





# UNITED STATES PATENT OFFICE.

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## GUITAR.

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*To all whom it may concern:*

Be it known that I, EDWIN J. CUBLEY, a citizen of the United States, residing at Ravenswood, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Guitars, of which the following is a specification.

My invention relates to tuning or string-adjusting devices adapted for service in guitars and mandolins and comprising string-winding spindles and rotary pegs or keys connected up in pairs by means of worm-gears.

The principal objects of my invention are to provide a simple, durable, and efficient arrangement of string-winding spindles, rotary keys, and bearings therefor; to so inclose the worm-gears within boxes or bearings that all danger of their becoming loose by reason of wear shall be avoided; to reduce the cost of the manufacture of boxes or bearings adapted to inclose and conceal the worm-gears; to adapt the parts of a sectional box or bearing to be practically locked together and held in rigid connection by the application of the string-winding spindles and rotary key-stems to bearings with which the box is provided; to adapt the box to be applied in a ready and economical manner to the neck of the instrument, and to provide certain novel and improved details, as will hereinafter appear.

My improvement may be applied to mandolins, but is more particularly designed for guitars. The string-winding spindles, in place of being arranged parallel with the face or front side of the instrument-neck, as is usual in guitars, project from the face of the neck, while the rotary pegs or key-stems which are worm-gearred to the string-winding spindles lie in a plane parallel with the face of the neck, which disposition of stems and spindles generally considered has heretofore been proposed, but, so far as I am aware of, never practically adopted in violins, it being a well-known fact that violin-players object to the presence of gears and any metal whatsoever in the tuning portion of a violin, upon the ground that such devices and material are detrimental to the sound of the instrument.

A feature of my invention consists in arranging the worm-gears within boxes which are set into the back of the neck, and boring

through the solid wood face portion of the neck, so as to provide cylindric bearings, through which the string-winding spindles may extend.

A further feature consists in the particular construction of the box or bearing whereby various objects heretofore stated are attained.

The foregoing and other features of construction will be more readily understood by reference to the accompanying drawings, in which—

Figure 1 represents in perspective the outer-end portion of a guitar-neck in an inverted position, with one of the spindle boxes or bearings removed, so as to illustrate a recess which is formed in the back or under side of the neck for the reception of such box or bearing. Fig. 2 is a cross-section through Fig. 1, but shows the neck right side up, the section being taken on a plane at one side of one of the string-winding spindles, so as to illustrate the worm-wheel thereon. Fig. 3 is a top plan of one of the spindle boxes or bearings detached from the neck, a portion of said box or bearing being broken away for convenience of illustration. Fig. 4 represents in perspective the two plates or sections which are herein employed for forming the spindle box or bearing.

In said drawings, A indicates the outer-end portion of a guitar-neck, and *a* the under side thereof, it being again noted that in Fig. 1 said under side of the neck is shown uppermost, for convenience of illustration. The rotary pins or spindles B, upon which the strings are wound in tuning the instrument, project upwardly from the face or top side *a'* of the neck, and are arranged perpendicular thereto, as illustrated in Fig. 2, wherein one of the string-winding spindles is shown. These string-winding spindles are operated by worm-gears arranged within recesses that are formed in the back or under side of the neck, and to permit the string-winding spindles to extend from the worm-gears to and through the face of the neck, the latter is simply bored to provide cylindric bearings for said spindles.

The pegs or keys C, for operating the string-winding spindles, are formed with spindles or stems *c*, which are connected with the string-winding spindles by worm-gears, con-



sisting of worm - wheels  $b$ , rigid with the string-winding spindles, and worms  $c'$  upon the rotary key-stems  $c$ . The key-stems  $c$  are arranged at right angles to the string-winding spindles and extend from the side edges of the neck, it being observed that the keys are divided into two sets, which respectively project from opposite side edges of the neck. The worm-gears are therefore divided into two sets, and for each set I provide a separate box or bearing which incloses the set of worm-gears to which it is allotted, and which also provides bearings for the stems and spindles belonging to such set.

Each box or bearing is divided longitudinally into two sections, respectively, consisting of flanged or angle plates  $D$  and  $E$ , as best illustrated in Fig. 4. The plate  $D$  is made angular in cross-section, and hence is bent to provide the two oblong flat portions  $d$  and  $d'$ , which are at right angles to one another. The plate  $E$  is formed similar to the plate  $D$ , and hence comprises the two flat oblong portions  $e$  and  $e'$ , arranged at right angles to one another, it being, however, observed that the angle-plate  $E$  is made somewhat smaller than the plate  $D$ , so that when the two are placed together the angle-plate  $E$  can be received within a recess in the neck, and when so disposed of be covered and concealed by the plate  $D$ .

The angle-plate  $D$  is provided with two sets of cylindric apertures, which respectively provide bearings for the rotary key-stems and the lower or inner ends of the string-winding spindles, and to such end the wider portion  $d$  of said angle-plate is provided with bearings  $d^2$ , which receive the short end portions of the string-winding spindles that are below the worm-wheels thereon, and the narrower portion  $d'$  of said plate is provided with bearings  $d^3$ , through which the rotary key-stems  $c$  extend. The wider portion  $e$  of the angle-plate  $E$  is provided with bearings  $e^2$ , through which the stem-winding spindles extend upwardly from their respective worm-wheels, and the narrower portion  $e'$  of said angle-plate is provided with bearings  $e^3$ , in which the inner ends of the rotary key-stems are received. The angle-plate is also provided with screw-holes  $d^4$  for such screws as may be employed for securing it to the neck. When a couple of these plates  $D$  and  $E$  are fitted together, as best illustrated in Fig. 2, the angles of the two plates will be diagonally opposite one another, so as to provide a long two-part box or case, which is rectangular in cross-section, and which is adapted to receive a set of worm-gears. The angle-plate  $E$  may be said to fit within the angle-plate  $D$ —that is to say, the longitudinal edge of the portion  $e$  of plate  $E$  fits against the inner side of the flange or portion  $d'$  of plate  $D$ , and the longitudinal edge of the flange or portion  $e'$  of plate  $E$  fits against the inner side of the wider flange or portion  $d$  of plate  $D$ .

The guitar-neck is provided with a couple of recesses  $a^2$ , which are formed in its under side along the side edges thereof, which said recesses are adapted to receive the angle-plates  $E$ . Holes  $a^3$  are also bored through the face or upper side of the neck, so as to open into the recesses  $a^2$ , and thereby provide bearings through which such portions of the string-winding spindles as are above the two-part spindle boxes or bearings may extend. When the several parts are in place, to provide for each set of worm-gears, a two-part box inclosing a set of worm-gears and provided with four lines of apertures or bearings for the rotary stems and spindles, the two parts of the box will be locked together simply by the said stems and spindles, since each of the four sides  $d$ ,  $d'$ ,  $e$ , and  $e'$  of the two-part box will be provided with a line of holes or bearings engaged in the manner shown by key-stems and string-winding spindles, whereof the string-winding spindles are set and held at right angles to the key-stems, and hence are arranged to extend through the vertical sides  $d'$  of the boxes, which are parallel with and which constitute portions of the side edges of the neck. The angle-plate  $E$  is so proportioned with reference to the length of worm-wheel employed that the opposite flat ends of the worm-wheels, which are confined between the top and bottom sides  $e$  and  $d$  of the two-part box, will bear closely against the inner faces of said sides, in which way the worm-wheel spindles, which are also the string-winding spindles, will at all times be held perfectly steady, and hence all wobbling of the worm-wheels be avoided. The greatest diameter of each worm is also desirably such that it will likewise bear against the inner faces of said top and bottom sides of the box, in which way the worm will be effectively steadied and held against any irregular movement. This feature of causing the worm-gears to work steady and true regardless of time and wear is a most important one, since any looseness in the working of the worm-gears in a guitar becomes a source of great annoyance.

The key-stems are provided with shoulders  $c^2$ , which fit against the inner face of the vertical side  $d'$  of the box, and with shoulders  $c^3$ , which fit against the inner face of the vertical side  $e'$  of the box, so that end movement on the part of the spindles is avoided. The flange portions of the outer angle-plate  $D$  extend somewhat beyond the smaller angle-plate  $E$  and are secured to the side edges and back of the guitar-neck by screws, thereby holding the two-part box, as a whole, firmly and in rigid connection with the guitar-neck, and also covering up all traces of the recesses  $a^2$  therein.

The angle or flange plates  $D$  and  $E$  can obviously be made in a most economical way, since to form each angle-plate it will only be necessary to bend an oblong plate along a line coincident with its length and to punch a cer-



tain number of holes therein, the punching operation being either prior to or during or after the bending of the plate, but preferably before the bending operation.

5 What I claim as my invention is—

1. In a guitar or similar instrument, the combination, with the neck provided with the recesses  $a^2$ , which are formed in its back at points along the side edges of the neck, and  
10 holes  $a^3$ , bored through the wooden face of the neck, so as to open into said recesses, of four-sided metal boxes fitted within the recesses  $a^2$ , string-winding spindles projecting upwardly from the face of the neck and ex-  
15 tending through the holes  $a^3$  into the boxes, worm-wheels confined within the boxes and fixed upon the string-winding spindles, and rotary key-stems extending through the sides of the boxes, which constitute portions of the  
20 side edges of the neck and provided with worms which engage said worm-wheels, substantially as described.

2. The combination, with a recessed neck,

of a couple of boxes set into the recessed neck and inclosing worm-gears by which the string- 25 winding spindles and rotary key-stems are connected up in pairs, the depth of each box being substantially equal to the length of a worm-wheel, so as to provide opposite bearing-surfaces against which opposite ends of 30 the worm-wheel bear, substantially as and for the purpose set forth.

3. The combination, with a recessed neck, of a box set into the neck and inclosing worm-gears by which string-winding spindles and 35 rotary key-stems are connected up in pairs, said box being formed by a couple of angle-plates D and E, provided with bearings for the string-winding spindles and rotary key-stems and fitted together, substantially as and 40 for the purpose described.

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Witnesses:

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WM. E. MILES.