

Jan. 2, 1940.

L. A. LOAR

2,185,734

STRINGED MUSICAL INSTRUMENT

Filed Oct. 7, 1937

3 Sheets-Sheet 1

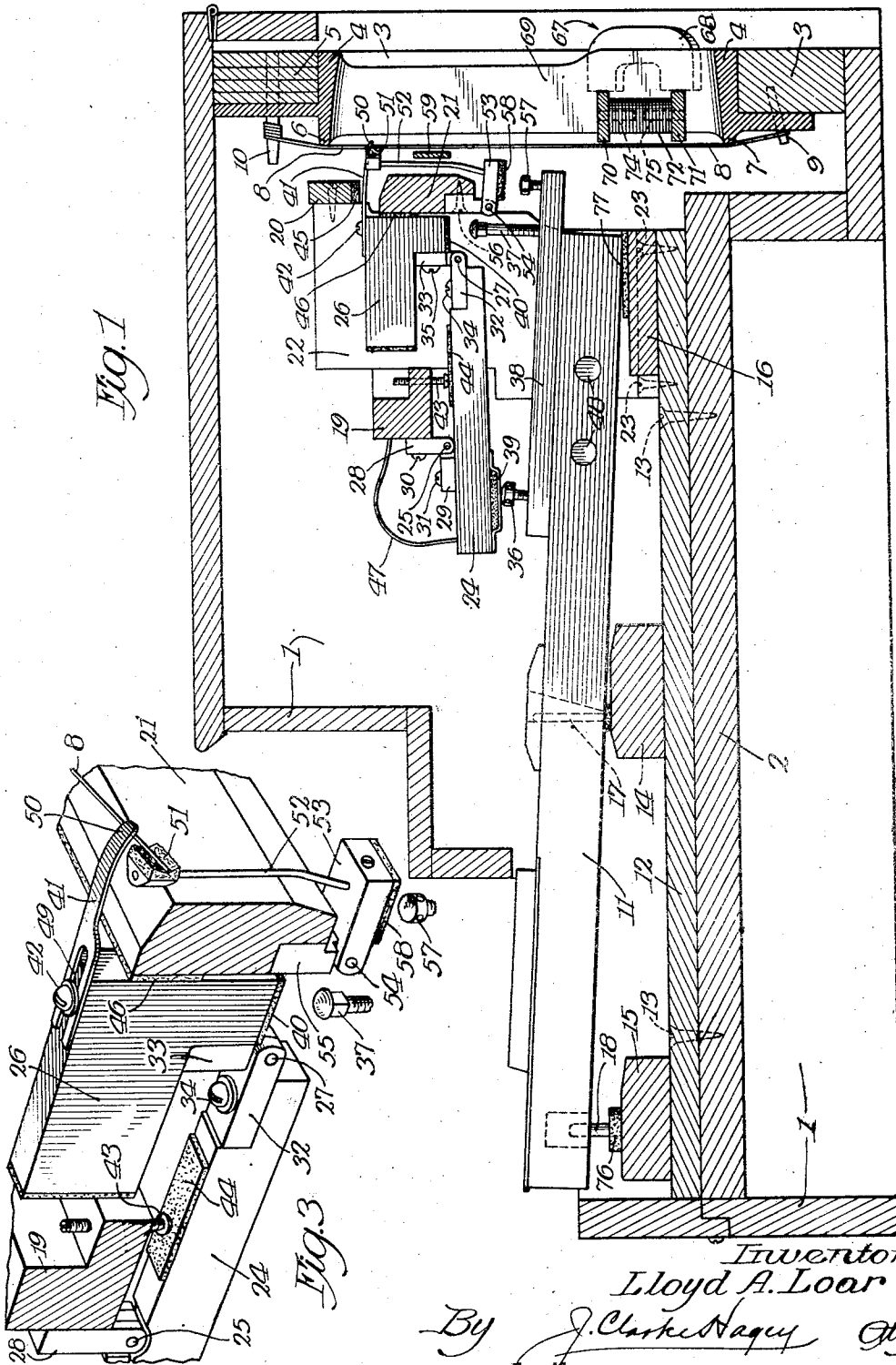


Fig. 1

Fig. 3

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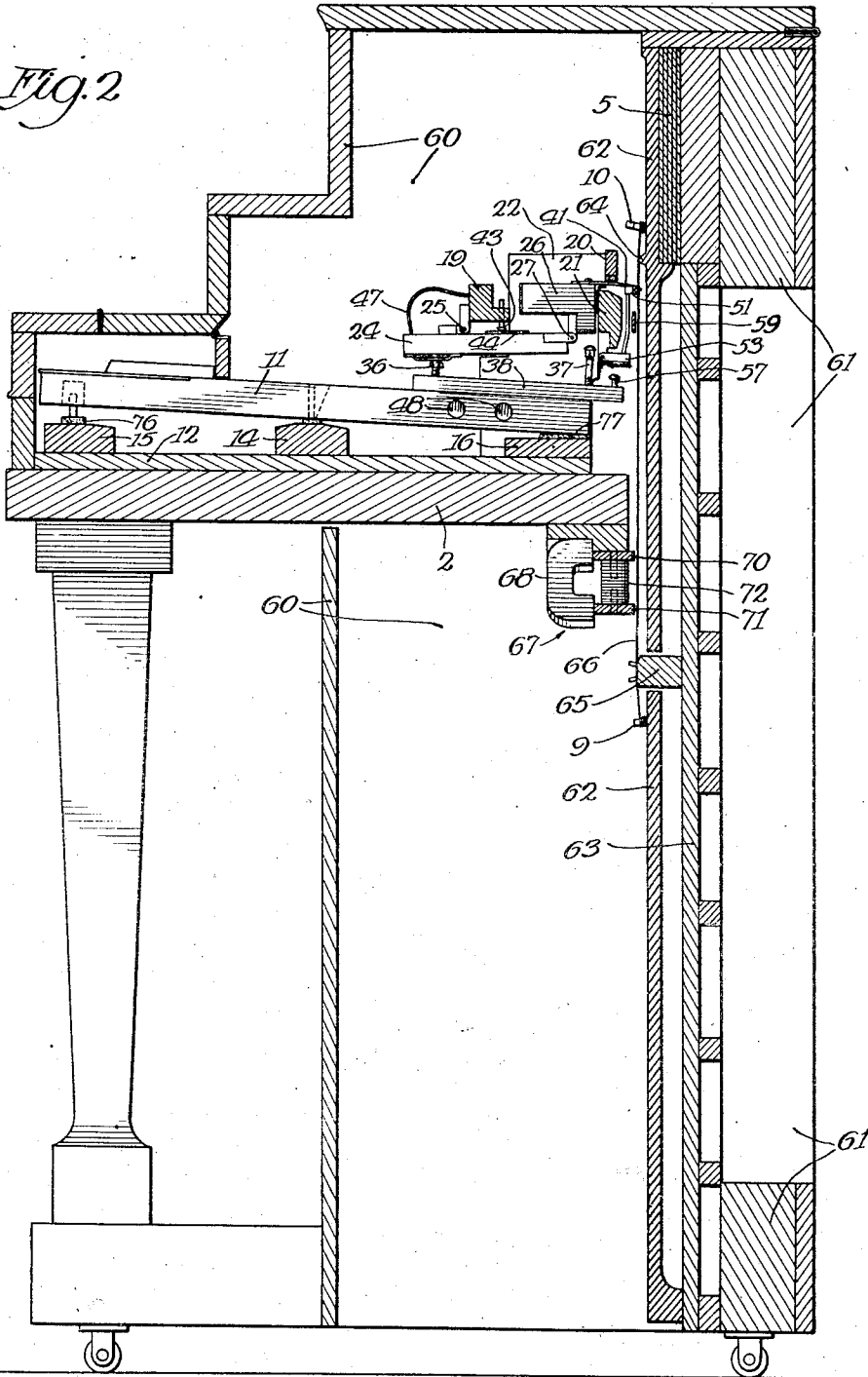
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Filed Oct. 7, 1937

3 Sheets-Sheet 2

Fig. 2



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3 Sheets-Sheet 3

FIG. 4

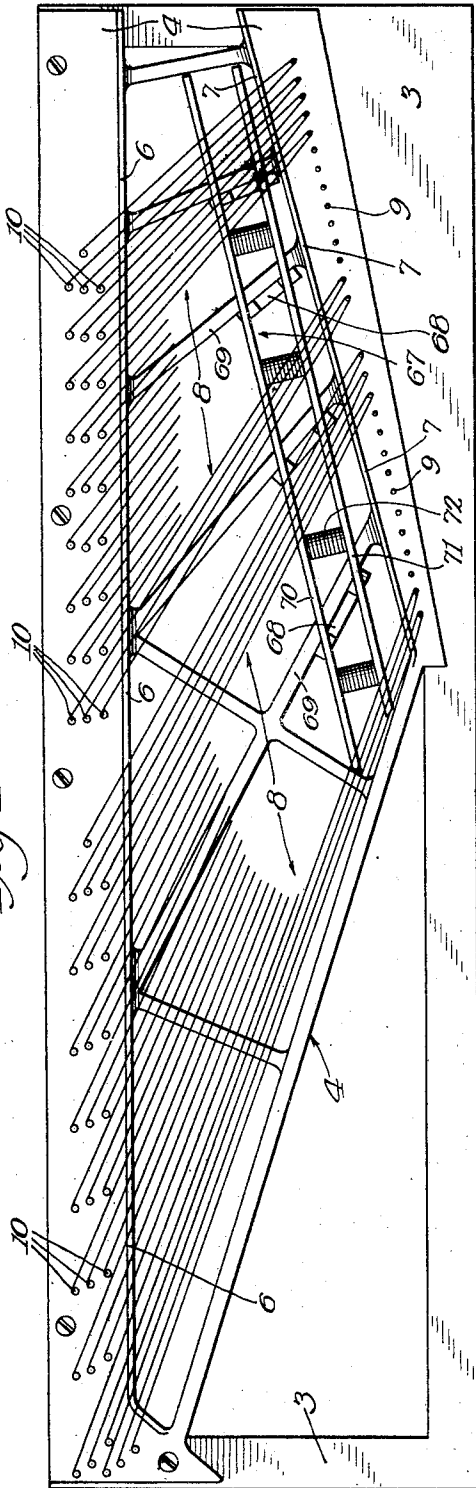


FIG. 5

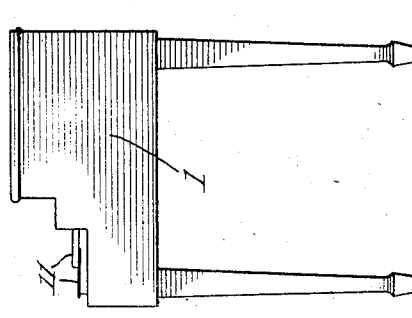
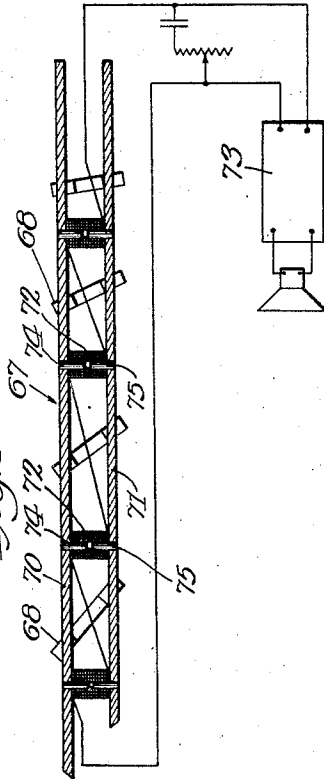


FIG. 6

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UNITED STATES PATENT OFFICE

2,185,734

STRINGED MUSICAL INSTRUMENT

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Application October 7, 1937, Serial No. 167,694

11 Claims. (Cl. 84—1.15)

This invention relates to stringed musical instruments, and more particularly concerns instruments of the spinet and harpsichord types in which the tensioned strings thereof are picked or plucked by means of key-operated plectrum actions.

One of the principal objects of the invention is to provide an instrument which possesses the quaint tonal characteristics peculiar to the spinet or harpsichord, but which is distinguished from such instruments in that the tonal power of the notes may be controlled, individually and collectively, by the force with which the respective keys are manually operated. Another principal object is to provide an instrument having the tonal characteristics and key-board control of note-intensities just mentioned with means through which an improved and highly satisfactory note-repetition may be obtained, with the result that novel and desirable musical expression effects may be produced, the tonal characteristics of which are those of the spinet or harpsichord and the key-board control of individual and collective note-intensities and of note-repetition are similar to those of the modern piano. Still another object is to provide an instrument characterized as aforesaid with a novel magneto-electric pick-up device, directly controlled by the strings and of which the strings form an essential part, for connection, when desired, with a system for electrically amplifying the musical effects produced. Further objects of the invention are to provide a simple, practical, economical and substantial construction which may be conveniently and accurately adjusted and which will retain adjustment with reasonable permanence.

Two embodiments of the invention are illustrated in the accompanying drawings, in which—

Figure 1 is a vertical fore-and-aft sectional view of a stringed musical instrument of the spinet or harpsichord type embodying the invention and constructed as a portable table model;

Fig. 2 is a view similar to Fig. 1, illustrating the application of the invention to a stringed musical instrument of the piano type, in which a sounding-board is employed;

Fig. 3 is a fragmentary perspective view, upon an enlarged scale, showing in greater detail that part of one of the units of the plectrum action directly associated with its respective string and string-damper;

Fig. 4 is a front elevational view of the string-

plate and strings of the spinet or harpsichord type of musical instrument shown in Fig. 1;

Fig. 5 is a schematic view of an electronic amplification circuit-arrangement which may be employed in connection with the magneto-electric pick-up device shown in Figs. 1, 2 and 4; and

Fig. 6 is a side elevational view of one form of musical instrument embodying the construction shown in Figs. 1 and 4.

In order that the purposes of the present invention may be better understood and the advantages provided by the construction more fully appreciated, it may be well to point out that, while the tonal characteristics of the spinet and harpsichord are pleasing, the construction of such instruments has heretofore been such that musical expression effects obtainable therefrom by even the most skilled performers have been decidedly limited. Heretofore, the key-board touch of plectrum instruments has been peculiar thereto and greatly different from that of the modern piano, individual and selective note-accentuation has not been obtainable by means of key-dynamics, and rapid note-repetition has been practically impossible. While the method of operation may prevent the key-board touch of a plectrum instrument from being exactly like that of a percussion instrument, and while rapid note-repetition and dynamic modification of tone by difference of touch may have been unobtainable with the previously known forms of plectrum instruments, it does not follow that these limitations are necessarily inherent in all forms of plectrum instruments. The construction which will now be described provides a plectrum instrument which has the tonal characteristics of the spinet or harpsichord, and in which the key-board touch, individual note-accentuation and note-repetition have been vastly improved, so as to resemble, as far as practicable, these same features of the modern piano and thereby enable a pianist to obtain to a much greater degree than heretofore the musical expression effects obtainable upon a piano. In addition to this, the present invention provides means for amplifying with a high degree of fidelity the tone of the instrument, so that it may be given a much wider scope of usefulness, and may be satisfactorily employed as a solo concert and orchestral instrument.

The construction of the portable table model, shown in Figure 1, comprises a casing 1 (outlined also in Fig. 6), enclosing a horizontal key-bed 2 and a vertically arranged back-frame 3 (see also

Fig. 4), which supports a string-plate 4 and provides the laminated tuning-pin-plank 5. String-plate 4 is preferably a skeleton frame of light and strong metal, such as cast aluminum, and is formed with upper and lower string-bridges 6 and 7, respectively, across which the strings 8 extend from the hitch-pins 9 to the tuning-pins 10. This arrangement is somewhat similar to that of an upright piano, the tuning-pins being accessibly positioned near the hinged top of the casing for adjustment to tension the strings to pitch, but it will be observed that there is no sounding-board and, of course, no sounding-board string-bridge.

The manual key-board is substantially the same as that of a piano, the keys 11 thereof being carried upon a key-frame 12, which is removably secured upon key-bed 2 by screws 13 and comprises the usual balance-rail 14, front guide-pin-rail 15 and rear bumper-rail 16. Balance-rail-pins 17 and front-rail-pins 18 guide the keys in the usual manner.

The entire plectrum action is supported as a removable unit above the rearward part of keys 11 and forward of strings 8. Action-rail 19 and stop-rails 20 and 21 extend transversely above the keys and are secured to upright supports, such as 22, which are removably secured by screws 23 upon key-frame 12. Upon releasing screws 23, the key-board and action may be removed as a unit, or, upon releasing screws 23, the action may be removed without removing the key-board.

While but single units of the manual key-board and plectrum action are shown, it is to be understood, of course, that there is a key 11 and an associated action-unit for each string 8 of the scale, and that all of the action-units are alike, so that the following description of the construction, arrangement and operation of one of the action-units applies to all.

Rocker-lever or wippen 24 is pivotally secured at 25 to action-rail 19 and at its rearward end carries the plectrum-jack 26 pivotally secured thereto at 27. In the particular construction here shown, pivot 25 is a hinge-pin connecting the flanges 28 and 29, flange 28 being secured by screw 30 to action-rail 19 and flange 29 being secured by screw 31 to wippen 24, and pivot 27 is a hinge-pin connecting the flanges 32 and 33, flange 32 being secured by screw 34 to wippen 24 and flange 33 being secured by screw 35 to plectrum-jack 26, but, as is well known to those familiar with the art, flanges 28 and 33 may be pinned directly to wippen 24 and the flanges 29 and 32 eliminated. Wippen 24 is longitudinally arranged directly above its respective key 11, and the pivot 25 is located toward the forward end of the wippen, so that the vertical swing of the rearward end of the wippen is considerably greater than that of the forward end thereof. Capstan-screws 36 and 37 are screwed into a hardwood block 38, which is glued upon the top of the rearward end-part of key 11, and project upwardly therefrom to contact with cushions 39 and 40 glued upon the under surfaces of wippen 24 and plectrum-jack 26, respectively. Plectrum-jack 26 carries the plectrum 41, adjustably secured upon the upper face thereof by screw 42, and is shaped and balanced to have a toppling action over pivot 27. An adjustable stop-screw 43 is screwed into action-rail 19 and projects downwardly therefrom to engage a cushion 44 glued upon the upper face of wippen 24, said cushion 44 extending rearwardly upon the wip-

pen far enough to be engaged by the forwardly overhanging end of the plectrum-jack 26 and thereby limit the forward toppling action thereof. The under face of stop-rail 20 is provided with a cushion-strip 45 for the plectrum 41, and the forward face of stop-rail 21 carries a cushion-strip 46 for the rearward face of the plectrum-jack 26. An expansion-spring 47, here shown as a bowed wire, is applied between action-rail 19 and the forward end-part of wippen 24 to overcome the weight of the longer rearward end-part of the wippen and of the plectrum-jack carried thereby, and resiliently hold these parts in their normally elevated positions. The strength and strength-gathering power of spring 47 is important, as is the weight and placement of the usual key-weights 48, as the arrangement of these elements determine to a large degree the touch and balance of keys 11.

Plectrum 41 is preferably, though not necessarily, struck out of some suitable sheet metal, such as copper, brass, aluminum, or nickel-silver, and is shaped as clearly illustrated in Figure 3, the forward end-part being slotted or bifurcated, as at 49, to facilitate removal and replacement of the plectrum and so that it may be conveniently and accurately adjusted upon the plectrum-jack with relation to its respective string 8, upon release of the clamping screw 42. The rearward finger-like end-part of the plectrum is curved slightly downward, as at 50, but is not hooked sufficiently to catch upon the string, and the shanks of the different plectrums are twisted to incline the end-parts 50 in conformity with the slant of the respective strings. The progressively varying slant and close arrangement of strings 8 upon the string-plate 4 of the portable table model are shown in Figure 4, and it will be seen that, in order for the different plectrums to act upon their respective strings, the finger-like end-parts 50 thereof must extend between the strings. It will also be understood that the pre-actuated position of each plectrum 41 must be such that the end-part 50 thereof is directly over its respective string, out of contact therewith and out of contact with the adjacent string, and that the repetition of a note requires the return of the plectrum to such position between each plucking operation thereof. Consequently, the plectrums must be accurately guided with a minimum amount of friction to effect the repeated insertion of the end-parts 50 thereof between the strings without contacting them.

Referring, again, to Figure 3, it will be observed that a damper 51 is positioned to engage string 8 closely beside, but not to interfere with, the plectrum engagement therewith. Damper 51 is secured upon the upper end-part of damper-wire 52, and the lower end of damper-wire 52 is adjustably secured in damper-butt 53. Each damper-butt 53 is pivoted, as at 54, to a corresponding damper-flange 55 which is secured by a screw 56 to the lower forward face of stop-rail 21. A capstan-screw 57 is screwed into, and projects upwardly from, the rearward end-part of the block 38 upon each key 11 to engage a cushion 58 glued upon the under face of the corresponding damper-butt 53, so that the individual string-dampers are actuated by the operation of the keys in substantially the usual manner. A damper-lift-bar for operating the entire series of dampers is indicated at 59, but the operating connections therefor are not shown, since it is to be understood that any preferred form and ar-

arrangement of damper-lifting mechanism may be employed, depending to some extent upon whether pedal, manual, or knee actuating means are desired.

5 The construction thus far described constitutes a complete musical instrument possessing the tonal characteristics, the key-board control of individual note-intensities, and the provisions for rapid note-repetition already mentioned, but, while the tonal power may be sufficient for home and studio uses, the portable table model is designed for strength, lightness and compactness, and does not comprise a sounding board. This model may be placed in a carrying case and carried about as other forms of portable musical instruments, and may be removed from the carrying case and placed upon a table or stand, or may be fitted with detachable supporting legs as in the form shown in Figure 6.

20 In the piano form of instrument illustrated in Figure 2, the casing 60, back-frame 61, string-plate 62, sounding-board 63, bridges 64 and 65, and arrangement of strings 66 may be the same as in the conventional upright piano. The construction of the keys and plectrum action is substantially the same as that already described in connection with the portable table model, and similar reference characters have been employed to indicate the parts thereof, but, in this embodiment of the invention, the strings are longer and more highly tensioned, and the use of the sounding-board 63 and sounding-board string-bridge 65 produces somewhat different tonal characteristics and greater tonal volume. The scale of the action and inclination of the end-parts 50 of the plectrum 41 to conform to the different spacing and slant of strings 66 are, of course, correspondingly varied from those of the portable table model, but the operation of the parts and the plucking of the strings are accomplished in exactly the same manner and result in producing a quaint, twanging tone similar in many respects to those of the spinet and harpsichord, though modified and amplified by the mentioned differences in construction.

The magneto-electric pick-up unit 67 (Fig. 5) is shown in position with respect to strings 8 in Figures 1 and 4. The novel features and details of construction of the unit do not form a part of this invention, and they will be but briefly described in connection with the arrangement and operative association of the unit with the string-plate and strings of the portable table model. Different forms of pick-up units may be employed, without departing from the spirit and scope of this invention, and the present unit may be differently positioned, as indicated in the piano form of instrument illustrated in Figure 2. Preferably, a plurality of permanent horse-shoe magnets 68 are secured to the sides of the ribs 69 of string-plate 4 and their north and south magnetic poles are connected together by respective bars 70 and 71, which bars extend in parallel arrangement back of strings 8 adjacent the lower string-bridge 7. With this arrangement, the entire unit is held firmly fixed upon the string-supporting plate and the bars 70 and 71 are rigidly held in their proper positions, extending across the entire series of strings 8, close enough thereto for the vibrations thereof to vary the density of the magnetic field between the bars but spaced sufficiently therefrom to avoid contact therewith. Referring, now, more particularly to Figure 5, it will be seen that a plurality of solenoid windings 72 are positioned between bars 70 and 71 and con-

nected together in series circuit arrangement with an amplifier unit 73. Each solenoid 72 surrounds a pair of magnetic pole-pieces 74 and 75, which extend toward each other in paired endwise alignment from their respective bars 70 and 71. As illustrated, there is an air-gap between the adjacent ends of each pair of pole-pieces.

Now, as the various strings 8 are vibrated by the playing of the instrument, their movements with respect to bars 70 and 71 will vary the strength and other characteristics of the magnetic field existing between the bars and between the pole-pieces 74 and 75 within the solenoid windings 72. These variations in magnetic strength and balance within the solenoid windings induces a correspondingly varying alternating electric current in the solenoids and in the circuit connecting them with the amplifier unit 73. Any satisfactory arrangement of one or more electrically operated amplifiers and loud-speakers may be employed to amplify the weak modulated input current supplied thereto in the manner just described and convert the modulations into audible sound of the strength desired.

The operation of the keys and the plectrum action will now be described. Depression of the forward key-board end of each key 11 rocks it upon the balance-rail 14 in the usual manner and elevates the rearward end thereof, the extent of movement or dip of each key being regulated by the thickness of the front-rail felt punchings 76 as is customary. Upward movement of the rearward end-part of key 11 from its position of rest upon the cushion 77 upon bumper-rail 16 raises capstan-screw 36 and thereby pushes up the forward end of wippen 24 against the slight resistance of spring 47, rocking the wippen upon its pivot 25 and forcing the longer rearward end-part of the wippen downwardly from its position of rest against stop-screw 43 toward the upwardly moving end-part of key 11. The first part of this downward movement of the rearward end-part of wippen 24 lowers plectrum-jack 26 and plectrum 41 away from the cushion-strip 45 on stop-rail 20 and brings the finger-like end-part 50 of the plectrum down upon the respective string 8. As the downward movement of the plectrum-jack continues, the bearing of the end-part 50 of the plectrum upon string 8 establishes a second pivotal point for the plectrum-jack and it starts to topple forwardly upon its pivotal connection 27 with wippen 24. However, the arc followed by pivot 27 is determined by the pivotal point 25 of the wippen, and the distance between pivot 27 and the point of contact of the plectrum with the string is increased as the movement continues until the finger-like end-part 50 of the plectrum slips from, or is pulled from, the string and the plectrum-jack topples forwardly over the pivot 27, away from its position of rest against the cushion-strip 46 on stop-rail 21, throwing the end-part 50 of the plectrum upwardly and forwardly away from string 8. During the movement of the parts just described, the capstan-screw 37 near the rearward end of key 11 has engaged the damper-butt 53 and, just before the plectrum leaves the string, the damper 51 is lifted therefrom. Immediately after the plectrum leaves the string, and at the last part of the upward movement of the rearward end-part of key 11 and the downward movement of the rearward end-part of wippen 24, capstan-screw 37 engages the under face of the plectrum-jack 26, completes the toppling movement thereof, if it has not already been completed, and holds the forwardly overhanging

end of the plectrum-jack down upon the cushion 44 upon wippen 24, preventing a possible rebound therefrom which might result in the plectrum being thrown back under instead of over its respective string.

Before describing the return movements of the parts to their initial positions, it is particularly important to explain that the speed with which each key 11 is operated determines the speed of downward movement of the plectrum-jack 26, but the speed of the toppling movement thereof is not so determined—that is to say; the downward movement of the end-part 50 of the plectrum 41 upon string 8 may be much faster than the forward withdrawing movement of the plectrum from the string. To illustrate further, if the speed of the downward movement of the plectrum-jack does not exceed that of its toppling movement, no appreciable pressure of the plectrum upon the string will result, and the finger-like end-part 50 will touch the string and lift away therefrom as the plectrum-jack topples forwardly, barely disturbing the string and sounding the note very faintly. On the other hand, graduated increases in the force (and, therefore, in the speed) with which key 11 is actuated will effect similar increases in the downward movement of the plectrum-jack and, as this downward speed exceeds the disengaging speed of the toppling movement, the plectrum will not have time to leave the string of its own inclination, but will depress the string more or less, depending upon the force and speed of the downward movement, before it is tossed or pulled away therefrom, and the string will be more powerfully vibrated. Experiments have shown that an abnormal blow upon the key may even result in the breaking of the string. From the foregoing description, it will be seen that this construction differs from the usual forms of plectrum actions in that there is no fixed predetermined point in the movement of the key at which the plectrum will disengage from the string, and that the force or speed with which the individual keys are actuated therefore determines the tonal intensities of the respective notes. The weight and placement of the key-weights 48 and the initial resistance of spring 47 determine the initial resistance of key 11 and these factors, together with the strength-gathering power of spring 47, determine almost wholly the resistance and stiffness of the touch of the key action, the string-plucking operation of the plectrum being practically unnoticeable.

Upon release of the key and the downward movement of the rearward end-part thereof, capstan-screw 37 moves downwardly away from the under face of plectrum-jack 26, and spring 47 causes the forward end of wippen 24 to follow the downward movement of capstan-screw 36, rocking the wippen upon its pivot 25 and raising the longer rearward end-part thereof, thereby moving the plectrum-jack simultaneously upward away from the retreating capstan-screw 37. Plectrum-jack 26 continues, however, in its over-balanced, forwardly toppled position, until plectrum 41 encounters the cushion-strip 45 on the upper stop-rail 20. When this occurs, upward movement of the plectrum is arrested and the continued upward movement of the rearward end-part of wippen 24 and pivot 27 results in the righting of the plectrum-jack from its forwardly toppled position and moves the finger-like end-part 50 of the plectrum downwardly and rearwardly until the plectrum-jack is brought to rest

against the cushion-strip 46 on the lower stop-rail 21, at which position the end-part 50 of the plectrum has returned to its position over its respective string 8, out of contact therewith and out of contact with the adjacent string. Just prior to the insertion of the end-part 50 of the plectrum between the strings, the downward movement of capstan-screw 37 has permitted the replacement of damper 51 upon the string, preventing any vibration of the string against the said end-part 50 of the plectrum as it is returned to its initial position.

It is to be observed that the introduction of the end-part 50 of the plectrum between the strings and over its respective string is very definitely and accurately guided and held by and between the cushion-strips on the stop-rails 20 and 21; that it cannot move upwardly because of the cushion-strip 45, and cannot move downwardly because of the cushion-strip 46; that it can be brought downwardly upon its respective string 8 only through the bodily downward movement of the plectrum-jack 26; and that such action can only occur as the initial part of another actuation of key 11 and wippen 24. It is also to be observed that the string-plucking action of the plectrum takes place during the first part of the key movement, rather than near the completion of such movement, as in the earlier forms of plectrum actions, providing for a much higher speed of note-repetition. Furthermore, the accessibility of all adjustable parts permits easy and accurate regulation with the parts in position and operative relationship.

I claim:

1. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a support extending transversely with respect to said keys and said strings; a series of levers pivotally supported by said support, each of said levers being operatively associated with one of said keys and one of said strings and positioned with its rearward end extended toward said strings for movement crosswise of the string with which it is associated; a series of plectrum-jacks pivotally connected one to each of said levers near the rearward end thereof to swing forwardly thereupon away from the respective string, said plectrum-jacks being top-heavy over their pivotal connections with said levers; and a series of plectrums secured one upon each of said plectrum-jacks and projecting rearwardly therefrom to a position adjacent its respective one of said strings: the actuation of each of said keys effecting the operation of one of said levers and the movement of the attached plectrum-jack to bring the plectrum secured thereto into engagement with the respective string and draw it thereacross and thus effect the plucking of said string, such action causing said plectrum-jack to topple forwardly over its pivotal connection with said lever, thereby moving said plectrum away from said string.

2. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a support and a stop-rail extending transversely with respect to said keys and said strings; a series of levers pivotally supported by said support, each of said levers being operatively associated with one of said keys and one of said strings and positioned with its rearward end extended toward said strings for movement crosswise of the string with which it is associated; a series of plectrum-jacks pivotally

connected one to each of said levers near the rearward end thereof to swing alternately toward and away from the string with which the respective lever is associated, said plectrum-jacks being top-heavy over their pivotal connections with said levers; and a series of plectrums secured one upon each of said plectrum-jacks and projecting rearwardly therefrom beneath said stop-rail to a position adjacent its respective one of said strings; the note-sounding actuation of each of said keys effecting the operation of one of said levers and the downward movement of the attached plectrum-jack to move the plectrum secured thereto away from said stop-rail into engagement with the respective string and draw it thereacross and thus effect the plucking of said string, such action causing said plectrum-jack to topple over its pivotal connection with the lever and move the respective plectrum away from the string, and the release of each of said keys after their aforesaid note-sounding actuation permitting the return of the aforesaid elements to their initial positions, such return involving the upward movement of the respective plectrum-jacks and the engagement of their plectrums with said stop-rail, resulting in the righting of said plectrum-jacks from their toppled-over positions and the return of the respective plectrums to their positions adjacent their respective strings.

3. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a support and first and second stop-rails extending transversely with respect to said keys and said strings; a series of levers pivotally supported by said support, each of said levers being operatively associated with one of said keys and one of said strings and positioned with its rearward end extended toward said strings for movement crosswise of the string with which it is associated; a series of plectrum-jacks pivotally connected one to each of said levers near the rearward end thereof to swing alternately toward and away from the string with which the respective lever is associated, said plectrum-jacks being top-heavy over their pivotal connections with said levers and normally resting rearwardly against said first stop-rail; and a series of plectrums secured one upon each of said plectrum-jacks and projecting rearwardly therefrom beneath said second stop-rail to a position adjacent its respective one of said strings; the note-sounding actuation of each of said keys effecting the operation of one of said levers and the downward movement of the attached plectrum-jack to move the plectrum secured thereto away from said second stop-rail into engagement with the respective string and draw it thereacross and thus effect the plucking of said string, such action causing said plectrum-jack to move away from said first stop-rail and topple over its pivotal connection with the lever and move the respective plectrum forwardly away from the string, and the release of each of said keys after their aforesaid note-sounding actuation permitting the return of the aforesaid elements to their initial positions, such action involving the upward movement of the respective plectrum-jacks and the engagement of their plectrums with said second stop-rail, resulting in the righting of said plectrum-jacks from their toppled-over positions to their initial positions of rest against said first stop-rail and the return of the respective plectrums rearwardly to their initial positions adjacent their respective strings.

4. The combination, with the keys and strings

of a keyboard stringed musical instrument, of a plectrum action comprising a support extending transversely above the rearward end-parts of said keys forward of said strings, a series of levers pivotally supported between their ends by said support and extending lengthwise of and above the rearward end-parts of said keys, a series of plectrum-jacks arranged above said series of levers and pivotally attached one to the rearward end-part of each of said levers, and plectrums secured one upon each of said plectrum-jacks and extending rearwardly therefrom to positions adjacent their respective strings; adjustable means operatively engaging the forward end-part of each of said levers with the rearward end-part of the respective key, acting, upon the note-sounding actuation of each key and the consequent elevation of the rearward end-part thereof, to effect the downward movement of the rearward end-part of the respective lever and of the plectrum-jack pivotally attached thereto, whereupon the plectrum secured upon said plectrum-jack will be moved downwardly into engagement with the respective string and drawn thereacross to pluck and move forwardly away therefrom; and adjustable means operatively engaging the rearward end-part of each key with the respective plectrum-jack after the plectrum secured thereupon has effected the plucking of the string, acting to retain the plectrum-jack in its operated position and thereby prevent said plectrum from returning rearwardly toward said string while the key is maintained in its actuated position.

5. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a support extending transversely above the rearward end-parts of said keys forward of said strings, a series of wippens pivotally supported between their ends by said support and extending lengthwise of and above the rearward end-parts of said keys, a series of plectrum-jacks pivotally attached to the rearward end-parts of said wippens, plectrums secured upon said plectrum-jacks and extending rearwardly therefrom to positions adjacent respective strings, adjustable means operatively engaging the forward end-part of each of said wippens with the rearward end-part of the respective key, a spring acting upon the forward end-part of each of said wippens to yieldingly resist the operation of the wippens by said keys, and adjustable stop-means acting upon each of said wippens to limit the action of said springs thereupon.

6. A stringed musical instrument comprising an upright back-frame and a string-plate secured thereto, a series of tuning-pins and a complementary series of hitch-pins secured in and projecting from said string-plate near the upper and lower marginal portions thereof, respectively, an upper string-bridge formed upon said string-plate extending in a horizontal direction below said tuning-pins, a lower inclined string-bridge, a series of tensioned strings extending between said tuning-pins and said hitch-pins and bearing upon said upper and lower string-bridges, a manual keyboard horizontally arranged forward of said strings and having a key for each of said strings, a plectrum-action removably positioned above the rearward end-part of said keyboard forward of said strings, each plectrum-unit of said action being operatively associated with one key of said keyboard and having a plectrum for each of said strings, and a magneto-electric pick-up device positioned

above said lower string-bridge closely adjacent said strings and extending across the entire series thereof.

7. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a support extending transversely with respect to said keys; a series of wippens pivotally supported by said support, each of said wippens being operatively associated with one of said keys; a plectrum-jack pivotally attached to each of said wippens for free swinging movement thereupon; and a plectrum secured upon each said plectrum-jack and extending therefrom past and adjacent to one of said strings, acting upon partial operation of its respective wippen and plectrum-jack in one direction to engage with and be arrested by said one of said strings and, upon further operation of its said wippen in said one direction to pivot upon said string and thereby effect the free swinging of said plectrum-jack upon its pivotal attachment with said wippen during said further operation thereof until said plectrum disengages from said string.

8. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a support extending transversely with respect to said keys; a series of wippens pivotally supported by said support, each of said wippens being operatively associated with one of said keys; a plectrum-jack pivotally attached to each of said wippens; and a plectrum secured upon each said plectrum-jack and extending therefrom past and adjacent to one of said strings, acting upon partial operation of its respective wippen and plectrum-jack in one direction to engage with said one of said strings and, upon further operation of its said wippen in said one direction to displace said string and, through its engagement therewith, effect the swinging of said plectrum-jack upon its pivotal attachment with said wippen and thereby disengage from said string, the extent to which said string is displaced by said plectrum being variably determinable by varying the speed at which said wippen is operated with respect to the speed at which said plectrum-jack is swung about its pivotal attachment by the engagement of said plectrum with said string prior to its disengagement therefrom.

9. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a support extending transversely with respect to said keys; a series of wippens pivotally supported by said support, each of said wippens being operatively associated with one of said keys; a plectrum-jack pivotally attached to each of said wippens; and a plectrum secured upon each said plectrum-jack, extending

therefrom and having a curved end-part positioned adjacent one of said strings, acting upon partial operation of its respective wippen and plectrum-jack in one direction to engage said curved end-part with said one of said strings and, through such engagement and further operation of its said wippen in said one direction, effect the swinging of said plectrum-jack upon its pivotal attachment and the disengagement of said plectrum from said string, the speed at which said wippen is operated by its associated key with respect to the speed at which said plectrum-jack is swung upon such operation about its pivotal attachment by engagement of the curved end-part of said plectrum with said string determining the extent to which said string is displaced by said plectrum prior to its disengagement therefrom.

10. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a series of plectrums, a series of plectrum-jacks to each of which one of said plectrums is secured, and means operatively associated with said keys and pivotally supporting said plectrum-jacks each with its plectrum in position to engage with and effect the vibration of one of said strings upon the operation of the corresponding one of said keys, each of said plectrum-jacks being independently free to be swung upon its pivotal support to disengage its plectrum from the respective string, the swinging of each plectrum-jack upon its pivotal support being effected wholly through operation of the associated key in cooperation with the engagement of said plectrum with said string.

11. The combination, with the keys and strings of a keyboard stringed musical instrument, of a plectrum action comprising a series of plectrums, a series of plectrum-jacks to each of which one of said plectrums is secured, and means operatively associated with said keys and pivotally supporting said plectrum-jacks each with its plectrum in position to engage with and effect the vibration of one of said strings upon the operation of the corresponding one of said keys, each of said plectrum-jacks being independently free to be swung upon its pivotal support to disengage its plectrum from the respective string, the swinging of each plectrum-jack upon its pivotal support being effected wholly through operation of its associated key in cooperation with the engagement of said plectrum with said string, and the extent to which each of said strings is vibrated by its plectrum being individually determinable by the force and speed of operation of the associated key during the swinging of the corresponding plectrum-jack upon its pivotal support to disengage its plectrum from the respective string.

LLOYD A. LOAR.