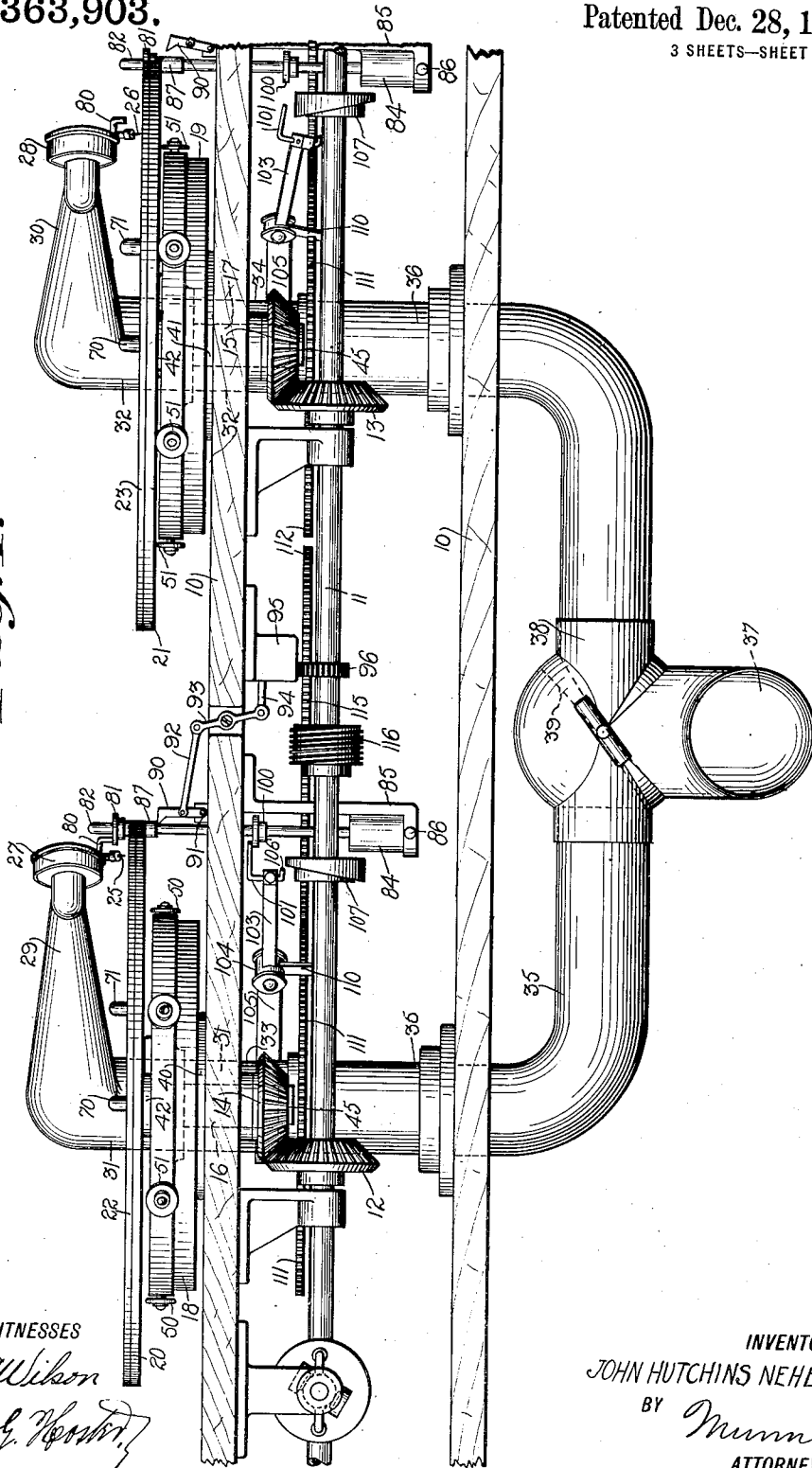


J. H. NEHER.
 SOUND RECORDING AND SOUND REPRODUCING MACHINE.
 APPLICATION FILED JULY 2, 1919.

1,363,903.

Patented Dec. 28, 1920.
 3 SHEETS—SHEET 1.

Fig. 1.



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Fig. 2.

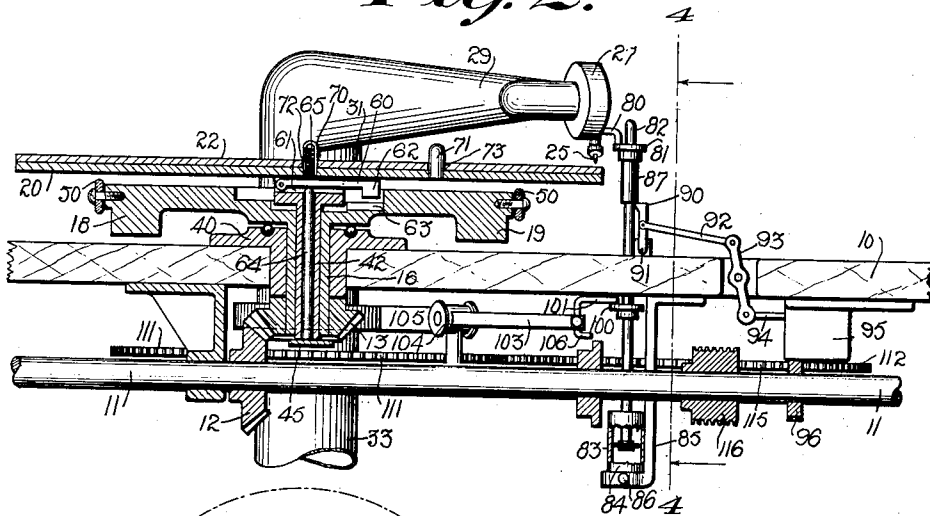
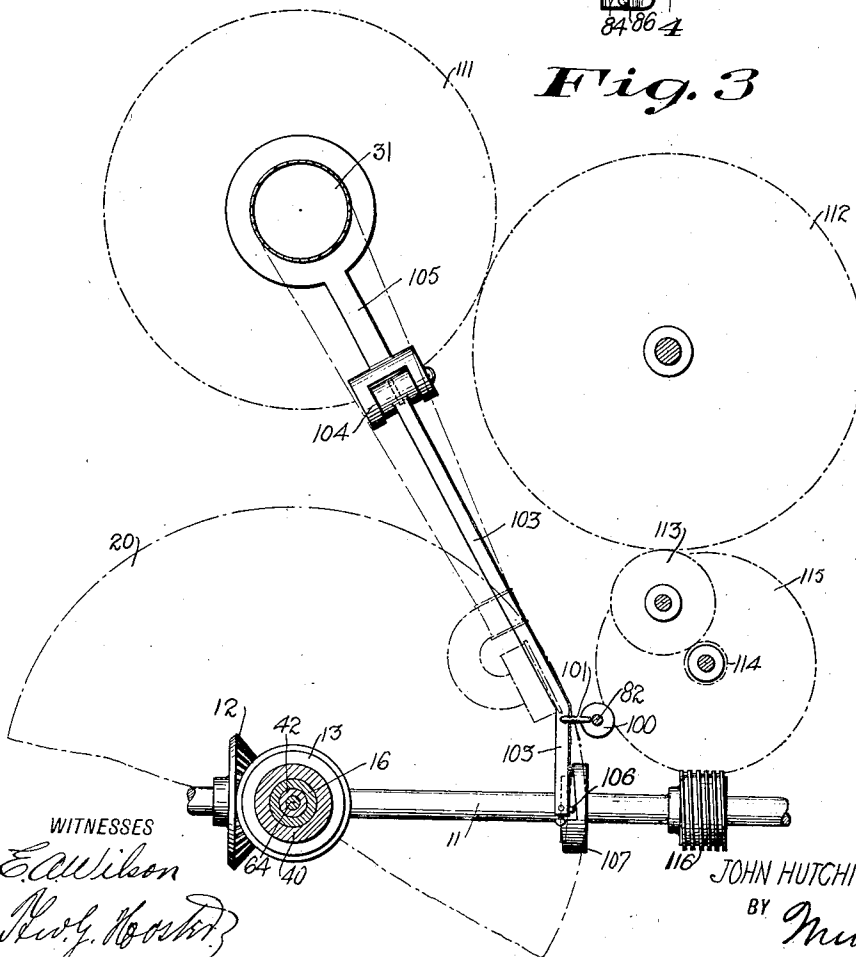


Fig. 3.



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Fig. 4.

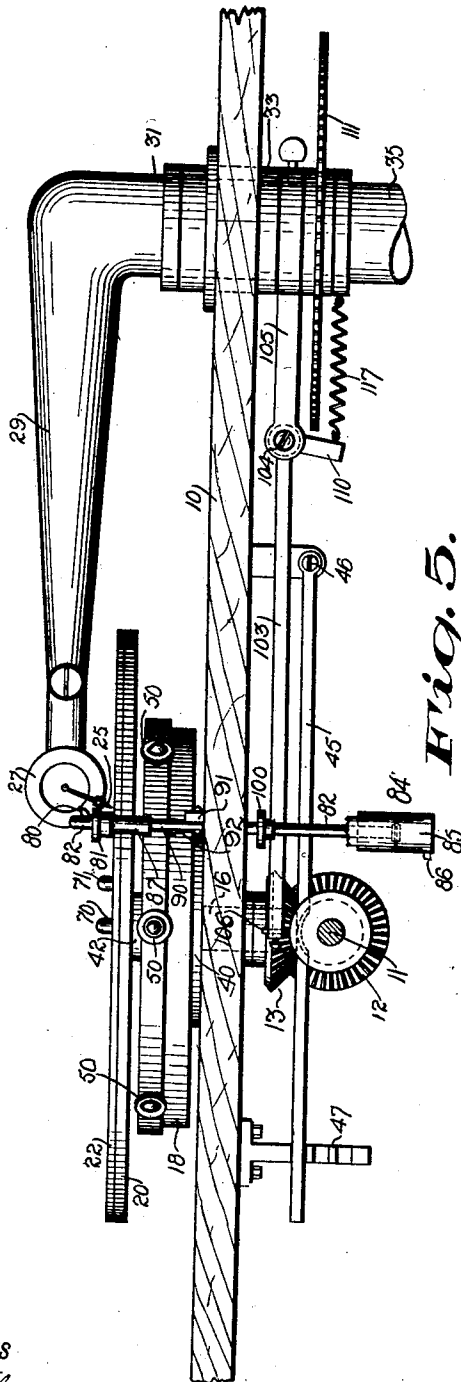
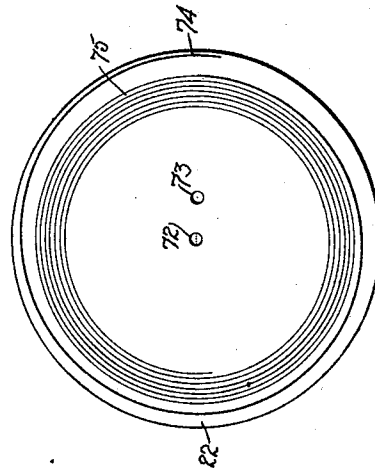


Fig. 5.



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SOUND-RECORDING AND SOUND-REPRODUCING MACHINE.

1,363,903.

Specification of Letters Patent.

Patented Dec. 28, 1920.

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To all whom it may concern:

Be it known that I, JOHN HUTCHINS NEHER, a citizen of the United States, and a resident of Princeton, in the county of Mercer and State of New Jersey, have invented new and useful Improvements in Sound-Recording and Sound-Reproducing Machines, of which the following is a full, clear, and exact description.

The invention relates to the recording and reproducing of lengthy speech or music on a plurality of records, and its object is to provide certain new and useful improvements in sound recording and sound reproducing machines whereby the continuous recording or the continuous reproduction of speech or music can be readily obtained without noticing the transition from one record to another. Another object is to give the operator ample time for placing the next record in position on the machine prior to the stylus in engagement with an active record, reaching the end of the sound groove, thus insuring the continuous recording or continuous reproduction of the subject matter.

With these and other objects in view, the invention consists of certain novel features of construction as shown and described hereinafter and then specifically pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the improved sound recording machine;

Fig. 2 is a sectional side elevation of the same and showing more particularly the inactive unit;

Fig. 3 is a sectional plan view of the same on the line 3—3 of Fig. 2;

Fig. 4 is a cross section of the same on the line 4—4 of Fig. 2; and

Fig. 5 is a plan view of one of the records.

The sound recording machine illustrated in Fig. 1 consists essentially of two recording instruments arranged side by side and mounted on a suitably constructed frame 10. The two recording instruments are actuated from a main driven shaft 11 journaled on the main frame 10 and provided with bevel gear wheels 12 and 13 in mesh with similar gear wheels 14 and 15 attached to the lower

ends of hubs 16 and 17 of two flywheels 18 and 19 adapted to support platforms 20 and 21 supporting disk records 22, 23. The records 22, 23 are adapted to be engaged by styli 25, 26 forming parts of sound boxes 27, 28 mounted to swing on the usual tone arms 29 and 30 terminating in vertical members 31 and 32 mounted to turn in suitable bearings 33, 34 attached to the frame 10. The lower ends of the members 31 and 32 are connected by branch pipes 35, 36 with a pipe 37 connected with the sound receiving horn (not shown). In the junction 38 connecting the branch pipes 35 and 36 with the pipe 37 is arranged a valve 39 under the control of the operator for connecting the pipe 37 with either branch pipe 35 or 36 so that the subject matter to be recorded passes to either the sound box 27 or the sound box 28.

The platforms 20 and 21 are adapted to be raised out of engagement with the flywheels 18 and 19 or lowered into engagement with the said flywheels and locked thereto to rotate with the same. For this purpose raising and lowering devices are provided, alike in construction and one for each platform 20 or 21, so that it suffices to describe but one in detail. The hubs 16 and 17 are journaled in suitable bearings 40 and 41 arranged on the main frame 10, and through each hollow hub 16 or 17 extends a hollow hub 42 of the corresponding platform 20 or 21. The lower end of the hub 42 projects below the lower end of the corresponding hub 16 or 17 and rests on a lever 45 fulcrumed at 46 on the main frame 10 (see Fig. 4) and engaging at its free end a notched segment 47 attached to the main frame 10. This lever 45 is under the control of the operator to permit the latter to swing the lever upward with a view to raise the hub 42 and with it the corresponding platform 20 or 21 and the record 22 or 23 held thereon. On swinging the lever 45 downward the platform 20 or 21 moves downward by its own weight into engagement with the corresponding flywheel 18 or 19. The peripheral faces of the flywheels 18 and 19 are preferably provided with rollers 50, 51 projecting slightly above the upper faces of the flywheels to form supports for the platforms 20 and 21. In order to lock the lowered platform 20 or 21 to the corresponding flywheel 18 or 19 use is made of a locking arm 60 pivoted on the upper

enlarged portion of the hub 42 and extending through a slot 61 formed in the said hub. The free end of the locking arm 60 is provided with a lug 62 adapted to engage a recess 63 formed in the corresponding flywheel 18 or 19. The locking arm 60 is held in inactive position by a pin 64 slidably mounted in the hollow hub 42, and the lower end of this pin 64 rests on the lever 45. Thus when the lever 45 is in uppermost position the corresponding platform 21 or 20 is held in raised position and likewise the locking arm 60, and when the lever 45 is swung downward then the corresponding platform 20 or 21 is lowered until it rests on the rollers 50 or 51, and when a further downward swinging movement is given to this lever 45 then the pin 64 is lowered to allow the locking arm 60 to move downward and engage with its lug 62 the recess 63 thus locking the corresponding platform 20 or 21 to the flywheel 18 or 19. A spring 65 bears on the locking arm 60 to hold the lugs 62 in firm engagement with the recess 63. The spring 65 is preferably mounted in a centering pin 70 forming part of the corresponding platform 20 or 21 and adapted to engage a central aperture 72 in the corresponding record 22 or 23. Another pin 71 is attached to the corresponding platform 20 or 21 and is adapted to engage an eccentrically located aperture 73 formed in the corresponding record 22 or 23 to hold the records against accidental turning on the platforms 20 and 21. (see Figs. 2 and 5). Each record 22 or 23 is provided, as hereinafter more fully explained, with a spiral starting groove 74 beginning at the margin of the record and preferably formed of one convolution with the ends spaced apart about one-eighth of an inch and with the inner end coinciding with the beginning of the sound groove 75. Each stylus 25 or 26 is adapted to be held out of engagement with the corresponding record 22 or 23 and for this purpose the sound box 27 or 28 is swung up or down by the use of a raising and lowering device arranged as follows: Each of the sound boxes 27 and 28 is provided with an arm 80 adapted to rest on a collar 81 secured to the upper end of a rod 82 mounted to slide up and down on the main frame 10. The lower end of the rod 82 is provided with a piston 83 engaging a dash pot 84 supported on a suitable bracket 85 attached to the main frame 10. The dash pot 84 is provided with an outlet valve 86 for regulating the resistance of the fluid in the lower end of the dash pot against the downward movement of the piston 83. On the rod 82 is secured a collar 87 adapted to be engaged by a latch 90 pivoted at 91 on the frame 10. The latch 90 is pivotally connected by a link 92 with a lever 93 fulcrumed on the frame 10 and connected

by a member 94 with the mechanism of a revolution counter 95 of any approved construction attached to the main frame 10 and driven by a gear wheel 96 from the shaft 11. Presuming that the stylus 26 is recording on the disk 23 and the stylus 25 is held out of engagement with the disk 22 by the arm 80 resting on the collar 81 of the rod 82 held in uppermost position by the latch 90, now when the platform 21 and its disk 23 have completed, say the 399th revolution, then the revolution counter 95 actuates the lever 93 which by the link 92 swings the latch 90 out from under the collar 87 thus allowing the rod 82 to drop. When this takes place the stylus 25 engages the blank record 22 to form the starting groove 74 and on the completion of the 400th revolution of the platform 21 and its record 23 the stylus 25 begins to form the sound groove 75 on the record 22.

When the stylus 25 has completed the groove 74 then the tone arm 29 is given a positive swinging movement in unison with the turning movement of the main shaft 11. For this purpose the following arrangement is made: On the rod 82 is secured a collar 100 engaged by an arm 101 secured to a link 103 pivoted at 104 on an arm 105 secured to the corresponding vertical member 31 or 32 of the tone arm 29 or 30. The link 103 is provided at its free end with a lug 106 adapted to engage a cam 107 secured on the shaft 11, it being understood that as long as the rod 82 is in raised position, as shown to the left in Fig. 1, the lug 106 is out of engagement with the cam 107, but when the rod 82 is lowered, as above explained, and the stylus 25 engages the record 22 then the lug 106 moves in engagement with the cam 107, and when the shaft 11 has completed one revolution then the cam 107 pushes the lug 106 out of engagement with the cam to allow the link 103 to swing downward by its own weight. This link 103 is provided at its fulcrum end 104 with a lug 110 adapted to engage a gear wheel 111 secured on the vertical member 31 of the tone arm 29. The gear wheel 111 is connected by a train of gear wheels 112, 113, 114, 115 and 116 with the main shaft 11 to impart a swinging motion to the tone arm 29 as soon as the lug 110 engages the gear wheel 111. By reference to Fig. 3 it will be noticed that the gear wheel 111 is in mesh with the gear wheel 112 and the latter is in mesh with a gear wheel 113 in mesh with a pinion 114 with which rotates a worm wheel 115 in mesh with the worm 116 secured on the main shaft 11, and hence the rotary motion of the latter is transmitted by the train of gear wheels 116, 115, 114, 113 and 112 to the gear wheel 111, and the latter imparts a swinging motion to the tone arm 29 by the lug 110 and arm 105 as soon as the lug 110 engages the gear wheel

111. It is understood that as long as the arm 101 rests on the collar 100 and the latter is in raised position, as shown to the left in Fig. 1, then the lug 110 is out of engagement
 5 with the gear wheel 111, but as soon as the lug 106 drops off the side of the cam 107 and the link 103 swings downward then the lug 110 engages the gear wheel 111, that is, at the time the stylus 25 has cut the groove
 10 74 into the record. It is further understood that a raising mechanism, such as described in connection with the stylus 25, is used for the stylus 26, as shown in Fig. 1, but as the said devices are alike in construction further
 15 description of the same is not deemed necessary.

In practice, a spring 117 is connected with the lug 110 to hold the latter in engagement with the gear wheel 111 (see Fig. 4). It is
 20 understood that when the stylus 26 is in engagement with the record 23, as shown to the right in Fig. 1, then a positive feeding from the right to the left is given to this tone arm 30 from the shaft 11 by the driving
 25 mechanism of this tone arm owing to the corresponding lug 110 engaging the gear wheel 111 rotating loosely on the vertical member 32 of the tone arm 30 and with the arm 105 attached to this vertical member
 30 and carrying the link 103 provided with the said lug 110.

The operation is as follows:

When the several parts are in the position shown in Fig. 1 then the first section of the
 35 subject matter is recorded by the stylus 26 on the record 23 rotating with the platform 21 locked to the flywheel 19. A positive feeding movement from the right to the left is given to the tone arm 30 from the shaft
 40 11 by the mechanism above described and shown to the right in Fig. 1. During the recording of the first section of the subject matter on the record 23, the platform 20 is in raised position and likewise the sound
 45 box 27 supported by the arm 80 on the collar 81 of the rod 82 held in raised position by the latch 90. The platform 20 is now lowered by the operator swinging the supporting lever 45 downward to allow the platform
 50 to drop and engage the lug 62 of the locking arm 60 with the recess 63 to cause the platform 20 to rotate with the driven flywheel 18. It is understood that during the downward movement of the platform 20 it moves
 55 into engagement with the rollers 50 and thereby is gradually carried along until the lug 62 engages the notch 63 to positively drive the platform 20 from the flywheel 18. The platform 21 is given, say 400 revolutions
 60 for recording the first section of the subject matter under consideration at the time, and when the platform 21 has made 399 revolutions then the revolution counter 95 for the inactive recording instrument shown to the
 65 left in Fig. 1 draws the latch 90 from under

the collar 87 to allow the rod 82 to move downward and thus permit the sound box 27 to swing downward and engage its stylus 25 with the blank record on the platform 20. The stylus 25 now cuts the groove 74 during
 70 one revolution of the platform 20 and at the end of this time the cam 107 releases the link 103 and allows the latter to swing downward to engage the lug 110 with the gear wheel 111 mounted to rotate loosely on the
 75 bearing 33. As the arm 105 is attached to the vertical member 31 of the tone arm 29 it is evident that the gear wheel 107 now feeds the tone arm 29 from the right to the left. It is understood that when the record 23 has
 80 completed the 400th revolution the valve 39 is shifted to connect the pipe 37 with the branch pipe 35, and then the operator swings the sound box 28 upward to disengage the stylus 26 from the record 23. It will be no-
 85 ticed that when the record 23 has completed its 400th revolution the stylus 25 has finished the groove 74 in the record 22 and recording of the second section of the subject matter now takes place on the record 22.
 90

During the recording of the second section of the subject matter, the operator raises the platform 21 and with it the record 23, then removes the latter and replaces it by a blank record. The operator also raises
 95 the rod 82 and its latch 90 of the now inactive instrument shown to the right in Fig. 1 to hold the stylus 26 out of engagement with the new record on the platform 21. It is further understood that the link 103 of
 100 the arm 105 attached to the vertical member 32 is raised relative to the collar 100 of the now inactive instrument shown to the right in Fig. 1, and when the platform 20 has completed the 399th revolution then the
 105 stylus 26 engages a new blank record and cuts the groove 74, and the above described operation is repeated, that is, the third section of the subject matter is recorded on the record, now on the platform 21, as soon
 110 as the platform 20 has completed its 400th revolution. The valve 39 at this time is changed back to the position shown in Fig. 1, that is, immediately after the beginning of the recording of the third section.
 115

From the foregoing it will be seen that by the arrangement described continuous recording of the subject matter can be readily obtained without noticing the transition
 120 from one record to the other.

When it is desired to reproduce the subject matter, the same machine is used with the exception of the arms 105, their links 103, cams 107, the trains of gear wheels 111
 125 to 116 and the valve 39.

It is understood that when the record for the first section is being played another for the second section is placed in position on the other platform, and when the record in active position has made its 399th revolu-
 130

tion then the stylus for the other record moves in engagement therewith at or between the convolution of the groove 74. At the end of the 400th revolution of the playing record the other stylus begins at the sound groove 75 of the record having the second section of the subject matter.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a machine of the class described, a driven shaft, a plurality of revoluble record carrying members each adapted to carry a record and adapted to be driven from the said shaft, sound boxes each adapted to engage a corresponding record, revolution counters driven from the said shaft, and means controlled by the said revolution counters for holding one of the said sound boxes temporarily out of operative engagement with its record while the other sound box is in operative engagement with its record and to allow such sound box to move into operative engagement with its record on the completion of a predetermined number of revolutions of the other record.

2. In a machine of the class described, a driven shaft, a plurality of record carrying platforms each adapted to carry a record, revoluble members driven in unison from the said shaft and adapted to rotate the said platforms, manually controlled means for raising a platform above and out of engagement with its driven member or lowering it into engagement with the same, sound devices for independent operative engagement with the corresponding records, revolution counters driven from the said shaft, and controlling means controlled by the said revolution counters to hold a corresponding sound device temporarily out of operative engagement with its record and to allow such sound device to move into operative engagement with its record on the completion of a predetermined number of revolutions of the other record.

3. In a machine of the class described, a driven shaft, a plurality of record carrying platforms each adapted to carry a record, revoluble members driven in unison from the said shaft and adapted to rotate the said platforms, manually controlled means for raising a platform above and out of engagement with its driven member or lowering it into engagement with the same, sound devices for independent operative engagement with the corresponding records, revolution counters driven from the said shaft, controlling means controlled by the said revolution counters to hold a corresponding sound device temporarily out of operative engagement with its record and to allow such sound device to move into operative engagement with its record on the completion of a predetermined number of revolutions

of the other record, and connecting means connecting the said sound devices with the said driven shaft to impart a positive feeding movement to the said sound devices, the said connecting means being controlled by the said controlling devices for the sound devices.

4. In a machine of the class described, revoluble record supports each adapted to support a record, a tone arm provided with a sound box and stylus for each record, driving means for rotating the said supports in unison, revolution counters driven from the said driving means, and means controlled by the said revolution counters to hold a corresponding sound box temporarily out of operative engagement with its record and to allow such sound box to move into operative engagement with its record on the completion of a predetermined number of revolutions of the other record.

5. In a machine of the class described, a driven shaft, at least two flywheels geared with the said shaft to rotate the flywheels in unison, record supporting platforms, one for each flywheel and movable relative thereto in an up and down direction, manually controlled means for raising a platform above and out of engagement with its flywheel or lowering it into engagement with the corresponding platform, locking means controlled by the said manually controlled means for locking a platform to its flywheel when in lowered position, tone arms one for each platform and each having a sound box and stylus adapted to engage the record on the corresponding platform, raising and lowering devices for the said sound boxes to normally hold the stylus out of engagement with the corresponding record, and revolution counters driven from the said shaft and controlling the said raising and lowering devices to lower one sound box of one platform on the other platform completing a predetermined number of revolutions.

6. In a machine of the class described, a driven shaft, at least two flywheels geared with the said shaft to rotate the flywheels in unison, record supporting platforms one for each flywheel and movable relatively thereto in an up and down direction, manually controlled means for raising a platform above and out of engagement with its flywheel or lowering it into engagement with the corresponding platform, locking means controlled by the said manually controlled means for locking a platform to its flywheel when in lowered position, tone arms one for each platform and each having a sound box and stylus adapted to engage the record on the corresponding platform, raising and lowering devices for the said sound boxes to normally hold the stylus out of engagement with the corresponding record, revolution counters driven from the said shaft and con-

trolling the said raising and lowering devices to lower one sound box of one platform on the other platform completing a predetermined number of revolutions, and
 5 actuating means adapted to be driven from the said shaft and connected with the tone arms to impart a swinging motion thereto, the said actuating means being controlled by the said raising and lowering devices.

10 7. In a machine of the class described, a driven shaft, at least two flywheels geared with the said shaft to rotate the flywheels in unison, record supporting platforms one for each flywheel and movable relatively
 15 thereto in an up and down direction, manually controlled means for raising and lowering it into engagement with the corresponding platform, locking means controlled by the said manually controlled
 20 means for locking a platform to its flywheel when in lowered position, tone arms one for each platform and each having a sound box and stylus adapted to engage the record on the corresponding platform, raising and
 25 lowering devices for the said sound boxes to normally hold the stylus out of engagement with the corresponding record, revolution counters driven from the said shaft and controlling the said raising and lowering
 30 devices to lower one sound box of one platform on the other platform completing a predetermined number of revolutions, cams on the said shaft, locking arms swinging in unison with the tone arms and provided
 35 with pivoted members controlled by the said raising and lowering devices and adapted to engage the said cams, and trains of gear wheels driven from the said shaft and connected with the tone arms to impart a swing-
 40 ing motion thereto, one of the gear wheels in each train of gear wheels being adapted to be engaged by the pivoted member of the corresponding locking arm.

8. In a machine of the class described, a
 45 driven shaft, revoluble platforms adapted to support records and driven from the said driven shaft, tone arms having sound boxes and styli adapted to engage the corresponding records, raising and lowering devices
 50 which in one position hold the said sound boxes and their styli in raised inoperative position and in another position of the said devices allow the styli to engage the records, revolution counters driven from the said
 55 shaft and controlling the said raising and lowering devices, trains of gear wheels driven from the said shaft, and locking devices controlled by the said raising and lowering devices and adapted to connect the said trains of gear wheels with the said tone

arms to impart a swinging motion to the latter.

9. In a machine of the class described, a driven shaft, revoluble platforms adapted to support records and driven from the said
 65 driven shaft, tone arms having sound boxes and styli adapted to engage the corresponding records, raising and lowering devices which in one position hold the said sound boxes and their styli in raised inoperative
 70 position and in another position of the said devices allow the styli to engage the records, revolution counters driven from the said shaft and controlling the said raising and lowering devices, trains of gear wheels
 75 driven from the said shaft, one of the gear wheels in each train of gear wheels being attached to the corresponding tone arm, arms attached to the tone arms and provided with pivoted locking members adapted to
 80 engage the gear wheels fixed on the tone arms, the said locking members being controlled by the raising and lowering devices, and cams on the said shaft and adapted to be engaged by the said locking members. 85

10. In a machine of the class described, a
 85 main driven shaft, at least two platforms driven in unison from the said shaft and each adapted to support a record, tone arms each provided with a sound box having a
 90 stylus adapted to engage the corresponding record, a raising and lowering device for each sound box and having a member adapted to hold the corresponding sound box in raised position, a pivoted latch for each
 95 member and adapted to temporarily hold the latter in raised position, and a revolution counter for each latch and driven from the said shaft to move the corresponding latch out of engagement with the cor-
 100 responding member to allow the stylus of the corresponding sound box to engage the corresponding record.

11. In a machine of the class described, a
 105 revoluble flywheel provided with rollers, a platform adapted to support a record and adapted to rest on the said rollers, the said flywheel and the said platform having hubs, of which the platform hub extends through the flywheel hub, raising and lowering
 110 means connected with the said platform hub to raise the platform off the said rollers or to lower the platform onto the said rollers, a pin extending through the platform hub and controlled by the said raising and low-
 115 ering means, and a lock having coacting members, one on the said flywheel and the other on the said platform, the platform member being controlled by the said pin.

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