F. F. MURDOCK.

SPEED CHANGING MECHANISM FOR GRAPHOPHONES.

APPLICATION FILED MAR. 19, 1909.

927,809. **Patented July 13, 1909.**

2 SHEETS—SHEET 1.

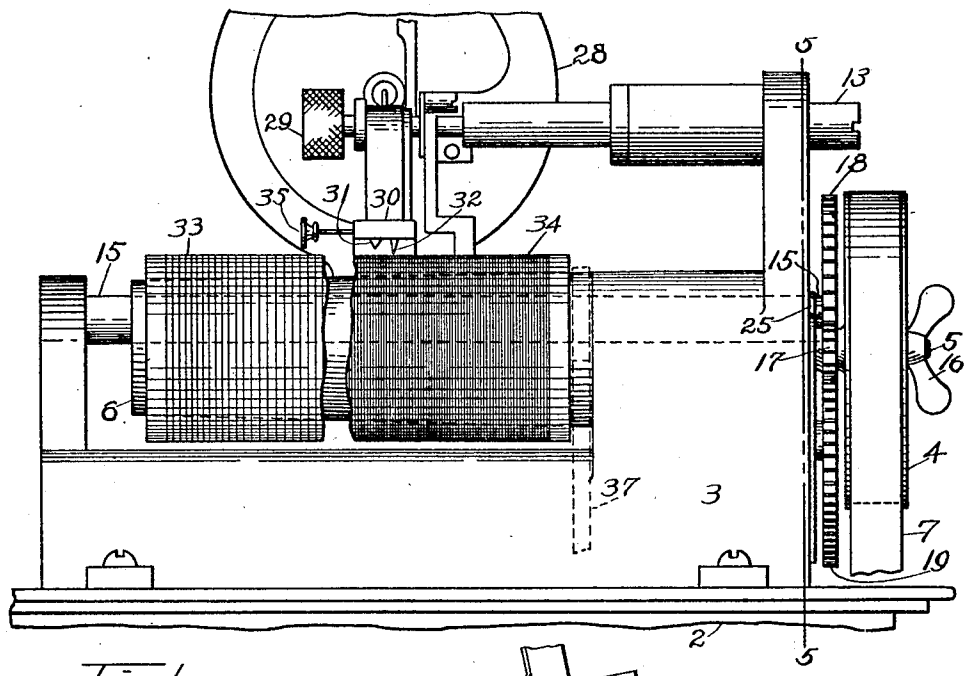

Fig. 1.

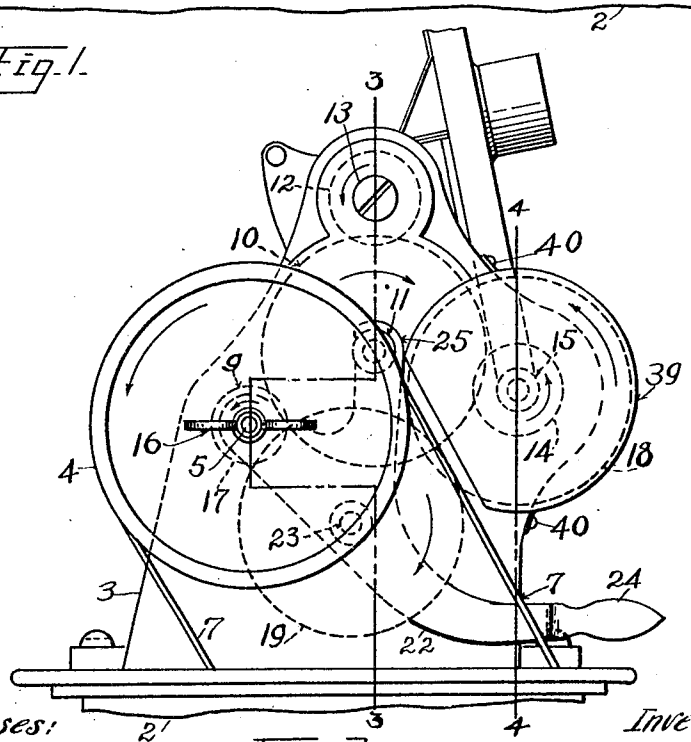

Fig. 2.

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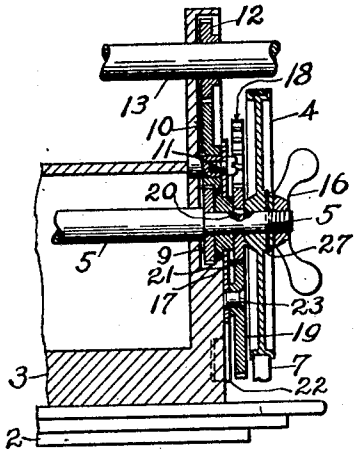

Fig. 3.

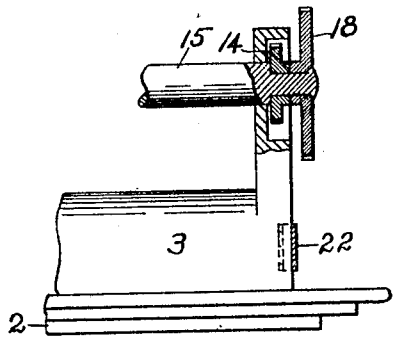

Fig. 4.

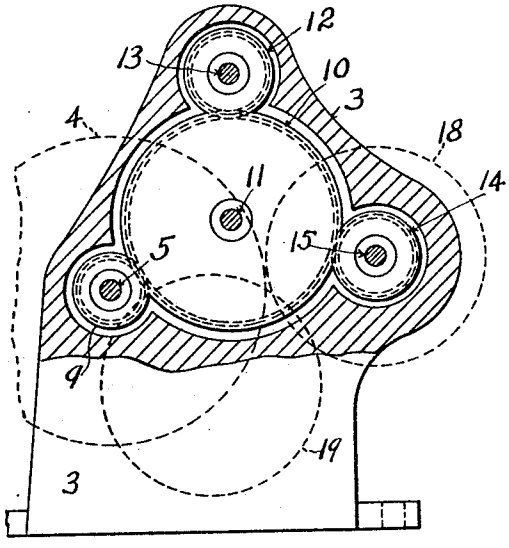

Fig. 5.

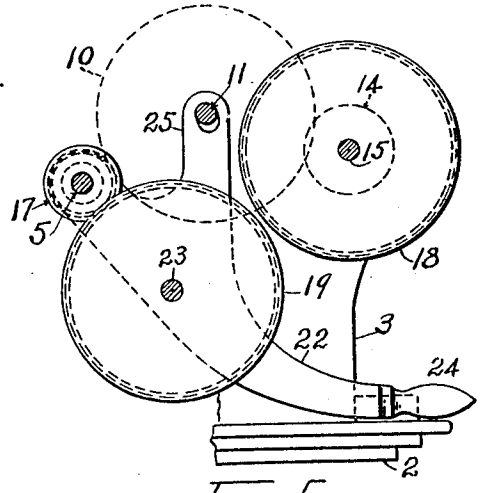

Fig. 6.

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UNITED STATES PATENT OFFICE.

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SPEED-CHANGING MECHANISM FOR GRAPHOPHONES.

No. 927,809. Specification of Letters Patent. Patented July 13, 1909.

Application filed March 19, 1909. Serial No. 484,343.

To all whom it may concern:

Be it known that I, FREDERICK F. MURDOCK, a citizen of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Speed-Changing Mechanism for Graphophones, of which the following is a specification.

This invention relates to improvements in speed changing mechanism for graphophones, and has for its object to provide an additional attachment or mechanism, by means of which both the old and the new machines may be readily adapted to play what is commonly known as the standard two minute record, and also a new four minute record which has recently been produced.

The invention relates particularly to improvements in the devices shown and described in my pending application, filed Jan. 25, 1909, Serial No. 473,963.

The present invention consists of the features and parts set forth in the detail description which follows, and as illustrated by the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a side elevation of a graphophone, showing the location and arrangement of the principal parts of my invention; also showing a portion of the old and new records. Fig. 2 is a front end elevation of the machine. Fig. 3 is a sectional view on line 3—3 of Fig. 2. Fig. 4 is a sectional view on line 4—4 of Fig. 2. Fig. 5 is a sectional view on line 5—5 of Fig. 1. Fig. 6 is a part end elevation showing the manner of throwing the auxiliary train of gears out of mesh.

In the accompanying drawings, 2 represents the case or box, in which a spring motor or other mechanism for driving a graphophone is disposed.

3 represents the body of the machine which is mounted upon the top of the case or box 2.

4 represents a pulley mounted upon a shaft 5, the latter being journaled in the body 3, on the opposite end of which is mounted a tapering cylinder 6 which carries the record. Pulley 4 is driven by a belt 7, which passes downwardly into the case and connects with the motor or other source of power. In a cavity in the front end of body 2 is disposed the usual train of spur gears employed for playing the old two minute records.

9 represents the smaller gear of the train, which is loosely mounted upon the shaft 5, and meshes with an idler gear 10 mounted on a screw or stud 11, supported by the body 2. Gear 10 meshes with a third gear 12, which is mounted upon and operates what is called the "amber" shaft 13. The idler 10 also meshes with a fourth gear 14 which is mounted upon a feed shaft 15, which supports and carries the sound box or reproducer, needles, horn and other parts.

On all of the graphophones, so far as known to me, the outer end of shaft 5 is threaded and projects beyond the record pulley 4, to which a common nut (not shown) is applied and employed for holding the inner hub of pulley 4 tightly against gear 9, and by this means the said gear is rotated with said pulley and said shaft, and drives the gears 10, 12 and 14. In the old machines the nut referred to, is always maintained in its tightened position except when the machine is being taken apart. In the present invention this old nut is removed from shaft 5, and a thumb-nut 16 substituted, the office of which will later be described.

The speed changing mechanism embodying my improvement consists of an auxiliary train of spur gears designated by the numerals 17, 18 and 19, all of which are preferably mounted on the front end of the body 2, as shown. The gear 17, which is preferably the same size and has the same number of teeth as the gear 9, is mounted upon shaft 5, and positively driven thereby, by means of a key or spline 20. The gear 17 is spaced from the gear 9 by a collar 21, loosely journaled on shaft 5. The collar having an outwardly extending hub which receives and forms a pivotal bearing for an operating lever 22. Gear 17 is constantly in mesh with the idler gear 19, which is journaled on the outer face of lever 22, by means of a screw or stud 23. Gears 17, 18 and 19 are all disposed in the same plane, and gear 19 is so positioned that it may be thrown into mesh with the gear 18, by the raising of lever 22 to the position shown in Fig. 2, or it may be thrown out of mesh with gear 18, by the shifting of lever 22 to the position shown in Fig. 6. Gear 18 is rigidly secured to the outer end of the feed shaft 15, and operates with said shaft the same as the old gear 14. The arrows in Fig. 2 show the direction of travel of the gears of both trains.

The lever 22 preferably lies flat against the face of the machine, and is provided with a handle 24, which projects past the rear side of the machine. Lever 22 is also provided

with an upwardly extending arm 25, which is perforated to receive the screw or stud 11, which is utilized for holding the lever in place, and the screw should be set tight enough, so that its head may exert sufficient frictional tension to hold the lever in either its upper or lower position. The perforation in the arm 25 of the lever is preferably made larger than the body of screw 11, to allow for suitable play of the lever when operating the gear 19.

In the old train of gears, the gear 9 must turn about two and one-half times in order to rotate the feed gear 14 and shaft 15 once. Under this arrangement the working parts are operated in proper time and at the right speed for playing the coarse two minute records, which are provided with about one hundred threads or turns per inch. The new four minute records have a finer threading, about two hundred threads per inch, and in order to adapt either the old or new machines for playing the new, as well as, the old records, it is necessary to provide an additional gearing by means of which the normal speed of the machine may be reduced substantially one-half. In the present device this reduction is accomplished by providing the gear 18 with about five times the number of teeth carried by the gear 17, as compared with two and one-half times that number of teeth as carried by the gear 14.

In assembling the parts of the machine, the gear 9 is placed in position on the shaft 5, being loosely journaled thereon, and the collar 21 is next placed in position. The collar also being loose on said shaft. Gear 17 is next placed on the shaft, it having a key-way to engage the key 20, by means of which this gear is driven. The pulley 4 is then mounted on shaft 5 and held in place by a pin 27. And lastly the thumb-nut 16 is applied to the threaded outer end of shaft 5. Under this disposition and arrangement of the parts referred to, the tightening up of the thumb-nut 16 forces the pulley 4, the gear 17 and the collar 21 inwardly, and the latter when made to bear sufficiently hard against the gear 9 will effect the positive driving of said gear, and through it the several other gears, as 10, 12 and 14. This is the condition of the parts, and the manner of adjusting them for playing the old two minute records.

To readjust the gearing of a machine having my speed changing parts applied, the operator should first unscrew the thumb-nut 16, so as to relax the tension between the collar 21 and gear 9, and allow said parts to play idly upon shaft 5. He should next lift the lever 22 from the position shown in Fig. 6, to the position shown in Fig. 2, which will effect the meshing of gear 19 with gear 18. The gear 17 which is keyed to shaft 5 will then drive gear 19, and the latter will drive gear 18, which is mounted rigidly upon the feed shaft 15. The gear 18 being relatively twice the diameter of gear 14, will require double the number of turns of the driving gear 17 to rotate it once, or in other words, to reduce the speed of the feed shaft 14, to correspond with the finer threading of the new four minute records, hereinbefore explained. Thus when thumb-nut 16 is loosened and lever 22 is raised to connect gears 19 and 18 (see Fig. 2) my new train of gears do all the work of feeding the reproducing parts at the reduced speed required, while the old train of gears work idly. On the other hand, when the nut 16 is tightened up, and the lever 22 is shifted to its lower position, to break the mesh between the gears 18 and 19, the old train of gears 9, 10, 12 and 14 become the positive drivers for the feed parts, and operate them at the old or normal rate of speed.

The usual sound box 28 is adjustably mounted on shaft 15, and other well-known reproducing parts as the amber wheel (not shown) and the weight 29 are carried and operated by the shaft 13. The usual stylus support 30 is also shown, and carries a coarse and a fine stylus, as 31 and 32 respectively. The coarse stylus is for operating on the old record 33, while the fine stylus is for the new record 34, and 35 represents a handknob and rod employed for manipulating the styluses.

39 represents a shield for the gear 18 which may be applied in any suitable manner as by screws 40.

In many of the smaller and cheaper grades of graphophones, the driving belt is applied direct to the cylinder 6, as shown at 37, Fig. 1, the pulley 4 is omitted, and the amber shaft 13 and the gear 12 are also omitted. In all such machines, my new train of gears, 17, 18 and 19, and also lever 22, may be employed for reducing the speed of the old mechanism, for adapting the same for playing the four minute records, the same as for the style of machine shown in Figs. 1 to 5 inclusive, and the lever 22 with its arm 25 may be employed for alternately throwing the gears 10 and 19 into and out of mesh with the feed gears 14 and 18, as may be seen by reference to Fig. 6, in which the lowering of the lever 22 disconnects gears 18 and 19 and at the same time engages gears 10 and 14, while the raising of the lever will disconnect the latter and connect the former.

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

1. In a graphophone, the combination with a record and an operating mechanism therefor, and a reproducing stylus and a feed mechanism therefor, the said mechanism comprising a train of gears timed for playing standard "two minute" records, of an auxiliary train of spur gears, one of said gears carried by the record operating shaft and positively driven thereby, the second gear

carried by the feed shaft, and a third gear comprising an idler adapted for operatively connecting the first and second gears for reducing the speed of the feed mechanism for playing a four minute record, and a lever pivotally mounted on said record shaft adapted for shifting said third gear into or out of mesh with said second gear.

2. In a graphophone, the combination with a record and an operating mechanism therefor, and a reproducing stylus and a feed mechanism therefor, the said mechanism comprising a train of gears timed for playing standard "two minute" records, of an auxiliary train of spur gears, one of said gears carried by the record operating shaft and positively driven thereby, the second gear carried by the feed shaft, and a third gear comprising an idler adapted for operatively connecting the first and second gears for reducing the speed of the feed mechanism for playing a four minute record, and a nut carried by the record shaft adapted for adjusting the speed of the reproducing parts for playing either a long or a standard record.

3. A speed changing mechanism for graphophones, comprising an auxiliary train of gears, one of said gears carried by the record operating parts of the machine, a second gear carried by the reproducing parts of the machine, and a third gear, being an idler, adapted for making or breaking the driving connection between said first and second gear, a lever operatively supporting said idler gear, and a nut carried by the record operating parts adapted to coöperate with said lever and said gears for inceasing or decreasing the speed of the machine.

4. A speed changing gearing for graphophones, comprising a pair of spur-gears of unequal size, the smaller of said gears being mounted on the record shaft, the larger of said gears being mounted on the reproducing feed shaft, the relative difference between said gears being sufficient to reduce the normal speed of the machine approximately one-half, thereby to adapt said machine for playing a four minute record, an idler gear to operatively connect said large gear with said small gear, and a lever pivoted to the record shaft capable of making and breaking the connection between said small and said large gear.

5. A speed changing gearing for graphophones, comprising a pair of spur-gears of unequal size, the smaller of said gears being mounted on the record shaft, the larger of said gears being mounted on the reproducing feed shaft, the relative difference between said gears being sufficient to reduce the normal speed of the machine approximately one-half, thereby to adapt said machine for playing a four minute record, an idler gear to operatively connect said large and said small gear, a lever pivoted to the record shaft capable of making and breaking the connection between said small and said large gear, and a thumb-nut carried by said record shaft for adjusting the machine for playing records of different length.

6. In a graphophone, the combination with a record and an operating mechanism therefor, and a reproducing stylus and a feed mechanism therefor, the said mechanisms being normally geared for playing standard two minute records, of a pair of spur-gears of unequal size one carried by said record operating mechanism, the other carried by said feed mechanism, the relative difference in the size of said gears being sufficient to reduce the travel of the stylus approximately one-half, thereby to adapt said machine for playing a four minute record, an idler gear to connect said spur-gears being constantly in mesh with one of said spur-gears, and a hand lever to support said idler gear, the said lever capable of throwing said idler gear into or out of mesh with the second spur-gear.

7. In a graphophone, the combination with a record and an operating mechanism therefor, and a reproducing stylus and a feed mechanism therefor, the said mechanisms being normally geared for playing standard two minute records, of a pair of reducing gears of unequal size, one carried by said record operating mechanism, the other carried by said feed mechanism, the difference in the size of said gears being sufficient to reduce the travel of the feed mechanism approximately one-half, thereby to adapt said machine for playing a four minute record, an idler gear to connect said reducing gears being constantly in mesh with the smaller of said gears, a lever to support said idler gear, the said lever capable of throwing said idler gear into or out of mesh with the larger reducing gear, and a nut carried by the record operating mechanism adapted to control the changing of the speed of the feed mechanism.

8. A graphophone having a shaft adapted for carrying records of different length, and a shaft for carrying and feeding the reproducing parts, and having a train of gears connecting the said shafts, one of said gears mounted loosely on the record shaft, and one of said gears mounted rigidly on the feeding shaft, a pulley for driving said record shaft, a source of power, a belt connecting said source of power with said record pulley, a reduction gearing comprising a small gear keyed to the record shaft and a large gear rigidly secured to the end of the feed shaft, a collar disposed between the gears on said record shaft, a nut mounted on the end of the record shaft adapted for frictionally connecting the first named gear to said record shaft, an idler gear to connect said reduction gears, and a lever to support said idler gear, the said lever ar-

ranged to hold said idler gear constantly in mesh with said small gear, and adapted to make or break the driving connection between said small and said large gear, for changing the speed of the reproducing parts from normal to a lower speed and vice versa.

9. An attachment for reducing the speed of graphophones, comprising a small gear and a large gear operatively connected by an idler gear, the small gear keyed to the record shaft of the machine, the large gear mounted upon the feed shaft of the machine, an operating lever pivoted to the record shaft, the said idler gear mounted upon said lever, the idler gear constantly in mesh with the small gear, and adapted to be connected with and disconnected from the large gear by the raising and lowering of said lever.

10. An attachment for reducing the speed of the reproducing parts of graphophones, comprising a gear mounted on the record shaft, and a second gear mounted on the feed shaft, a lever pivoted to said record shaft, an idler gear mounted on said lever in position to be held constantly in mesh with the gear on the record shaft, and also adapted to mesh with the gear on said feed shaft by the operation of said lever.

11. A graphophone having a record bearing and operating shaft, and a pulley for driving said shaft, and having a train of gears for operating the reproducing parts, one of said gears mounted upon the record shaft, and a second gear carried by a feed shaft, in combination with a motor connected with said pulley, of a reduction gearing comprising a gear keyed to the record shaft, and a gear mounted on the feed shaft, an idler gear to connect said gears when a four minute record is to be played, a lever pivoted to the record shaft, the said lever supporting said idler gear, and adapted for shifting said idler gear into and out of mesh with the gear on said feed shaft, and a nut carried by the record shaft adapted when tightened up to cause the feed shaft to be operated at a fast speed for playing two minute records, and when loosened to permit the said reduction gearing to operate said feed shaft at a slower speed for playing four minute records.

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

FREDERICK F. MURDOCK.

Witnesses:
WM. C. ANDERSON,
HARRY DE WALLACE.