

Oct. 7, 1941.

N. B. ABRAMS ET AL

2,257,995

MUSICAL INSTRUMENT

Filed Oct. 21, 1940

2 Sheets-Sheet 1

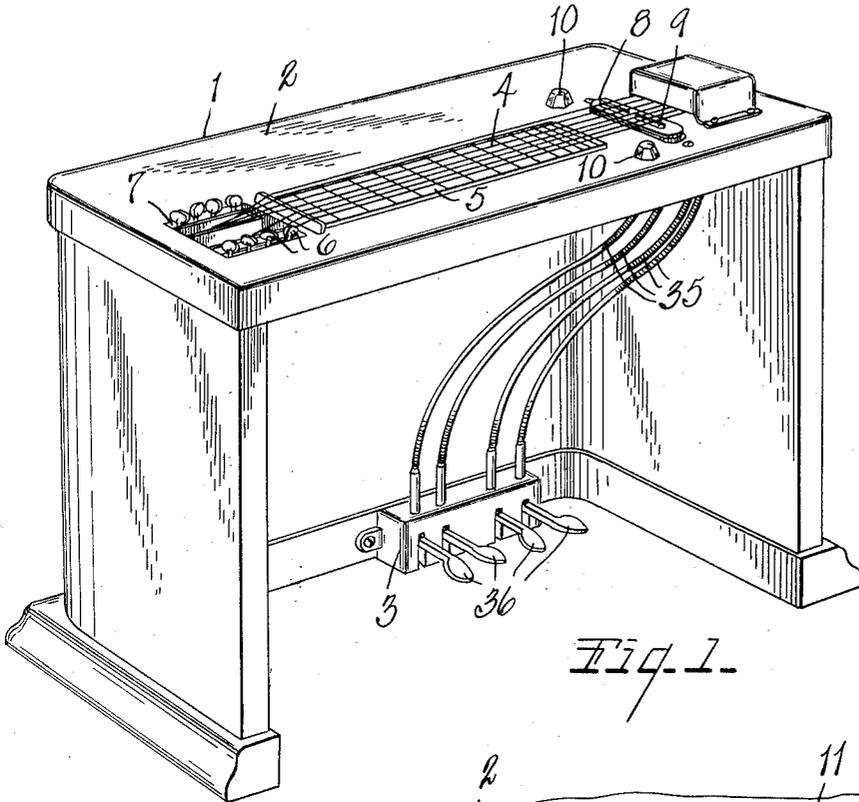


Fig. 1.

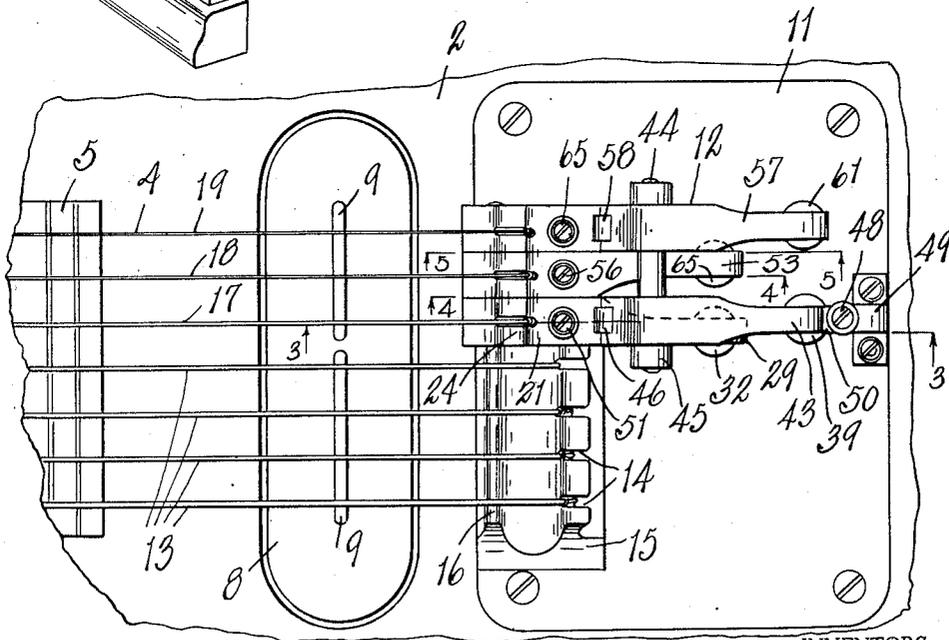


Fig. 2.

INVENTORS.
Neil B. Abrams
William J. Mills
BY *Carl & Chappell*
ATTORNEYS

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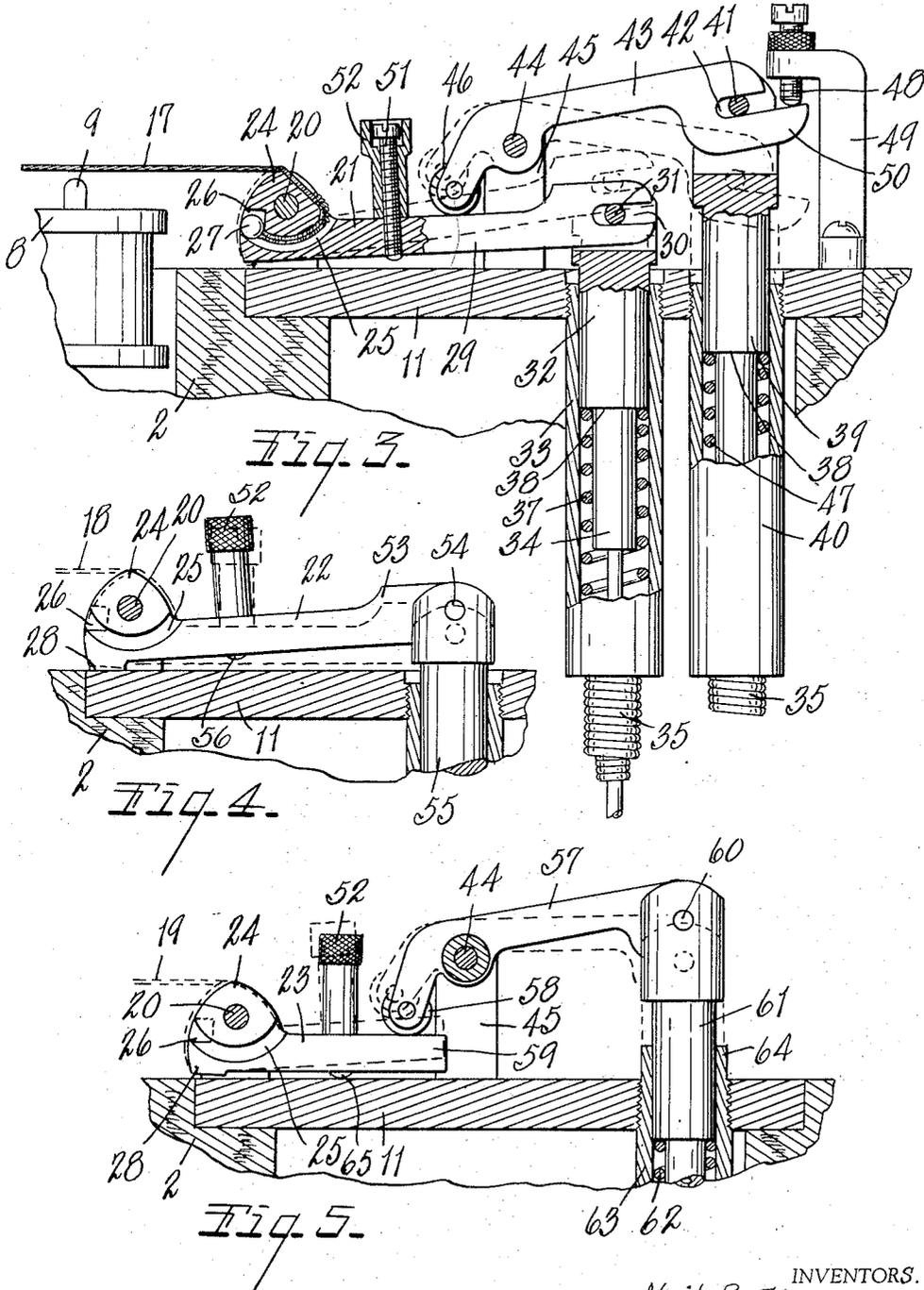
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2 Sheets-Sheet 2



BY

INVENTORS.
Neil B. Abrams
William J. Mills
Earl D. Chappell
ATTORNEYS

UNITED STATES PATENT OFFICE

2,257,995

MUSICAL INSTRUMENT

Neil B. Abrams and William J. Mills, Kalamazoo, Mich., assignors to Gibson, Inc., Kalamazoo, Mich.

Application October 21, 1940, Serial No. 361,988

13 Claims. (Cl. 84-312)

This invention relates to improvements in musical instruments.

The main objects of this invention are:

First, to provide a stringed musical instrument having provision for altering the tension of one or more of the strings during playing thereof in a novel and improved manner to enable the pitch or tone of certain of the strings to be altered at will and thereby permit the playing of numerous types of chords making chord progressions complete without objectionably increasing the number of strings.

Second, to provide an instrument of the type described for altering the tone of certain of the strings a predetermined degree by increasing or decreasing the tension thereof so as to raise or lower the tones and wherein the altered tuning of the strings thus affected is instantaneously and accurately effected and accurately maintained as long as desired.

Third, to provide a musical instrument having associated therewith an automatic tone changing device for certain of the strings operable while the instrument is being played and wherein the altered tunings of the notes produced are maintained effectively so long as the device is operative.

Fourth, to provide a stringed musical instrument adapted to be played manually having an improved pedal controlled automatic tuning device associated therewith for altering the tune of certain of the strings a predetermined precise amount.

Fifth, to provide an instrument of the type described having the foregoing pitch changing device associated therewith, the said instrument and device being built into a console or cabinet to provide a highly attractive and readily played instrument.

Further objects relating to details and economies of our invention will appear from the description to follow. The invention is defined in the claims.

A preferred embodiment of the features of our invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a rear perspective view illustrating a console type stringed instrument embodying our invention adapted to be manually played and having pedal provision for controlling the pitch or tone changing device associated therewith.

Fig. 2 is an enlarged fragmentary top plan view of the instrument of Fig. 1 with the automatic tuning housing associated therewith removed in order to illustrate the construction and arrange-

ment of the automatic tuning device of the instrument.

Figs. 3, 4, and 5 are enlarged fragmentary views partially broken away and in section on lines 3-3, 4-4, and 5-5, respectively, of Fig. 2, illustrating the several elements of the pitch changing or tuning device coacting with certain of the strings of the instrument to alter the pitch thereof during playing.

The present invention relates to improvements in stringed musical instruments, particularly of the guitar type, and more particularly to an automatic tuning instrumentality thereof which is pedal operated by the performer during playing of the instrument to enable the tone or pitch of certain of the strings of the instrument to be altered by altering the tension of those strings. This enables the playing of a wide range of chords without the necessity of manually altering the tuning of the instrument by the usual tuning posts or keys. Furthermore, the invention concerns the provision of such an automatically tunable instrument mounted in console style with readily operable pedal means for effecting the desired tuning during playing which console conceals the lower part of the operator's body, the strings of the instrument being disposed across the top of the console for ready manipulation by the performer in playing.

Referring to the drawings, in Fig. 1 we indicate the console or cabinet for the musical instrument of our invention by the reference numeral 1, this console being enclosed on its front and sides and having a top 2 upon which the vibrating strings of the instrument are mounted. The rear of the console is open to receive the feet of the performer in operating the pedal control 3, the function of which will be hereinafter referred to, and it will be perceived that I have provided an instrument mounting which is highly attractive in appearance and which enables the playing of the instrument with the utmost ease.

The strings for the instrument, generally designated 4, are disposed longitudinally across a suitable fretted surface 5 on the console top and are tunably secured at one end to the post or keys 6. These posts or keys and the coacting parts thereof are mounted in a suitable recess 7 in the top surface of the console and are manipulated in the usual manner to initially tune the instrument.

The reference numeral 8 designates a suitable electromagnet pickup having pole pieces 9 disposed beneath the strings for electromagnetic reproduction of the tones produced thereby in vibrating, the pickup being controlled by the vol-

ume and tone control members 10. The construction and operation of the aforesaid electromagnetic means do not constitute part of the present invention, hence are not illustrated in further detail.

Immediately adjacent the pickup 8 and on the side thereof opposite the fret surface 5, table 2 has set into the upper surface thereof and secured thereto as by screws a base plate 11 for the automatic tuning device, which is indicated in general by the reference numeral 12. Details of this device are illustrated with particularity in Figs. 2, 3, 4, and 5.

Referring to Fig. 2, it will be noted that a group of four of the strings of the instrument, designated 13, have the ends thereof anchored in forks or slots 14 in a suitable tailpiece bar 15 secured to or integral with base plate 11, these strings 13 passing over an upstanding bridge 16 integral with said base. The tuning device 12 of our invention is not operative on these four strings, which are tuned solely by manipulation of the tuning posts 6 in a conventional manner. The other three strings 17, 18, and 19, in addition to being initially tuned by the tuning posts 6, are connected to the automatic device 12 in order to enable the tone or pitch of any one thereof to be altered in playing in the manner to be described. Thus, in the embodiment illustrated, string 17 may be manipulated during playing to increase or decrease its tension and thereby pitch the same a half tone above or below its initially tuned tone; string 18 may be manipulated by the performer to increase its pitch a full tone above initial tuning; and string 19 may be manipulated to decrease its pitch a full tone lower than the initial tuning. This enables the playing of a wide variety of chords without unduly or objectionably increasing the number of strings and resultant complexity of playing. Suitable operating connections to pedal control 3 are provided to effect the foregoing string tension alterations so that the range of the instrument is rendered indeed wide and the playing thereof facilitated.

Referring to Fig. 3, wherein the tuning elements for string 17 are illustrated, the reference numeral 20 denotes a fixed transverse pin preferably secured to the anchoring bar 15, on which pin the respective tuning levers 21, 22, 23 for strings 17, 18, 19 are pivoted. Each of these levers has an upwardly extending bridge nose 24 over which the string is disposed and is provided with a laterally opening arcuate recess 25 on the side thereof having an enlargement 26 at its end adjacent the forward extremity of the lever to receive the string and an anchoring element 27 at its end. Thus, it will be perceived that each of the noses 24 serves as a bridge over which its respective string is snubbed, and that when the lever 21, 22, 23 are rocked in one direction or another the tension of the respective strings is instantaneously altered. It should be noted in particular that this tension altering action is transmitted directly to the strings 17, 18, 19, which do not rest on any further fixed bridge member of any sort likely to interfere with or otherwise affect the accuracy and speed of the string tensioning action.

As illustrated in Figs. 4 and 5, each of the levers 22, 23 has a downwardly extending abutment 28 engageable with base 11 to limit the counterclockwise movement of the lever under the tension of the string associated therewith. This may be omitted in the case of the lever 21

shown in Fig. 3, or alternatively, an abutment of less thickness employed, for the reason that, as pointed out above, string 17 is intended to have the tension thereof either increased or diminished, hence lever 21 must be free to rock from the initial position thereof corresponding to the normally tuned tension of string 17 in either clockwise or counterclockwise direction under the influence of the tension controlling instrumentalities to be described. In any event, however, lever 21 will engage the base to limit its counterclockwise movement to the amount requisite to alter the tension of string 17 by loosening the same.

Referring to Fig. 3, the lever 21 has a rearwardly extending elongated arm 29 having a laterally extending horizontal slot 30 at its rear extremity. This slot is slidably engageable with a pin 31 which is fixed to and extends transversely of the forked head of a vertically extending lever actuating plunger 32. Plunger 32 is mounted for vertical sliding movement in a hollow guide tube or sleeve 33 secured to and extending beneath base plate 11, the plunger having secured thereto the actuating element 34 of a flexible cable 35 which is connected to one of the pedals 36 of the pedal control 3. A coil compression spring 37 disposed in the sleeve in surrounding relation to the plunger abuts at one end an enlarged shoulder 38 on the latter and at the other end the annular end wall in the sleeve, thereby serving to urge the plunger upwardly and rock lever 21 in counterclockwise direction.

The lever rocking tendency of plunger 32 is counteracted and balanced in the normal tuned condition of string 17 by means of a further similar plunger 39 mounted directly to the rear of plunger 32 in a sleeve 40 which is similar to sleeve 33 and similarly mounted on the base plate 11. Plunger 39 has a forked head provided with a pin 41 engageable in a slot 42 at the rear end of a rocker arm 43, which arm is pivoted on a fixed pin 44 carried by a pair of rearwardly disposed vertical posts 45 on the base plate, see Figs. 2 and 3. At its forward end rocker arm 43 carries a roller 46 having rolling engagement with the rearwardly extending arm 29 of lever 21. Sleeve 40, like sleeve 33, has a coil spring 47 therein normally urging the plunger 39 upwardly and the latter is likewise connected to a pedal-controlled flexible cable 35 in the same manner as described above.

By the foregoing provisions, it will be appreciated that spring 47 serves to urge plunger 39 upwardly and rock arm 43 counterclockwise, whereby the roller 46 thereon biases lever 21 in a clockwise direction and thereby counteracts and balances the effect of plunger 32 to urge the same in counterclockwise direction. These two instrumentalities acting on lever 21 serve to balance and maintain the latter in the normal neutral position thereof when string 17 is in initially tuned condition as described above.

A stop screw 48 threadedly engaged with a rear post 49 on the base plate is engageable with a rear extension 50 on pivoted arm 43 to adjustably limit the counterclockwise rocking thereof and the extent to which the rocker shifts lever 21 in clockwise direction, while a further screw 51 threadedly engaged with lever arm 29 and provided with concealing stop sleeve 52 is utilized to limit the clockwise rotation of lever 21 by engaging the base plate 11.

In the above we have provided a balanced adjustable bridge at 24 for the string 17, the

string being snubbed around the bridge and anchored at 26 and the spring urged plungers 32, 39 normally acting oppositely on the bridge carrying lever 21 to maintain the proper tuned tension on the aforesaid string. Either of the plungers 32, 39 is retractable downwardly by the manipulation of an appropriate pedal 36 to either increase or diminish the tension of spring 17 and thereby raise or lower the pitch thereof one-half tone and enable the playing of numerous chords as desired.

In Fig. 4 we illustrate the string tensioning elements for the second automatically tunable string 18 which is trained over the bridge nose 24 of lever 22 and anchored as described. Lever 22 has a rearwardly extending arm 53 pivoted by a slot therein on a pin 54 carried by the forked head of plunger 55, this plunger being spring urged upwardly in identical fashion to that described above in connection with the plungers 32, 39, and being likewise pedal controlled in a similar manner. In this case the maximum counterclockwise string loosening movement of lever 22 is determined by the engagement of the foot or abutment 28 with base plate 11, it being understood that the lever 22 and nose 24 thereon are in this last named position (illustrated in solid lines in Fig. 4) when the string 18 is in its normally tuned position. Actuation of plunger 55 serves to rock the lever to dotted line position and increase the tension and pitch of string 18 a full tone above its normally tuned pitch for the selective increase in the range of the instrument described. A suitable adjustment stop 56 is carried by lever 22 to determine the extent of clockwise rotation.

In Fig. 5 we illustrate provisions for automatically changing the pitch of the third controllable string 19, consisting of a rocker arm 57 pivoted on the above described pivot pin 44 carried by posts 45 and provided at its forward end with a roller 58 engageable with the rear end 59 of lever 23. At its own rear end the arm 57 is pivoted on a pin 60 carried by the forked head of a pedal-controlled plunger 61 similar to plungers 32, 39 and 55, this plunger being mounted similarly for spring biasing upwardly by a spring 62 in the sleeve 63. In this case the sleeve has an extension 64 projecting above the base plate to limit the downward movement of the plunger head. Obviously, spring 62 serves under normal conditions to maintain pivoted arm 57 and lever 23 in the position illustrated in dotted lines in Fig. 5 and thereby maintain string 19 in its normal tuned tension, while in the pedal-controlled downwardly actuated position of the plunger 61 the parts are shifted to the position illustrated in dotted lines to decrease the string tension and lower the pitch of the string 19 a full tone. The stop 65 on lever 23 limits the clockwise rotation thereof and the counterclockwise rotation is limited by foot or abutment 28 in the manner described above.

From the foregoing it is believed that the manner of manipulation of the foregoing string tension controlling instrumentalities by the performer in playing the instrument will be obvious. By suitably controlling the pedals 36, it is possible to raise or lower the pitch of string 17 a half tone, to raise the pitch of string 18 a full tone, or to lower the pitch of string 19 a full tone. These manipulations vastly increase the range of the instrument and enable the playing of a great number of chords without, however, increasing the number of strings.

We desire in particular to point out that by snubbing the strings 17, 18, 19 about the nose 24 of the respective levers 21, 22, 23 and employing the said nose as a bridge, dispensing with the conventional bridges heretofore provided and relied on in all comparable tuning devices of which we are aware, we enable any one of the said strings to be immediately and accurately altered in pitch as described. The presence of the usual stationary bridge in association with a string tensioning mechanism greatly detracts from its effectiveness by rendering non-uniform the tension of the string between the said bridge and the conventional tuning keys and automatic instrumentality, respectively. With such instruments it is simply impossible to effect the instantaneous automatic alteration of the pitch of the string with accuracy. The pitch shifts unavoidably and unpredictably following the pitch altering manipulation thereof. However, with our device this objection is not present and the strings 17, 18, 19 are instantaneously tensioned uniformly throughout the full length and without sliding on a bridge to the exact and proper degree for the desired altered tone, being otherwise maintained in the precise initially tuned pitch determined by the setting of the tuning keys 6.

The provisions which we have described above are admirably adapted for incorporation in the console type instrument illustrated in Fig. 1, wherein the manipulations of the performer's feet in controlling pedals 36 are concealed from the audience and a highly attractive effect is obtained.

We have illustrated and described our improvements in an embodiment which we have found highly satisfactory and practical. We have not attempted to illustrate or describe other embodiments which we contemplate as we believe this disclosure will enable the embodiment of our invention by those skilled in the art as may be desired.

Having thus described the invention what is claimed as new and desired to secure by Letters Patent is:

1. A pitch changing device for a musical instrument having a plurality of strings adjustably tensioned for tuning by keys at one end thereof, said device comprising a support having a fixed bridge thereon for anchoring the other end of certain of the strings, a plurality of levers, one for each remaining string, pivotally mounted on said support at one side of said bridge, each of said levers having an upwardly extending bridge nose, a rearwardly extending string snubbing surface adjoining the nose about which the string associated therewith is disposed, and means for receiving and anchoring the adjacent end of the string whereby pivotal movement of any of said levers rocks the nose and alters the tension of the corresponding string, said noses alone supporting and tensioning the respective strings throughout the entire effective length thereof up to said keys, a plurality of plungers mounted on said support for vertical sliding movement and operatively connected with said levers, and pedal operated means associated with the plungers for actuating the same.

2. A pitch changing device for a musical instrument having a plurality of strings fixedly secured at one end thereof, said device comprising a support, a plurality of levers, one for each string, pivotally mounted on said support, each of said levers having an upwardly extending

bridge nose, a rearwardly extending string snubbing surface adjoining the nose about which the string associated therewith is disposed, and means for receiving and anchoring the adjacent end of the string whereby pivotal movement of any of said levers rocks the nose and alters the tension of the corresponding string, said noses alone supporting and tensioning the respective strings throughout the entire effective length thereof up to said keys, a plurality of plungers mounted on said support for vertical sliding movement and operatively connected with said levers, and pedal operated means associated with the plungers for actuating the same.

3. A pitch changing device for a musical instrument having a plurality of strings fixedly secured at one end thereof, said device comprising a support, a plurality of levers, one for each string, pivotally mounted on said support, each of said levers having an upwardly extending bridge nose, a rearwardly extending string snubbing surface adjoining the nose about which the string associated therewith is disposed, and means for receiving and anchoring the adjacent end of the string whereby pivotal movement of any of said levers rocks the nose and alters the tension of the corresponding string, said noses alone supporting and tensioning the respective strings throughout the entire effective length thereof up to said securing means and having stop elements on the bottom thereof engageable with the support to limit movement of the levers under the tension of the string secured thereto, and means for pivotally actuating said levers during playing of the instrument.

4. A pitch changing device for a stringed musical instrument comprising a plurality of strings provided with tuning keys at one end thereof, said device comprising a fixed bridge element for certain of said strings, a bridge element for each of a plurality of other strings pivotally mounted on said support, said pivoted bridge elements being provided with eccentrically disposed nose-like string rests over which the strings are disposed, the strings being anchored to their respective pivotally mounted bridge elements so that tension of such strings is varied with pivotal movement of the bridge elements, said bridge elements being provided with laterally projecting arms, adjustable strops for said arms, manually operable means including foot levers for actuating said arms in one direction, and stop elements on the forward edge of certain of said string rests engageable with said support to limit movement of the bridge element under the tension of the string.

5. A tune changing device for a musical instrument having a plurality of strings connected to anchoring means at one end thereof, said device comprising a support having a fixed bridge thereon for supporting and anchoring the other end of the strings, a plurality of levers, one for each remaining string, pivotally mounted on said support, each of said levers having an upwardly extending bridge member over which the corresponding string is disposed, means on the levers for receiving and anchoring the adjacent end of said string whereby pivotal movement of any of said levers rocks the bridge member and alters the tension of the corresponding string, said members alone supporting the respective strings throughout the entire effective length thereof up to said first named anchoring means, certain of said members having stop elements on the bottom thereof engageable with said support to limit

movement thereof under the tension of the respective strings, spring means associated with the levers for normally urging the same in one direction, and pedal operated means operatively connected with the levers for actuating the same in the opposite direction during playing of the instrument.

6. A tune changing device for a musical instrument having a plurality of strings connected to anchoring means at one end thereof, said device comprising a support having a fixed bridge thereon for supporting and anchoring the other end of the strings, a plurality of levers, one for each remaining string, pivotally mounted on said support, each of said levers having an upwardly extending bridge member over which the corresponding string is disposed, means on the levers for receiving and anchoring the adjacent end of said string whereby pivotal movement of any of said levers rocks the bridge member and alters the tension of the corresponding string, said members alone supporting the respective strings throughout the entire effective length thereof up to said first named anchoring means, certain of said members having stop elements on the bottom thereof engageable with said support to limit movement thereof under the tension of the respective strings, and pedal operated means operatively connected with the levers for actuating the same during playing of the instrument.

7. A tune changing device for a musical instrument having a plurality of strings connected to anchoring means at one end thereof, said device comprising a support, means for supporting and anchoring the other end of the strings including a lever pivotally mounted on said support having an upwardly extending bridge member over which one of the strings is disposed, means on the lever for receiving and anchoring the adjacent end of said string whereby pivotal movement of said lever rocks the bridge member and alters the tension of the corresponding string, said member alone supporting the string throughout the entire effective length thereof up to said first named anchoring means, said member having a stop element thereon engageable with said support to limit movement of the member under the tension of the string, and means operatively connected with the lever for actuating the same during playing of the instrument.

8. In a tuning device for a stringed musical instrument having a plurality of strings fixedly anchored at one end, a support having a lever pivotally mounted thereon, said lever having an upwardly extending bridge member over which one of said strings is snubbingly disposed and having means for receiving and anchoring the adjacent end of said string, said string being tensioned in its effective length solely by its fixed anchor and said adjustable bridge member, said lever having a rearwardly extending arm actuable to alter the tension of the string and a downwardly projecting stop adjacent the forward side of the bridge member engageable with the support to limit movement of the lever under the tension of the string.

9. In a tuning device for a stringed musical instrument having a plurality of strings fixedly anchored at one end, a support having a lever pivotally mounted thereon, said lever having an upwardly extending bridge member over which one of said strings is disposed and having means for receiving and anchoring the adjacent end of said string, said string being tensioned in its effective length solely by its fixed anchor and said adjust-

able bridge member, said lever having a rearwardly extending arm actuable to alter the tension of the string and a downwardly projecting stop adjacent the forward side of the bridge member engageable with the support to limit movement of the lever under the tension of the string.

10. In a tuning device for a stringed musical instrument having a plurality of strings fixedly anchored at one end, a support having a lever pivotally mounted thereon, said lever having an upwardly extending bridge member over which one of said strings is disposed and having means for receiving and anchoring the adjacent end of said string, said string being tensioned in its effective length solely by its fixed anchor and said adjustable bridge member, and means for pivoting said lever to alter the tension of the string, said bridge member having a stop on the bottom thereof engageable with the support to limit movement thereof under the tension of the string.

11. A pitch changing device for stringed musical instruments comprising a plurality of strings provided with tuning keys at one end thereof, said device comprising individual bridge members for said strings rockably mounted on said support, said strings being anchored to their respective bridge member whereby on the rocking of the bridge member of a particular string the tension of the string is varied without sliding action of the string on its bridge member, means for normally maintaining the rockable bridge members in initially tuned position, and manually operated means for selectively rocking said bridge members, said bridge members having stops thereon engageable with said support to limit movement thereof under the tension of the strings.

12. A pitch changing device for stringed musical instruments comprising a support, a bridge

member for a string pivotally mounted on said support, said string being anchored to said bridge so that on the rocking of the bridge member the tension of the string is varied without sliding movement of the string on its bridge member, and manually operated means for rocking said bridge member on its pivot for varying the pitch of the string, said bridge member having a stop element on the lower forward edge thereof engageable with said support to limit movement of the bridge member under the tension of the string.

13. In a tuning device for a musical instrument having a string fixedly anchored at one end and adapted to be adjustably anchored at the other end for altering of the tension and pitch thereof, a support at the last named end of the string, a lever pivoted on said support, having means for anchoring the string end adjacent the same and an offset string engaging and tensioning portion, a pedal-actuated control member mounted on said support and connected to said lever for rocking said portion to alter the tension of the string, a second pedal-actuated control member mounted on said support, said members having spring means coacting therewith to urge the same in a direction opposite to the direction of pedal actuation thereof, and an arm pivoted on said support and operatively connected to said second member, said arm being operatively engageable with said lever, said first spring urged member and said arm acting oppositely on said lever to resiliently urge the same to and maintain the same in position to preserve the initial tuning of the string associated with the lever, said lever being rockable by actuation of said members to raise or lower the tension of the string during playing.

NEIL B. ABRAMS.
WILLIAM J. MILLS.