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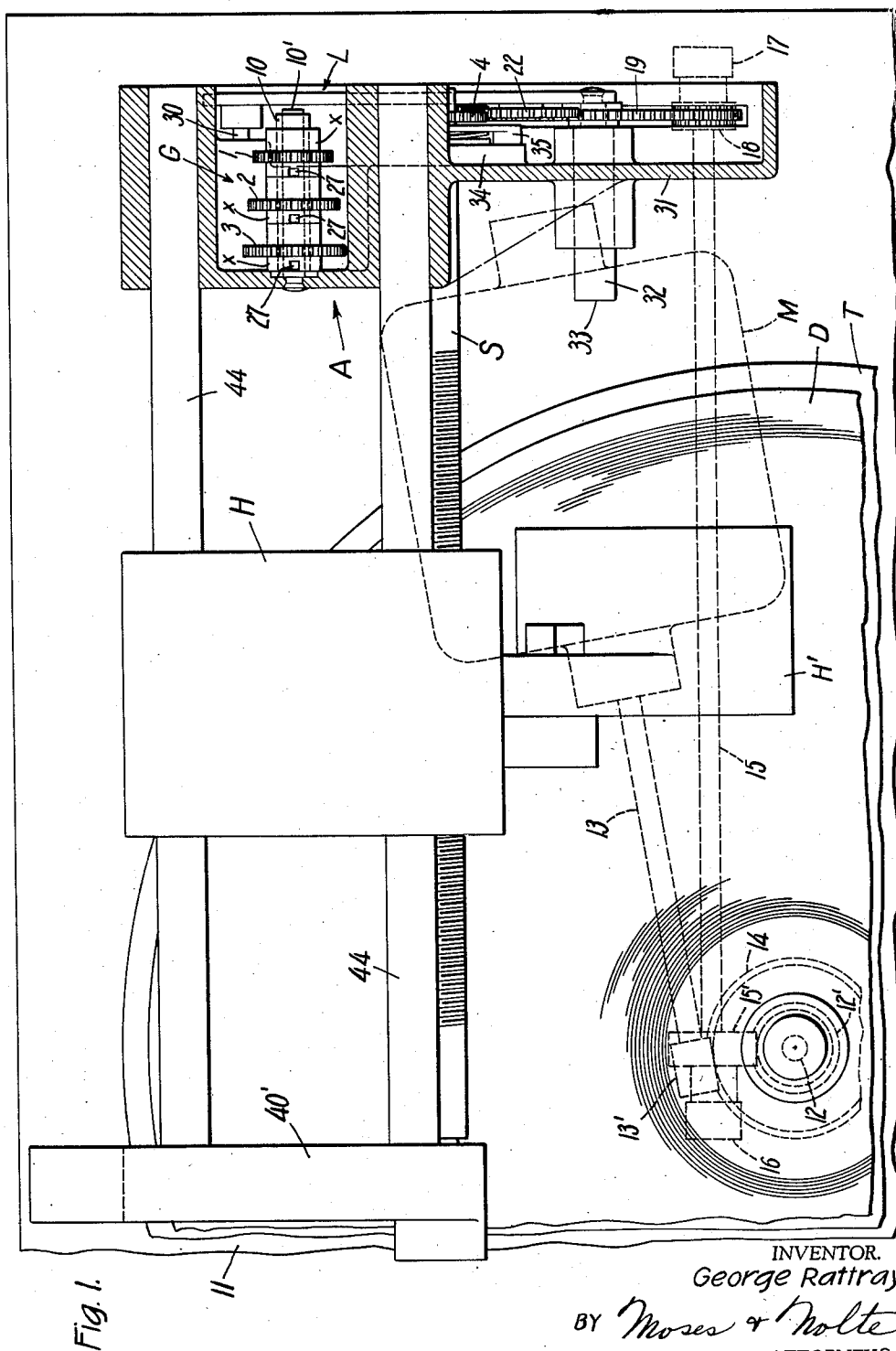
G. RATTRAY

2,174,167

APPARATUS FOR RECORDING AND REPRODUCING SOUND RECORDS

Filed Oct. 30, 1936

3 Sheets-Sheet 1



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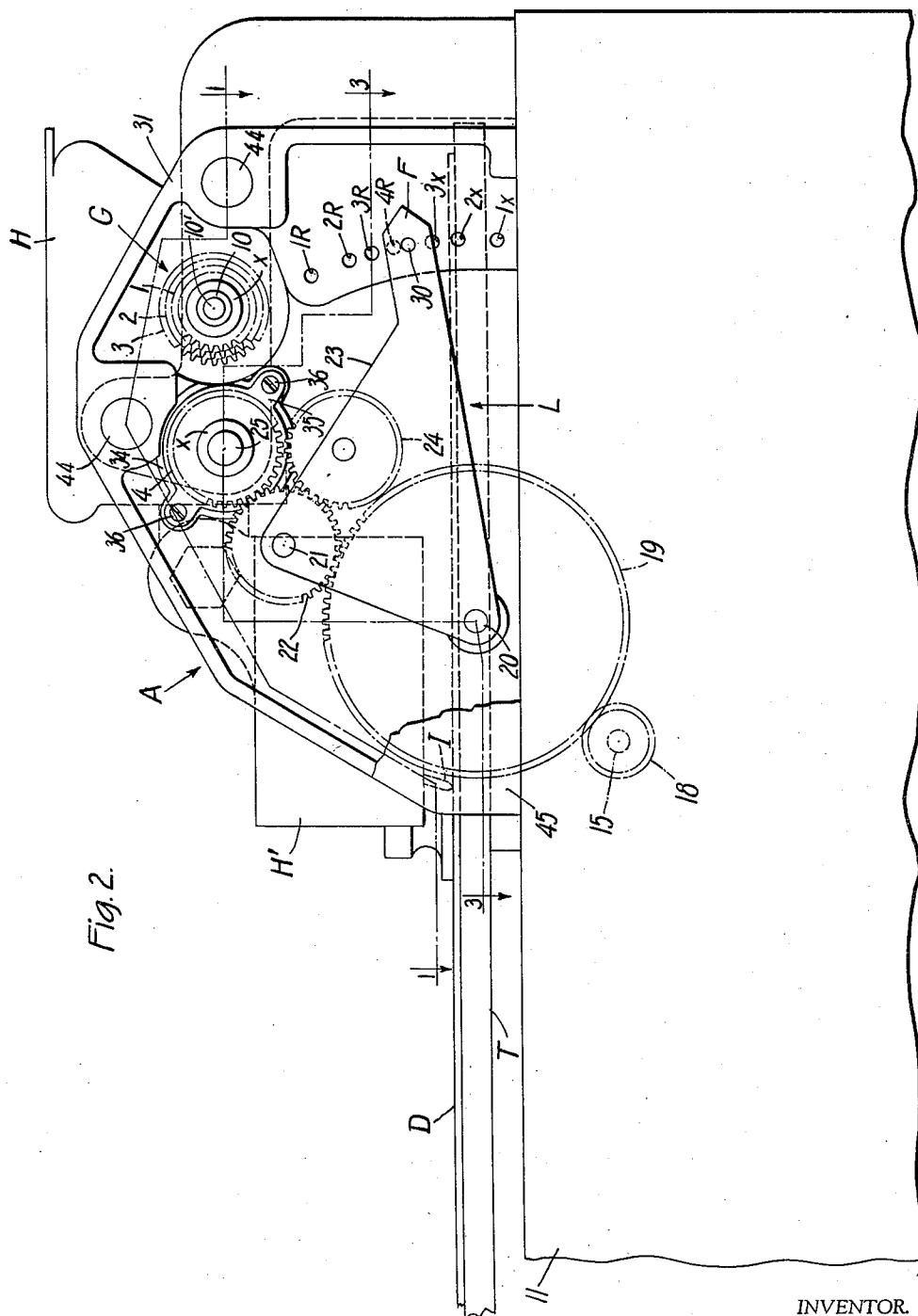
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APPARATUS FOR RECORDING AND REPRODUCING SOUND RECORDS

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3 Sheets-Sheet 2



INVENTOR.
George Rattray
BY *Moses & Nolte*
ATTORNEYS

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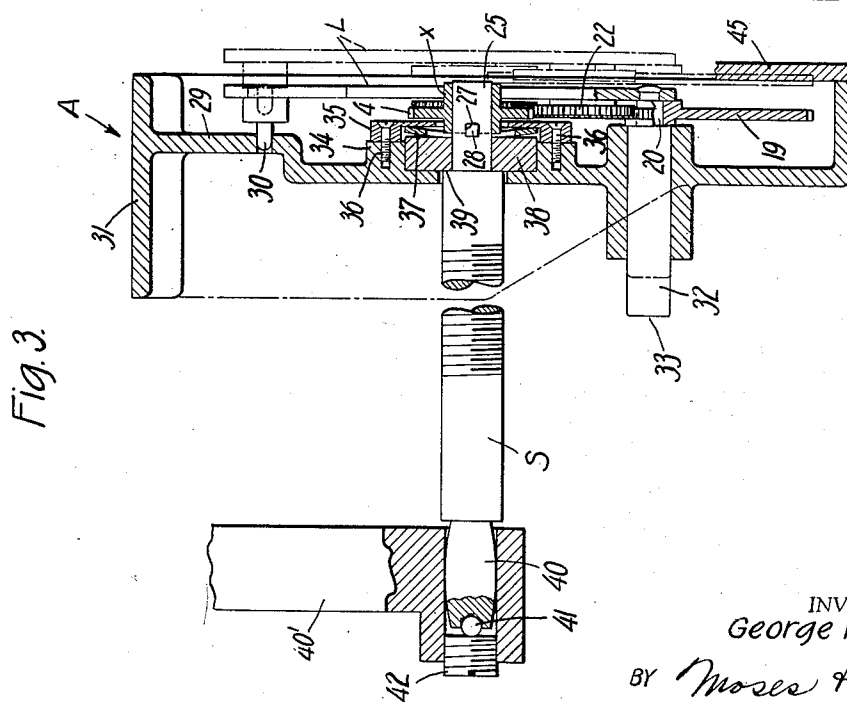
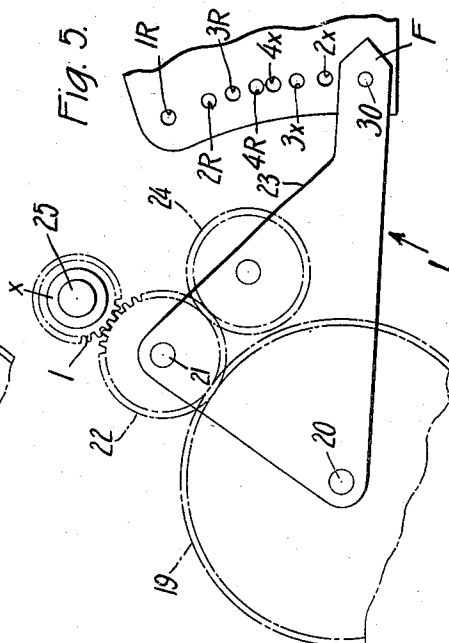
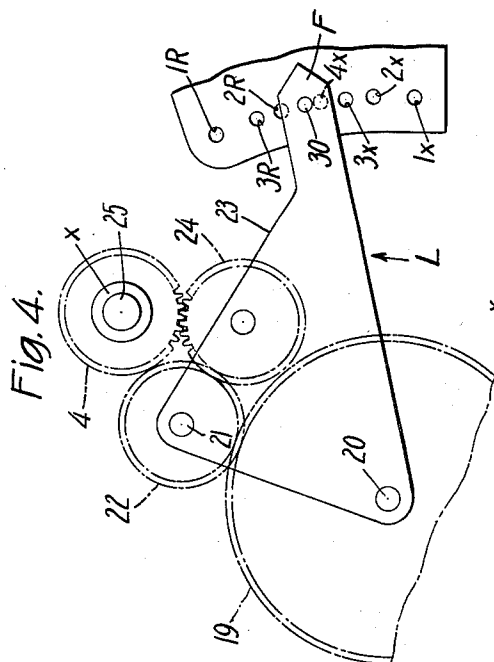
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APPARATUS FOR RECORDING AND REPRODUCING SOUND RECORDS

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3 Sheets-Sheet 3



INVENTOR.
George Rattray
BY *Moses & Nolte*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,174,167

APPARATUS FOR RECORDING AND REPRODUCING SOUND RECORDS

George Rattray, Mineola, N. Y., assignor to Fairchild Aerial Camera Corp., New York, N. Y., a corporation of New York

Application October 30, 1936, Serial No. 108,462

4 Claims. (Cl. 74—325)

This invention relates in general to a phonograph apparatus especially to a portable phonograph apparatus embodying a recorder mechanism, and more particularly to means for changing the spiral cutting pitch of the recorder mechanism, and means to reverse the direction of feed of the stylus.

Apparatus of a portable character, to be satisfactory, must fulfill various requirements, including among others, certain capabilities which will now be stated and which constitute objects of the present invention, viz. (a) the recorder must be capable of recording a wide range of frequencies with optimum fidelity. Such optimum fidelity of recording can be attained best by making available a choice of speeds of operation of the sound record disc member; and, as a corollary, by making available readily a choice of spiral-cutting pitches; and further, by providing for cutting the record at any of the selected pitches, either from the inside of the record to the outside, or from the outside in.

Again, in order to make this provision for pitch-selection desirably useful, it is necessary that the changes in speed ratio and direction shall be capable of accomplishment without the necessity of changing feed screws, and this accordingly is included in the category of objects to be solved by the present invention.

While improvements of the character above-mentioned, and hereinafter described and illustrated are of notable utility when embodied in apparatus of a portable character, it is to be understood that they are intended to be utilized in any department of the field of sound recording and reproduction for which they are adapted by their nature.

In pursuance of the above general objects, it is a more particular object of the present invention to bring the use of the aforesaid more technical improvements within the range of users of a portable recording and reproducing apparatus in such places as high schools, etc., where only average skill and little experience of a technical character may be expected from the available operators.

To this end, the invention provides means for effecting the necessary change of direction of cut (from the inside out and outside in) by the movement of a single easily accessible lever, and for making it possible to make quickly a manual substitution of gears for generating pitches of, say, 90, 110, 130 and 150 lines per inch selectively, and to make provision for thereupon setting the selected gear in mesh, ready for operation, by a

further movement of the aforesaid lever in the same directions as it has been moved for the directional setting which controls the cut.

Another object of the invention is to provide for the co-ordination and consolidation of the above designated speed-changing and direction-controlling instrumentalities within a sealed housing which, when assembled, becomes an integral part of the mounting panel, and which protects the mechanism so enclosed from injury thereto by the casual contacts incidental to the frequent transportation of a portable instrument of such a delicate character, and also protects it from the tampering therewith by unauthorized persons in many of the places where it must, perforce, be left unguarded from time to time.

Other objects and features of the present invention will be made to appear as the description of the particular physical embodiment of the invention selected to illustrate the same progresses.

In the accompanying drawings, like characters of reference have been applied to corresponding parts throughout the several views of the drawings, in which:

Fig. 1 is a plan view, partly in section on the irregular line 1—1 of Fig. 2, of part of a sound recording and reproducing apparatus in the construction of which the present invention has been embodied;

Fig. 2 is a view in side elevation of the same;

Fig. 3 is a fragmentary detail view in vertical section on the irregular line 3—3 of Fig. 2;

Fig. 4 is a fragmentary detail view in elevation of the direction-changing lever in a position adapted to set the parts for feeding the recording head in a direction opposite to that in Fig. 1;

Fig. 5 is a similar view showing said lever in a position adapted to set the parts to feed the recording head in the same direction as in Fig. 1, and at a pitch of 150 lines per inch, the appropriate gear for producing a speed commensurate with that pitch being shown in its operating position.

In a now-preferred embodiment of the invention selected for illustration and description to permit ready and complete understanding of the invention, the part designated by the reference character 11 is the base of a sound recording and reproducing apparatus of a portable character, the base comprising a box-like casing within which is housed the motor M, outlined schematically in dotted lines in Fig. 1, merely by way of indicating what has been found to be a desirable location for it in the general organization of the

apparatus according to the research already mentioned, this portion of the research having eventuated in a co-pending application by the present inventor, Serial No. 108,463 to which reference may be had for a disclosure of various features which have proved of importance in the solution of certain problems attendant upon making a successful recorder of the portable type free from motor-originated vibration.

The motor M is indicated as driving the main arbor 12 of the turntable T through the medium of a worm 13' upon a shaft 13, the worm 13' engaging a worm gear 14 upon the arbor. Spiral gears 12' and 15' are secured respectively to shafts 12 and 15 to drive the shaft 15 which extends from said arbor to the vicinity of the speed change gearing now to be described, the shaft 15 being provided with thrust bearings at each of its ends, in known manner, as at 16 and 17.

A pinion 18 on the shaft 15 meshes with a carrier gear 19 on a stud shaft 20, to be described later in detail, and which serves also as the axis for a control lever L of generally triangular shape, this lever carrying at one of its angles, as 21, a carrier gear 22 which is in constant meshing relationship with the carrier gear 19. At about the mid-point of its side 23 the lever L is provided with another carrier gear 24, which meshes constantly with the gear 22, but never with the gear 19 and is rotated by gear 22 in a reverse direction.

All of the gears thus far mentioned are of fixed and unvarying diameter, and the desired changes of speed are secured by placing a suitable gear of selected size upon the end 25 of the feed screw S of the mechanism that causes traverse of the carrier H bearing the recording head H' for actuation of the instrument I, which in turn operates in contact with the sound record disc member D.

In pursuance of the invention, provision is made of several gears, as those designated 1 to 4, carried on a storage sleeve 10 which in turn is supported on and removable from a fixed rod 10' to give ready access to the gears, this set being designated generally by the reference character G. There may be any desired number of gears in the set, each having a hub x which is adapted to fit upon the end 25 of the feed screw S. At the inner side of each hub x there is a notch 27, adapted to be engaged with a dowel 28 which transfixes the shaft S at a suitable distance from its extremity, this arrangement making it possible to fit the selected gear on the screw-end 25 with the exercise of a minimum of skill, and likewise to effect the substitution therefor from time to time of another selected gear of the set, in accordance with the pitch which it is decided to cut upon the record.

In the instance illustrated, there are four of the change speed gears in the set G, and the gear on the screw end 25 is gear No. 4, i. e., the largest of the four, which is adapted to drive the feed screw S at its slowest speed in direct, viz., at say, 90 lines to the inch, this gear being of a suitable diameter and gear ratio to be engaged with the carrier gear 22, as shown in Fig. 2.

This figure shows also how the lever L is disposed in order to hold the gear 4 in its meshed operative position, it being understood that each of the low holes 4x, 3x, 2x and 1x represents a change in speed ratio progressively toward the highest speed, called first speed, while each of the holes in the upper series, from 4R to 1R, represents a similar change from low speed in re-

verse to high in reverse. The indexing is facilitated by providing an index finger F, or pointer, if there be a scale (not shown), with a stud 30 (see Fig. 4), adapted to enter any selected hole of either series.

The holes are formed in a wall 29 of a housing 31, and the lever L has a limited lateral movement with its stud 26 to permit it to be moved to clear the stud, as shown in dot-and-dash lines in Fig. 3, from any hole in which it may have been entered.

To effect this outward movement of the lever L, the operator has only to place a finger behind the end 33 of an extension 32 of the stud 26, and to press the stud forward, which uncouples the carrier 19 from the pinion 18 at the same time that it clears the stud 30 from whatever index hole it has entered.

Fig. 5 shows the stud entered in the bottom hole of the lower series, this being its position when the smallest gear No. 1 of the series is mounted upon the end 25 of the feed screw S, and the pitch cut is of the order of 150 lines per inch.

The wall 29 is shown as having a central boss 34 of annular form, to which a bezel 35 is secured by screws 36, and within the bezel 35 is confined a dished disc spring 37 which tends constantly to bias the bearing collar 38 rearward against the wall 29, and to bias the feed screw rearward against the end-thrust ball bearing 41.

As already indicated, the feed screw is formed with a semi-spheroidal bearing surface 40 at its other end and a ball 41 held in place by an abutment screw 42, prevents any end shake in that direction. This construction compensates for any disalignment of the shaft bearing in the bracket 40' and housing 31.

As already indicated in the opening part of the specification, all of the parts last described above are enclosed by the housing A, which is desirably made of aluminum, mounted rigidly upon the cross-rods 44, and sealed by a closure plate 45, which extends over its entire front face, and is only removed when it is desired to set the gearing in the manner already described.

It will be readily seen from the foregoing disclosure that the structure described constitutes a sturdy embodiment of the invention and is designed to accomplish the several objects recited at the opening part of the present specification, it being understood that the particular physical embodiment illustratively shown and described does not exhaust the possible embodiments of the idea of means underlying the invention.

I have described what I believe to be the best embodiments of my invention; I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. In a machine of the kind described, the combination with an input rotary member and an output rotary member of a gear fixed on one of said members, a transmitting and reversing gear unit comprising a gear carrier mounted for swinging movement about the axis of the rotary member which carries the fixed gear, a pair of meshing gears carried thereby one in mesh with the fixed gear and the other escaping engagement therewith, said rotary member which does not carry the fixed gear adapted to have affixed upon it gears of various sizes adapted to be engaged selectively by the gears of the transmitting and reversing unit, and detent means cooperative with

the gear carrier and including a plurality of sets of depressions, each set being adapted to detain the carrier in forward or reverse driving position when a particular gear is used.

5 2. In a machine of the kind described, the combination with an input rotary member and an output rotary member of a gear fixed on one of said members, a transmitting and reversing gear unit comprising a gear carrier mounted for swinging movement about the axis of the rotary member which carries the fixed gear, a pair of meshing gears carried thereby one in mesh with the fixed gear and the other escaping engagement therewith, said rotary member which does not carry the fixed gear adapted to have affixed upon it gears of various sizes adapted to be engaged selectively by the gears of the transmitting and reversing unit, and detent means constructed and arranged to hold the carrier selectively in distinct and definite direct and reverse driving positions for each of a plurality of gears of different sizes.

3. In a machine of the kind described in combination, a uniformly operating input rotary member, an output rotary member, a gear fixed on one of said members, a transmitting and reversing gear unit comprising a gear carrier mounted for swinging movement about the axis of the rotary member which carries the fixed gear, a pair of meshing gears carried thereby at opposite sides of the line of centers of the input and output rotary members, one in mesh with the fixed gear and the other escaping engagement therewith, said other rotary member

which does not carry the fixed gear adapted to have affixed upon it gears of various sizes adapted to be engaged selectively by the gears of the transmitting and reversing unit, the carrier supported gears being of equal radii and each having a radius substantially greater than one third of the distance from the periphery of the fixed gear to the axis of said other rotary member, and detent means constructed and arranged to hold the carrier selectively in distinct and definite direct and reverse driving positions for each of a plurality of gears of different sizes.

4. In a machine of the kind described, the combination with an input rotary member and a gear driven output rotary member, of a gear fixed on one of said members, said rotary member which does not carry the fixed gear adapted to have affixed upon it gears of various sizes, and a transmitting reversing gear unit comprising a gear carrier mounted for swinging movement about the axis of the rotary member which carries the fixed gear, and gearing mounted on the carrier and disposed between the fixed gear and the driven rotary member for operatively interposing, at will, a driving train composed either of an even number of gears or of an odd number of gears, between the fixed gear on one rotary member and the selected gear on the other rotary member, and detent means constructed and arranged to hold the carrier selectively in distinct and definite direct and reverse driving positions for each of a plurality of gears of different sizes.

GEORGE RATTRAY.