of a sound recording and reproducing machine with safety means operative to automatically halt the movement of the machine under certain conditions.

Another object of this invention is to provide a sound recording and reproducing machine, having an indicator adapted to locate any predetermined section of the sound wire as it passes through the recording and reproducing unit, having also associated therewith certain control and safety devices operative to halt the movement of the machine under certain conditions; the entire assembly being strong and sturdy in construction, easy to

adjust and manipulate, and efficient and foolproof in operation.

Another object of this invention is to provide a sound recording and reproducing machine having associated therewith a signal device operative to signal the approach of any predetermined section of or point on the sound wire toward the recording and reproducing unit.

Other objects of this invention will be in part obvious and in part pointed out hereinafter.

In accordance with my invention, I provide a pair of reels spaced apart and adapted to pass sound wire from one to the other. The recording and reproducing unit is mounted to reciprocate in a straight line and transverse to the lineal movement of the sound wire, thus assuring that the record wire is placed upon the reels smoothly and in even layers. My indicator attachment comprises generally a fixed indicator plate and a movable indicating element mounted on a threaded screw which is geared to a moving element of the machine. The indicator element moves along the indicator plate when the machine is in operation, and indicates by its position the number of rounds of sound wire which has been removed from the reel and passed through the recording and reproducing unit. When a talk or musical number is to be recorded on the sound wire, the position of the indicator element at the beginning of the recordation is noted and permanent notations made of its position. At the end of the talk or musical number, the position of the indicator element is again noted and recorded. The indicator element moves only when the reels are rotated and in a direction corresponding to the movement of the reels. Since the sound wire is at all times placed smoothly and in even layers on each particular reel, the indicator element will accurately indicate on the indicator plate the particular section of sound wire going through the sound recording and reproducing unit during each and every reeling and unreeling operation. By reference to the notations made when the particular selection desired was impressed upon the sound wire, this selection can be accurately located and reproduced by first driving the machine to the point where the indicator element points to the recorded notation, and then placing the sound recording and reproducing unit in operative engagement with the sound wire.

An adjustable stop device electrically operated is provided for throwing the motor out of operation and thus halting the machine when the end of the particular selection being reproduced has been reached. My adjustable stop device operates to release a solenoid controlled latch element associated with the motor control switch, permitting the motor switch to swing into open position and thus stop the motor. Indicator markings similar to the markings on the indicator plate are associated with the stop device, so that the stop member can be set in the proper position as indicated by the recorded notations. An electrically operated stop device is also provided to halt the operation of the machine at the end of the rewinding operation when the recorded sound wire is rewound upon the discharge reel. A safety stop arrangement is also provided to mechanically retract the latch element associated with the motor control switch should the electrically operated stop devices fail to operate for some reason. The safety stop device is so arranged as to function immediately upon the failure of the electric stop device. The machine is thus preserved against damage under all conditions of operation. A signal light is also provided to indicate the approach of the end of the particular selection being reproduced so that the operator will be warned beforehand and can prepare himself accordingly. The entire machine is assembled into a compact unit and occupies little space.

In order that a clearer understanding of my invention may be had, attention is hereby directed to the accompanying drawings forming a part of this application and illustrating certain possible embodiments of my invention.

Referring to the drawings, Figure 1 is a top view of my improved sound recording and reproducing machine, having the indicator and control devices associated therewith, certain hidden parts being shown in dotted lines to illustrate their inter-relation and location;

Figure 2 is a front elevation of my machine showing in particular my indicator and control devices associated therewith;

Figure 3 is a side view of my motor control switch and associated latch, the latch being operatively connected to the control and safety stop devices associated with the indicator, the electric motor and the wiring arrangement therefor being illustrated diagrammatically;

Figure 4 is a front elevation of my motor control switch;

Figure 5 is an enlarged top view of my indicator and associated motor control and safety stop devices, the view being taken on line 5—5 of Figure 2;

Figure 6 is an enlarged vertical cross sectional view through a portion of my machine illustrating more particularly the screw driven block carrying the indicator finger, the view being taken on line 6—6 of Figure 5;

Figure 7 is an enlarged vertical cross sectional view through another portion of my machine and indicator device, the view being taken on line 7—7 of Figure 5;

Figure 8 is an enlarged fragmentary cross-sectional view through a portion of my indi-

cator device, the view being taken on line 8—8 of Figure 5;

Figure 9 is an enlarged longitudinal cross-sectional view showing more particularly the construction of the yielding contact member associated with the safety stop device, the view being taken on line 9—9 of Figure 5;

Figure 10 is an enlarged top view of a modified construction of my indicator and associated motor control and safety devices;

Figure 11 is an enlarged vertical cross-sectional view of my modified indicator device, taken on line 11—11 of Figure 10; and

Figure 12 is an enlarged fragmentary side view of a portion of my safety stop device, the view being taken on line 12—12 of Figure 10.

Similar reference characters refer to similar parts throughout the several views of the drawings.

I have shown my indicator and various control devices as associated with a sound recording and reproducing machine, and while admirably adapted for this purpose it will be understood that I do not limit myself to this use alone. For example, my indicator and associated control mechanism could be used in connection with any reeling or unreeling operation where a band of any material is being wound or unwound from a reel. For purposes of illustration only, therefore, I have shown my indicator and associated control and safety devices in combination with a sound recording and reproducing machine. The sound recording and reproducing machine is mounted upon a suitable base plate 10 supported by posts 11 resting upon a suitable supporting base 9, as shown more particularly in Figures 1 and 2. Two pairs of supporting brackets 12 are shown secured to the base plate 10. A shaft 13 is journaled in one pair of brackets, and a shaft 14 extending parallel to shaft 13 is journaled in the other pair of brackets. A reel 15 is mounted on the end of shaft 13 and a reel 16 is mounted on the end of shaft 14. These reels are adapted to carry the sound wire between them and when rotated pass the sound wire from one reel to the other in the well-known manner. The shafts are operatively connected by means of a belting 17 extending around pulley wheel 18 mounted on shaft 14 and pulley wheel 19 mounted on shaft 13. The shafts may be driven in a conventional manner as by motor M, shown diagrammatically in Figure 3, connected by means of a belting 20 to the pulley wheel 21 fixed to the shaft 14.

A shaft 22 journaled in suitable brackets 23 is positioned at right angles to the shaft 13. A worm gear 24 mounted on shaft 13 meshes with the gear 25 mounted on shaft 22. A small gear 26 on shaft 22 meshes with a large gear 27 fixed to a shaft 28, which may be also journaled in the supporting brackets 23. A gear wheel 29 fixed to the shaft 28 extends through the base plate 10, and meshes with gear wheel 30 secured to shaft 31 mounted on the under-side of the base plate 10. It is seen that through this train of mechanism the shaft 31 is rotated along with the shafts 13 and 14 and reels 15 and 16.

The recording and reproducing head 32 may be of conventional design and construction, but is so mounted as to move with a weaving motion transverse to the path of lineal movement of the sound wire when passing from one reel to the other. To effectuate this movement, I support my recording and reproducing unit 32 upon a slidable plate 33, which is supported by fixed guide plates 34 so as to slide in a straight line transverse to the direction of movement of the wire when passing from one reel to the other. The plates 34 may be provided with suitable edge flanges 35, which seat in cooperating grooves in the sides of the plate 33, thus directing the movement of the plate 33.

Sliding movement is given to the plate 33 by means of a cam member 36 fixed to the end of the shaft 31. The cam member 36 engages a cam roller 37 rotatably mounted on a slide block 38 guided for reciprocating movement by the guide members 34. A rod 39 connects the slide block 38 to a slide block 40 secured to the slidable plate 33. The slide block 40 is also guided in its reciprocating movement by the guide members 34. Adjustable nuts 41 are provided at each end of the connecting rod 39 permitting relative adjustment in position between the cam roller 37 and the sound recording and reproducing unit 32. A coil spring 42 surrounding the connecting rod 39 and retained between a lug 43 extending upwardly from the base plate 10 and the slide block 38, maintains the cam roller 37 at all times in engagement with the periphery of the cam member 36. By means of this arrangement, it is seen that as the cam member 36 revolves, the plate 33 and the sound recording and reproducing unit 32 supported thereon will move back and forth in a straight line between and parallel to the axes of reels 13 and 14 at a uniform speed adapted to cause the sound wire to wind on the reels in even, flat and smooth layers. By the proper adjustment of the nuts 41 the sound recording and reproducing unit 32 can be positioned so as to direct the wire squarely upon the reels. Any particular section of sound wire will then fall in exactly the same position on the reel at each rewinding thereof, and a fixed relationship between the revolutions of the reels and the lineal travel of the sound wire is thus established.

To permit vertical adjustment of the sound recording and reproducing unit 32 with respect to the top of the reels, I preferably support the unit upon a post 44 adjustably secured in a socket member 45 by means of a set screw 46. Socket member 45 is mounted

directly on the sliding plate 33, and is part thereof.

Means are provided to prevent the reels from overrunning, and the consequent unwinding of the sound wire from one reel faster than it is being wound up on the other, which would result in the sound wire becoming tangled, and also in the destruction of the desired fixed relationship between the rotation of the reels and the lineal travel of the sound wire through the sound recording and reproducing unit. To this end I provide a friction drag device for each of the shafts 13 and 14. Each drag includes a disc 47 secured to each shaft, and rotatable therewith. A cooperating adjacent disc 48, through which the shaft extends rotatably, is held against rotation but is adapted to be moved toward and away from its associated rotating disc 47. A spring 49 surrounding the shaft is compressed between the disc 48 and a knurled nut 50, mounted for adjustment on the threaded portion 51 of the shaft. This spring 49 presses the disc 48 against its associated rotating disc 47 in accordance with the adjusted tension of the spring, thus establishing a friction drag effect between the discs 47 and 48, and in opposition to the free rotation in either direction of the shaft and the reel carried thereon. To adjust the force of the drag, it is merely necessary to adjust the nut 50 nearer to or further from the discs.

The sound recording and reproducing machine so far described present some improved features over a similar machine disclosed generally in my co-pending application Serial No. 164,669 filed January 31, 1927. The indicator and associated motor stop devices, forming particularly the subject matter of this invention, are especially adapted for use with the sound recording and reproducing machine above described, and in some respects operates in combination therewith. It will be understood, however, that broadly my indicator and associated stop devices may be used in connection with or attached to other machines operating along similar lines, and I do not limit my invention therefor to a use with sound recording and reproducing machines alone.

My indicator comprises generally an indicator block 52, which may be positioned along the front edge of the base plate 10. The front face of the indicator block 52 may be canted off, as shown in Figures 6 and 7, and a marking plate 53 secured thereto. The marking plate may be provided with suitable markings as will hereinafter be described. An indicating pointer extends through a vertical aperture 54 provided in the indicator block 50 and base plate 10, and is adapted to travel along the marking plate 53. My indicating finger is mounted upon a block member 67 which is driven by means of a drive screw operatively connected by a train of mechanism to the shaft 31 of the machine. More particularly a beveled gear 55 fixed to the end of the shaft 31 meshes with beveled gear 56 fixed to the end of forwardly extending shaft 57 journaled in suitable brackets 58 secured to the under-side of the base plate 10. The forward end of the shaft 57 is provided with a beveled gear 59, which meshes with a beveled gear 60 fixed to one end of a longitudinally extending shaft 61. The longitudinally extending shaft 61 is journaled at one end thereof in a supporting bracket 62 secured to the under-side of the base plate 10, and at its mid-section it is journaled in a bracket 63 secured to the under-side of the base plate 10, and at its other end it is journaled in a bracket 64 secured to the under-side of the base plate 10.

Referring more particularly to Figures 2 and 5, it will be noted that a section of the shaft 61 extending between the supporting blocks 63 and 64 is enlarged to provide a screw drive portion 66. The indicator block member 67 upon which the indicating finger is mounted is provided with a threaded aperture and is adapted to travel along the screw drive portion 66. The block member 67 and the supporting brackets 63 and 64 are preferably made of some non-conducting material, such as hard rubber. The screw portion 66 may be of such length as to indicate points along any length of sound wire which will be used on the machine.

The indicating pointer comprises generally a base portion 68, an upwardly extending stem portion 69, and an index head 70 bent over so as to travel along the beveled side of the indicator block. The pointer is secured to the top of the indicator block as by screws 71, which extend through the base portion thereof. The indicating pointer, driven as above described, moves along the marker plate 53 as the reels 15 and 16 rotate. The markings on the marker plate beginning at "zero" may progress from "zero" toward the right up to any desired number. Consecutive markings on the indicator plate may be so spaced as to correspond to the number of rounds of sound wire on the reel 16. When the reel 16 is fully wound with sound wire, the pointer is at the beginning of its run and directed at the "zero" point on the marker plate. When the reel 16 is rotated in a clockwise direction (see Figure 2) so that the sound wire will be progressively advanced through the sound recording and reproducing unit 32, the pointer will move towards the right, as shown in Figure 1, indicating progressively the number of rounds of sound wire removed from the reel 16. If the reel 16 is driven in a counter-clockwise direction, sound wire will leave reel 15 and be taken up or rewound upon the reel 16, and the pointer would accordingly move towards the left.

A reading of the marker plate at any particular time will indicate the amount of sound wire then unreeled or unwound from the reel 16. It is close enough if the markings on the indicator plate indicate only the number of rounds of sound wire unwound from the reel 16, since an entire round of sound wire would carry scarcely more than a single vowel (approximately two feet of wire being required to record for example, the vowel "a"). It will be understood, however, that I contemplate using any type of markings which will best serve the purpose, and I do not limit myself to any particular markings or any particular system of marking.

It is now seen that by merely making a written notation of the position of the pointer in respect to the indicator plate, when a selection is recorded, the location of the particular section of the sound wire having the selection impressed thereupon can thereafter be readily determined. The pointer moves whenever the reels carrying the sound wire are rotated. A fixed relationship between the rotation of the reels, the lineal travel of the sound wire through the sound recording and reproducing head, and the movement of the pointer with respect to the indicator plate is at all times assured, because of the smoothness and exactness with which the sound wire is wound, unwound and rewound upon the reels. When a particular selection is to be recorded on the wire, the position of the pointer with respect to the marker plate is noted and recorded.

When recordation of the selection is completed, the advanced position of the pointer with respect to the marker plate is again noted and recorded. When at any time thereafter that particular selection is desired, the reel 16 is rotated in the proper direction until the pointer indicates that the chosen selection has reached the sound recording and reproducing unit 32. The sound recording and reproducing unit 32 can then be put into operation and the particular selection reproduced. Likewise the pointer moving along the marker plate 53 will indicate when the end of the selection has been reached.

Means are provided for automatically halting the unwinding operation of the machine when the end of any particular selection has been reached and also to halt the rewinding operation of the machine when the desired length of sound wire has been rewound upon the reel 16. To this end I provide two substantially similar electrical stop devices, one carried by a slide-block 72 movable along the under side of the plate 10 and adjustable to halt the machine and the advancing movement of the wire at any desired point, and the other carried by the supporting bracket 64 and operative to halt the rewinding operation of the machine. Referring more particularly to Figures 2, 5 and 9, the stop device for halting the unwinding operation of the machine comprises a contact rod 73 supported within a suitable tubular member 74. The tubular member 74 extends through and is fixed within an aperture provided in the slide-block 72. The contact rod 73, as shown in Figure 5, is of considerable length and extends through an aperture 75 provided in the supporting block 63. The stop device for halting the rewinding operation of the machine similarly comprises a contact rod 76 supported within a tubular element 77. The tubular element 77 extends through an appropriate opening in the supporting block 64. As shown in Figure 5, the contact rod 76 is substantially similar to contact rod 73 except that it is considerably shorter in length. If desired, the tubular element 77 may be slidably mounted within the aperture therefor provided in block 64 and can be held in any desired adjusted position by a suitable set-screw 78.

Each stop device is provided with a coil spring 79 which surrounds the contact rod positioned within each tubular element. Each coil spring 79 is retained between a collar element 80 fixed to the contact rod and the closed end of the tubular element. A stop portion 81 provided on each contact rod abuts the end of the tubular member and limits the inward movement of the rod. It is seen that the coil spring normally operates to shoot the electrical contact rod forwardly and to normally retain the stop portion 81 seated against the end of the tubular member. A sleeve element 82 fixed within the tubular member guides the reciprocating movement of the contact rod. The sleeve element 82 and collar element 80 are made of non-conducting material so that the contact rod is completely insulated from its tubular member.

A contact pin 83 is provided which extends through the indicator block 67, as shown more particularly in Figures 5 and 6. A lead wire 84 is electrically connected to the contact pin 83, as by contact nuts 85 and 86. A lead wire 87 is also electrically connected to the rear end of the electrical contact rod 73 by means of contact nuts 88 and 89. The lead wires 84 and 87 are connected to the latch operating solenoids of the motor control switch, as will be hereinafter described. If the indicator block is advanced to the right a sufficient distance, the contact portion 90 of the contact pin 83 will eventually strike the contact end 91 of electrical contact rod 73. When this occurs, the solenoid circuit associated with the motor control switch will be closed to retract the switch latch.

The position of the contact portion 91 of the contact rod 73 with respect to the contact portion 90 of the pin 83 will determine when the machine will be halted. To facilitate the setting of the contact rod at the proper point, I provide a marker plate 92, shown more

clearly in Figure 1, having a series of markings or graduations similar to the markings or graduations on the marker plate 53. The marker plate 92 is positioned on the base plate 10 and is provided with an elongated aperture 93 cut through it and the base plate 10. The slide-block 72, as heretofore stated, is mounted to slide along the under-side of the base plate 10. The slide-block is supported in position by a set screw 94 which extends through the slot 93 cut in the marker plate and base plate 10, and screws into the body of the slide-block.

It is now seen that the slide-block 72 can be moved along the base plate carrying the tubular member 74 with it. To prevent the slide block from turning, a pair of guide pins 95 may be provided which are secured to the slide block and project upwardly into the elongated slot cut into the base plate 10. By sliding the tubular member 74 through the block 63 the proper distance as indicated by the markings on the marker plate 92, the contact portion 91 of the contact rod can be so positioned as to stop the machine at any desired point. The markings on the marker plate 92 should preferably run from "zero" and from the left to the right, or in the opposite direction from the markings on the marker plate 53. By setting the slide block by means of the set screw 94 at the desired stop notation, the contact point 90 carried by the indicator block will make an electrical contact with the contact point 91 to stop the motor M when the end of the selection has been reached. Thus it is seen that the machine can be stopped at any predetermined point desired.

A lead wire 96 is electrically connected to the contact rod 76 by contact nuts 97 and 98. The lead wire 96 is connected to the latch operating solenoids of the motor control switch, hereafter to be described. By setting the tubular member 77 the contact portion 99 of the contact rod can be placed in such relation to the contact portion 100 of the contact pin 83 as to stop the rewinding operation at any point desired. When the contact portion 99 of the contact rod strikes the contact portion 100 of the contact pin the solenoid circuit associated with the motor control switch will be closed to retract the switch latch. If complete rewinding of the reel 16 is to be permitted the tubular member may be set in the position shown in Figure 5. Suitable markings may be provided on the tubular member 77 to facilitate the setting of the contact portion 99 in the desired stop position.

I have shown for purposes of illustration in Figures 3 and 4 a multi-throw switch especially adapted for use in connection with my sound recording and reproducing machine and indicator arrangement. The particular switch shown in Figures 3 and 4 has been embodied in my co-pending application Serial No. 274,774 filed May 3, 1928, however, and therefore forms no part of this invention except where the same operates in direct combination with my indicator and stop devices. The switch herein shown comprises generally a stationary contact block 109 provided with one row of contact terminals, comprising terminals (a), (b), (c), and (d), and another row of contact terminals comprising terminals (e), (f), (g), and (h). A swinging terminal block 110 supported by suitable standards 111 and 112 carries at the lower edge thereof contact terminals (a'), (b'), (c'), and (d'). A spring member 113 positioned at each side of the movable contact block operates to normally retain the same in vertical position, and out of contact with the terminals in the stationary block 109. A pair of arms 114 is secured to one end of the hinged terminal block 111, one projecting laterally from each side thereof. Each of these arms is adapted to be engaged by a manually operated spring pressed plunger 115 adapted to swing the movable contact block into such a position that the contact terminals (a'), (b'), (c'), and (d') thereof will electrically contact with one of the sets of terminals carried by the stationary block 109.

Means are provided for latching the movable block 110 in the electrical contact position to which it has been swung. This latching means may comprise magnetic solenoid coils 116 and armature 117, which carries a pin 118 slidably supported in a U-shaped bracket 119. A coil spring 120 surrounds the pin 118 and is compressed between the armature 117 and the rear arm of bracket 119, thus yieldably holding the armature forward. The end of the pin 118 projects through the forward arm of the U-shaped bracket 119 and is adapted, under the action of coil spring 120, to latch against either side of a lug 121 which is secured to the rear end of the swinging block 110.

The movement given to the swinging block 110 by a manual manipulation of the plungers 115 will move the lug 121 sufficiently to cause latch pin 118 to engage against one side or the other thereof, holding the corresponding sets of terminals in contact and preventing a return movement of the swinging block to neutral non-contact position until the latch pin has been retracted, as by energization of the solenoids 116. The arrangement of the plungers 115 and projecting arms 114 is such that one will not interfere with the proper operation of the other.

The circuits and the operation of the switch will now be described. When the block 110 is in normal position, held so by the spring elements 113, none of the terminals carried thereby contacts any of the terminals on the

stationary block 109. In this adjustment, the motor is at rest and no current passes through the coils of the relay. To start the motor rotating in one direction or the other, it is merely necessary to depress the corresponding plunger 115. If the hinged block 110 is pivoted so as to sweep terminals (*a'*), (*b'*), (*c'*), and (*d'*) carried by the block 110 into contact with terminals (*a*), (*b*), (*c*), and (*d*) carried by block 109, the circuit will be as follows. From one terminal 122 of a suitable source of supply, current will flow through conductor 123 and terminal (*a'*). From terminal (*a'*) current will flow across to terminal (*a*); thence through conductor 124 to one pole 125 of the motor armature; and thence from the other pole 126 of the motor armature through conductor 127 to the opposite terminal 128 of the source of supply. Meanwhile, current will also flow from pole 125 of the motor through conductor 129 to terminal (*c'*), across to terminal (*c*), through conductor 130 to the field terminal 131 of the motor. After passing through the motor, the current flows from the field terminal 132 through conductor 133 to terminal (*b*), across to terminal (*b'*), and thence through conductors 134 and 127 to the opposite terminal 128 of the source of supply.

Assuming that in this adjustment of the switch, the motor drives reel 16 clockwise, the sound wire will then be advanced through the recording and reproducing unit 32 and the indicator will move towards the right (Figure 2) until electrical contact is made between contact portions 90 and 91. The solenoids 116 will then be automatically energized and the pin 118 will be retracted to permit block 110 to swing back into normal non-contact position, in accordance with the following circuit. Relay operating current will flow from one terminal 135 of a suitable source of low voltage current, as a battery 136, through conductor 84, to contact point 90, thence to contact point 91, through conductor 87 to terminal (*d*), across to terminal (*d'*), and through conductor 137 to the solenoids 116. From solenoids 116, the current flows through conductor 138 to the opposite terminal 139 of the battery 136. It is, therefore, seen that, as soon as the sound wire has been advanced to the desired stop setting, terminal points 90 and 91 are brought into contact and the solenoids 116 will be energized to retract latch pin 118, permitting block 110 to swing into non-contact position to stop the motor.

To retract the sound wire and to rewind the same upon the reel 16, it is first necessary to stop the motor if it is rotating. The opposite plunger 115 is then depressed to sweep terminals (*a'*), (*b'*), (*c'*), and (*d'*) into contact with terminals (*e*), (*f*), (*g*) and (*h*). In this event, the latch pin 118 will engage against the opposite side of the lug 121. In this adjustment of the switch, the armature circuit for the motor will be as follows. From terminal 122 of a suitable power source, through conductor 123, through terminal (*a'*), across to terminal (*e*), through conductor 140 to terminal (*a*), through conductor 124, and thence, as before, through the armature of the motor to the supply terminal 128.

The motor field circuit will then be reversed to reverse the direction of motor rotation, and will be as follows. From conductors 124 and 129 to terminal (*c'*), across to terminal (*g*), across through conductor 141 to terminal (*b*), and thence through conductor 133 to the field terminal 132. From the opposite field terminal 131, the current flows through conductor 130 to terminal (*c*), thence across through conductor 142 to terminal (*f*), across to terminal (*b'*), through conductors 134 and 127 to the opposite terminal 128 of the source of supply. Similarly, in this adjustment of the switch, the relay coils 116 will be energized to permit block 110 to swing into non-contact position when the indicator block has moved back so that contact portion 100 will make electric contact with the contact portion 99. Current will then flow from the battery 136 through terminal 135 through conductor 84 through terminal portions 100 and 99 of the stop switch, through conductors 96 and 97 to terminal (*h*), across to terminal (*d'*), through conductor 137 to the solenoids 116, from whence the current passes through conductor 138 to the opposite pole of the battery.

Manual means are provided to permit the operator to stop the motor at any time. A manually operative switch 143 is connected in circuit with the battery 136 and the solenoids 117, so that when the switch 143 is closed the relay is energized to retract pin 118, as heretofore described. Current then flows from terminal 135 of battery 136, through conductors 84 and 144, through the switch 143, through conductor 145, to the solenoids 116, and thence through conductor 138 to the opposite terminal of the battery.

Should the electrical stop mechanism fail to operate for some reason, it is seen that the motor would continue to rotate the sound wire reels 15 and 16 and also move the indicator block 67 along the drive screw 66 to the possible injury of the same. To take care of such an emergency, I provide safety means operative to mechanically retract the latch bolt 118 which normally retains the motor switch in closed circuit position.

To mechanically stop the machine should the electrical stop mechanism fail to operate, I provide a shimmey bar 146 of rectangular cross-section, which is slidably supported at each end thereof in correspondingly shaped notches cut in arm portions 147 and 148 projecting laterally from the respective supporting block 63 and 64, as shown in Figures 6

and 7. A pair of abutment blocks 149 and 150 are slidably mounted on the shimmey bar 146 and each is provided with an adjustment screw 151 by means of which the respective abutment blocks can be fixed to the shimmey bar at any point therealong. A plate 152, secured to the top side of each arm 147 and 148 as by screws 153, removably retains the shimmey bar 146 slidably positioned within the notches provided in the arms 147 and 148.

The indicator block 67 is provided with an abutment pin 154 projecting from the rear side thereof. Now it is seen that when the sound wire from reel 16 is advancing off the reel, the pin 154 carried by the indicator block will eventually strike the abutment block 149 and move the shimmey bar 146 to the right, as shown in Figure 5. During the rewinding of the reel 16, on the other hand, the indicator block 67 and associated pin 154 will move toward the left and the pin will eventually strike the abutment block 150, moving the shimmey bar 146 toward the left. This right or left movement of the shimmey bar 146 may be regulated so as to take place at any point during the unwinding or rewinding movement of the reels by merely fixing the respective abutment blocks 149 and 150 in the proper position along the shimmey-bar 146.

Means are provided for transmitting this right and left movement of the shimmey-bar 146 to mechanically retract the latch bolt 118 out of engagement with the lug 121 to permit the hinged section 110 of the switch to swing to noncontact position. To this end I cut a V-shaped cam slot having cam surfaces 155 and 156 in the under side of the shimmey-bar 146. A bell crank lever pivotally secured to a bracket 157 fixed to the under side of the base plate 10 is provided with a pin-shaped arm 158 which is adapted to seat within the V-shaped slot, as clearly shown in Figures 3 and 8. The other arm 159 of the rocker lever extends downwardly and may be provided with a forked portion 160 pivotally secured by means of studs 161 to the circular armature plate 117, as shown more clearly in Figure 4. Now it is seen that when the abutment pin 154 carried by the indicator block strikes the abutment block 149 so as to move the shimmey-bar 146 toward the right, cam portion 155 of the V-shaped slot will ride over the end of pin-shaped arm 158, depressing the same and rocking the bell crank lever in such a manner as to retract the latch bolt 118 out of engagement with lug 121. The hinged block 110 of the switch will then swing, under the influence of springs 113, out of engagement with the terminals of the stationary block 109, and the motor circuit will thus be broken, halting the operation of the motor.

Similarly, when the shimmey bar 146 is moved toward the left by the travel of the indicator block 67 as above described, the cam portion 156 of the V-shaped block will slide over the end of the pin-shaped arm 158 to rock the bell crank lever and withdraw the latch 118 out of engagement with lug 121 of the switch. The hinged block 110 will then swing into neutral non-contact position and the motor will be stopped as before. As soon as the pressure of abutment pin 154 carried by the indicator block is removed from the abutment block 149 or 150, the shimmey bar 146 is returned into neutral position with the pin-shaped arm 158 seated within the V-shaped slot as before. This restoration of the shimmey-bar is automatically accomplished by a pair of spring fingers 162, one secured as by screws 163 to each of the stationary supporting blocks 63 and 64, which press against the ends of the shimmey-bar. When the shimmey-bar 146 is in neutral position, the motor M is free to be started without interference from the bell crank lever.

To facilitate the setting of the abutment blocks 149 and 150, the shimmey bar 146 may be provided with a series of graduated markings, as clearly shown in Figure 5. For the unwinding operation of the sound wire from reel 16, the abutment block 149 should be so set on the shimmey bar 146 that contact portion 90 of the contact pin 83 is given an opportunity to fully engage contact portion 91, and depress the same slightly against the action of coil spring 79 before the safety stop arrangement will come into play and before the pin 154 carried by the indicator block will engage the abutment block 149. For the rewinding operation of the sound wire upon reel 16, the abutment block 150 should be so positioned on the shimmey bar that contact portion 101 of contact pin 83 will be given full opportunity to close the solenoid circuit and retract the switch latch bolt 118 electrically before pin 154 engages the abutment block. Thus, only when the electrical stop device fails to function will the unwinding or rewinding operation be halted mechanically. It is now seen that I have provided for all possible emergencies of operation, so that if the stop devices should fail to operate or the machine be negligently attended to, the machine will in no case be harmed.

I have shown in Figures 10, 11 and 12 a slightly modified construction of my mechanically operated switch throw device. In this modification the abutment block 149 is operatively connected to the slide block 72 so as to move along therewith and thus automatically accomplish the proper setting of the abutment block 149 when the slide block set screw 94 is fixed along the marker plate. To this end I provide a rod 164 which is secured at one end thereof to an arm portion 165 projecting from the slide block 72. The rod 164 slides through an aperture provided

in the arm portion 147 of supporting block 63 and also through an aperture provided in the abutment block 149. The end of the rod 164 is threaded and is provided with an adjustment nut 166. The abutment block 149 is resiliently retained against the nut 166 by means of an expansion spring 167 surrounding the rod and retained between the abutment block and collar 168 fixed to the rod. It is now seen that by a single manipulation of the nut 166 the abutment block 149 can be adjusted along the rod 164 as desired.

In this modification the adjustment screw 151 for fixing the abutment block 149 to the shimmey rod 146 is eliminated and a dog member 169 is substituted, which is adapted to engage ratchet-teeth 170 provided along the top edge of the shimmey rod. The dog member hinged to the block 149 is normally held in engagement with the ratchet teeth by spring element 171 fixed to the top of the block 149 and resiliently pressing against the dog member. When the slide block 72 is moved toward the right, as shown in Figure 10, the dog member 169 idles over the ratchet teeth and engages the tooth where it comes to rest. When the pin 154 engages the block 149 the shimmey rod 146 is carried to the right as before. A handle 171 may be provided to lift the dog member out of engagement with the ratchet teeth. By means of this arrangement, the proper setting of the abutment block 149 so as to mechanically throw the switch at the proper moment is always assured. Furthermore only one setting operation is necessary, i. e., the setting of the slide block set screw 94. The amount of depression the contact portion 91 of the contact pin shall undergo before the mechanical switch throw device comes into play can be regulated as desired by merely manipulating the adjustment nut 166 and thus fix the position of the abutment block 149 in reference to the contact portion 91.

In reproducing any particular selection from the sound wire it may often be desirable that the operator be forewarned when the end of that selection being reproduced is about to be reached, so that he can prepare himself for the event. To this end, I provide an electric light 172 placed in a convenient position on the base plate 10, and which is so connected in electric circuit that it will light up at a predetermined interval, of say one minute, before the end of the selection being reproduced is reached. The electric light 172 is electrically connected by means of a wire 173 to a resilient contact member 174 fixed at one end thereof to the slide block 72. The forward end of member 174 is bent into spoon-shaped form, as shown at 175, Figure 6. The spoon-shaped end of the contact member 173 is adapted to ride over the end of spring member 176 and move therealong in electrical contact therewith. The spring member 176 is secured as by screw 177 to the indicator block 67. A wire 178 electrically connects the spring member 176 to the main wire 84 which is in turn connected to the terminal 135 of battery 136, as shown in Figure 3.

As heretofore described, wire 138 connects the battery 136 to the solenoids 116 which are in turn connected by wire 137 to contact d' of the hinged block of the switch. When the sound wire is being unwound from reel 16 at the same time advancing the indicator block 67 toward the right, the contact d' will be in electrical contact with contact h. Wires 97 and 179 complete the electric circuit between the contact h and the lamp 172. Now it is seen that the lamp 172 will be lighted when, and only when, the circuit is closed by both resilient contact members 174 and 176 and also by contacts d' and h of the switch. By means of this circuit arrangement, as soon as the switch block 110 is swung to neutral position and the motor circuit broken, the lamp circuit will also be broken and the lamp will go out and the motor will stop at the same time. Only while the motor switch is closed and while the indicator block 67 is traveling through the distance interval provided will the lamp remain lighted. Since the resilient contact member 174 is secured to the slide block 72, the same is adjusted in position with the adjustment of the slide block 72 and contact member 83.

It is now seen that I have provided an indicator and associated stop devices which are admirably adapted for use in connection with sound recording and reproducing machines. A complete and fully operative machine has been described and illustrated to more particularly bring out the operation of my indicator and stop devices, and to bring out clearly how they cooperate when assembled into the entire machine combination. The indicator, operating in combination with the mechanism for winding, unwinding and rewinding the reels, accurately indicates the location of any desired talk or musical selection. The various devices so operate that the relationship between the lineal movement of the sound wire through the sound recording and reproducing unit and the movement of the indicator is always maintained no matter how many times the reels are unwound and rewound. By making a simple notation when the record is made, the beginning and end of any particular selection recorded on the sound wire can, with my device, be very accurately determined. The machine can be set to reproduce any desired selection without delay, annoyance or disturbance. The entire assembly is strong and durable. The various stop devices makes the machine practically foolproof, and the machine is thus at all times

preserved against possible self destruction during operation.

Talking heads for the purpose of this invention are well known, as well as are circuits for recording and reproducing sounds on magnetizable wire of the character referred to herein, and accordingly it is not believed to be necessary to describe any specific talking head construction or any specific recording or reproducing circuit to such head, this invention not being directed to these specific features.

As many changes could be made in the above construction and as many apparently widely different embodiments could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What I claim is:—

1. In an apparatus having a reel and driving means therefor, of control means for said driving means, including, in combination, a drive screw driven by said driving means in synchronism with the reel and having a traveler, a member adjustable axially relatively to said drive screw, means associated with said member, traveler and driving means adapted to shut off the driving means when the traveler reaches a place on its drive screw determined by the adjusted position of said member relative to the drive screw, and means, including a fixed dial and a coacting pointer movable with said member, for indicating the adjustment of said member relative to the drive screw.

2. In an apparatus having a reel and driving means therefor, of control means for said driving means, including, in combination, a control switch, a control member therefor adapted upon predetermined movement to open said switch to shut off said driving means, a drive screw driven by said driving means in synchronism with the reel and having a traveler, and a stop on the control member adapted to be engaged by the traveler when the traveler reaches a predetermined place on its drive screw to move the control member to open the control switch and shut off the driving means.

3. In an apparatus having a reel and driving means therefor, of control means for said driving means, including, in combination, a control switch, a control member therefor adapted upon predetermined movement to open said switch to shut off said driving means, a drive screw driven by said driving means in synchronism with the reel and having a traveler, and a stop mounted for adjustment on the control member and adapted to be engaged by the traveler to move the control member to open the control switch and shut off the driving means when the traveler reaches a place on its drive screw determined by the adjusted position of the stop on the control member.

4. In an apparatus having a reel and driving means therefor, of control means for said driving means, including, in combination, a control switch, a control rod associated with said driving means and adapted upon predetermined movement to open said switch to shut off said driving means, a drive screw parallel with said rod and driven by said driving means in synchronism with the reel and having a traveler, and a stop on the control rod adapted to be engaged by said traveler to move said rod to open the control switch and shut off the driving means, said stop being adjustable along said rod whereby the stop engaging position of the traveler on the drive screw may be varied.

5. In an apparatus having a reel and driving means therefor, of control means for said driving means, including, in combination, a control switch, a control rod associated with said driving means and adapted upon predetermined movement to open said switch to shut off said driving means, a drive screw parallel with said rod and driven by said driving means in synchronism with the reel and having a traveler, and a stop on the control rod adapted to be engaged by said traveler to move said rod to open the control switch and shut off the driving means, said stop being adjustable along said rod whereby the stop engaging position of the traveler on the drive screw may be varied, said control rod having means for indicating the adjusted position of the stop thereon.

6. In an apparatus having a reel and driving means therefor, of electro-mechanical control means for said driving means, including, in combination, a drive screw driven by said driving means in synchronism with the reel and having a traveler, a control member adapted to be engaged by said traveler when the traveler reaches a predetermined place on its screw, to actuate said control means electrically to shut off the driving means, and a control member adapted to be engaged by said traveler when the traveler reaches a predetermined place on its drive screw, to actuate said control means mechanically to shut off the driving means.

7. In an apparatus having a reel and driving means therefor, of electro-mechanical control means for said driving means, including, in combination, a drive screw driven by said driving means in synchronism with the reel and having a traveler, a control member adapted to be engaged by said traveler when the traveler reaches a predetermined place on its screw, to actuate said control means electrically to shut off the driving means, and a control member adapted to be engaged by said traveler when the traveler reaches a predetermined place on its drive screw, to actuate said control means mechanically to shut

off the driving means, said control members being adjustable axially relatively to said drive screw, whereby the control member engaging places of said traveler on its drive screw may be varied.

8. An apparatus having a reel and driving means therefor, and including, in combination, a dial, a drive screw driven by said driving means and having a traveler provided with a pointer for said dial, a control member adjustable axially relatively to said drive screw and adapted to be engaged by said traveler to shut off the driving means, and a dial for said control member, said control member having a pointer movable over said dial, and said dials having related markings.

9. In an apparatus of the character described, in combination, means for lineally advancing a strip of band material, and means operative to indicate the beginning and to indicate the end of any predetermined section of said band material as they respectively pass a predetermined point, said indicating means including an indicator plate having markings thereon, a drive screw, an indicating element mounted on said drive screw and movable along said plate, and means for rotating said drive screw to advance said indicating element along said plate in synchronism with the advancing movement of said band material.

10. In an apparatus of the character described, in combination, means for lineally advancing a strip of sound wire, means operative to indicate the beginning and to indicate the end of any desired sound selection impressed upon a portion of said wire as they respectively pass a predetermined point, means for automatically throwing said advancing means out of operation when the end of said section passes by said predetermined point, and means automatically operative to signal the approach of the end of said selection at a predetermined time interval prior to the arrival of said end at the predetermined point.

11. In an apparatus of the character described, in combination, means for lineally advancing a strip of sound wire, means operative to indicate the beginning and to indicate the end of any desired sound selection impressed upon a portion of said wire as they respectively pass a predetermined point, means for automatically throwing said advancing means out of operation when the end of said section passes by said predetermined point, and electrical means associated with said indicating element automatically operative to signal the approach of the end of said section at a predetermined time interval prior to the arrival of said end at the predetermined point.

This specification signed this 4th day of October, 1929.

HARRY F. CHIPMAN.