

March 16 , 1926.

E. W. POWERS

PIANO

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1,576,545

2 Sheets-Sheet 1

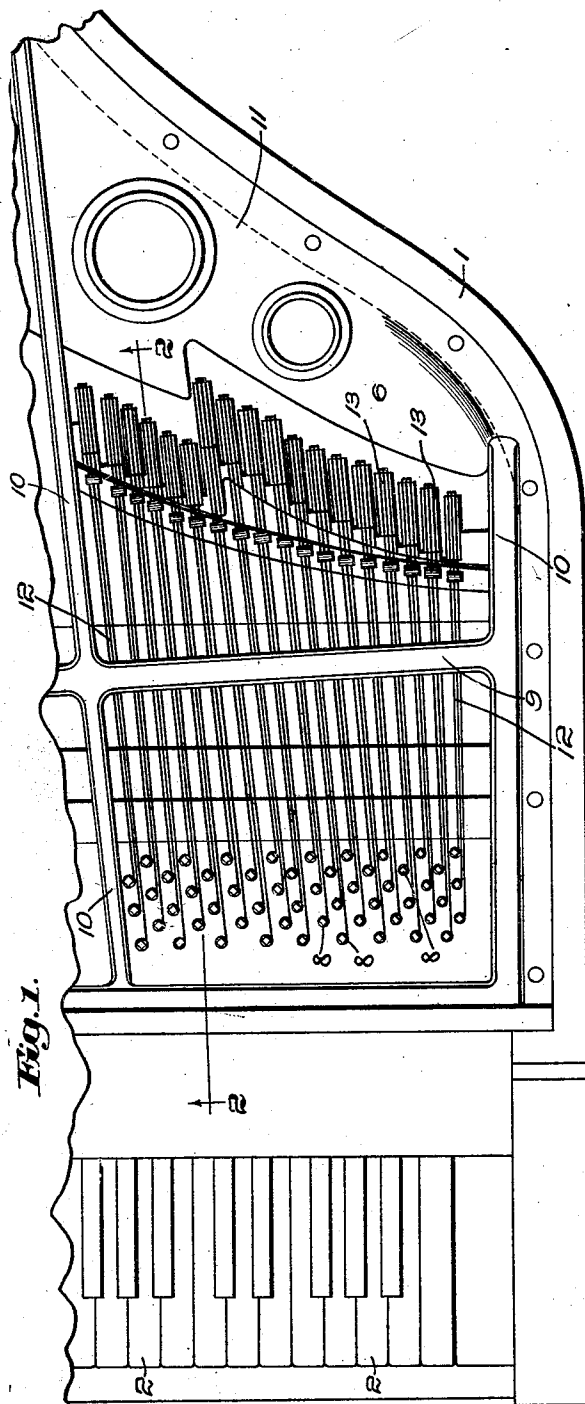


Fig. 1.

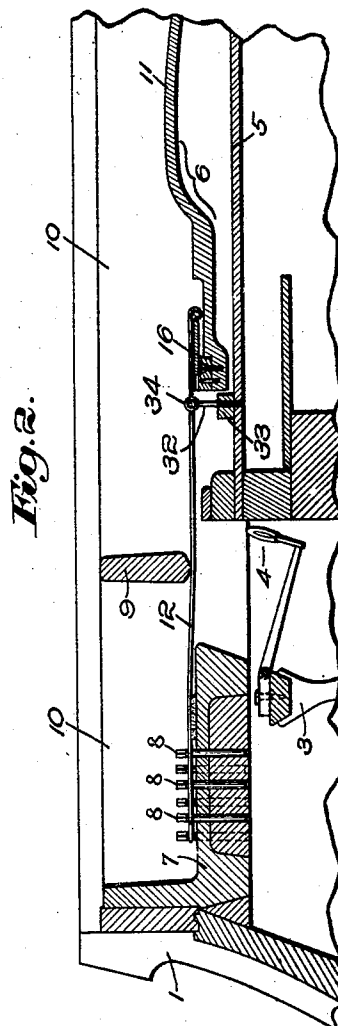


Fig. 2.

Inventor:
Edward W. Powers,
by Emory Booth James & Mary
Hays.

UNITED STATES PATENT OFFICE.

EDWARD W. POWERS, OF BOSTON, MASSACHUSETTS.

PIANO.

Application filed December 16, 1921. Serial No. 522,741.

To all whom it may concern:

Be it known that I, EDWARD W. POWERS, a citizen of the United States, and a resident of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Pianos, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to improvements in pianos, and the objects thereof will readily appear from the following specification taken in connection with the accompanying drawings of specific embodiments of the invention which have been selected merely for purposes of illustration.

Referring to the drawings:

Fig. 1 is a plan view of a portion of so much of a grand piano constructed in accordance with the invention as will enable one clearly to understand the nature of the invention, the portion illustrated being the treble end of the piano showing a plurality of treble strings;

Fig. 2 is a section taken on the line 2—2;

Fig. 3 illustrates, on an enlarged scale, the right-hand end of the string of Fig. 2 and its supporting means;

Fig. 4 is a plan view of the parts shown in Fig. 3;

Fig. 5 is a transverse section taken through the base of the supporting means shown in Fig. 3 substantially on the line 5—5 of Fig. 4;

Fig. 6 is a detail plan view of another form of string support shown in the present example supporting a unison of relatively long strings;

Fig. 7 is a vertical section taken on the line 7—7 of Fig. 6.

Fig. 8 is an enlarged end elevation of the support shown in Figs. 6 and 7 viewed in the direction of the arrow A, Fig. 7.

In the accompanying exemplification of the invention, portions of an appropriate piano casing 1 are shown supporting the various elements of the instrument. Within this case are mounted the keys 2, 2 and an action shown in part at 3, Fig. 2 having hammers, one of which is shown at 4, also other features well known to those skilled in the art but as they form no part of the present invention, no detailed or more com-

plete description thereof is believed necessary.

Secured to the case 1, in any appropriate manner, is a sounding board 5, and arranged above the board 5 is a plate or frame 6 of substantially rigid construction embodying the usual plate head 7 bearing tuning pins 8, 8. The frame 6 also includes a bearing bar 9 connected by means of struts 10, 10 with the plate head 7 and lower plate member 11. The plate 6 carries the usual piano strings 12, 12 each secured at one end to one of the tuning pins 8 and at its opposite or tail end to the lower plate portion 11 herein by resilient supports 13 which permit lateral yielding of the supported ends of the strings in order to provide a more natural or free vibratory movement thereof. Preferably these supports are arranged substantially parallel with the strings and to give the best results and greater freedom of action during their lateral yielding action, the ends of said springs are fixed to the frame or plate 6 at points between the ends of the strings. Various devices may be employed for fastening the string supports to the frame, and in Figs. 3 to 5, one such example is shown consisting of a series of sockets 14 formed as, for example, by drilling through an upstanding ledge 15, the latter preferably forming a part of a plate 16 secured in any appropriate manner to the frame or plate 6, see Fig. 3.

The sockets 14 are preferably parallel with the strings 12 and each socket is herein positioned with its axis lying in the same vertical plane with the axis of its particular string.

The members 13 are each provided with a cylindrical stem 17 which is inserted into the socket 14 from the end nearest to the tail of the string, said members 13 being shouldered at 18 to engage a suitably positioned face 19 of the ledge 15 and positively limit the extent to which said socket may be inserted.

To prevent turning of the members 13 in their sockets the holes constituting said sockets are positioned rather near to the upper face 20 of the plate 16 and the members 13 are squared off at 21 to engage said face 20.

It will be apparent from the foregoing description that after the strings have been

attached to their supports and tension is applied to said strings in tuning that said supports will be firmly maintained within their sockets, the greater the tension the more firmly will they be held in position.

The supports 13 may be of any appropriate design but, in the present example, they are constructed in the form of flat metallic springs (see Figs. 3 to 5 inclusive) designed and proportioned to resist the longitudinal tension exerted by its respective string in maintaining its proper tone and also to resist, in predetermined degree, the lateral pressure brought to bear upon the end of said spring by the vibratory action of its string or strings as the case may be, or of said sounding board.

Preferably an independent supporting member is provided for each individual string although it is to be understood that the invention is not limited to this arrangement. Preferably, however, each string illustrated is composed of three elements forming what is termed in the art as a unison and, in this example, each individual element of the unison has an independent support 13, for example, in the form shown in Figs. 3 to 5 inclusive, a string unison 23 is shown consisting of three separate strings 24, 25 and 26.

The ends of the strings may be attached to their respective supporting members in any suitable manner but herein the end 29 of each string is inserted in a hole 30 drilled into the end of the support from its underside and inclined at an angle thereto, the inclination of said hole being preferably upwardly and outwardly toward the free end of the support. From the hole 30 the wire composing said string extends outwardly around the free end of the support in contact with the end of said wire which has been extended beyond the end of the hole 30 in the member 13 and is bent laterally to lie across the face thereof at 22 (see Fig. 3). The wire of said string then stretches over a slight elevation or ridge 31 formed at the end of the supporting member to prevent contact between the string and the face of said member 13 except at the ridge, to the sounding board and tuning pin 8 as shown in Fig. 2.

From the foregoing description it will be seen that the resiliently supported end of each string is capable of vibrating substantially perpendicularly to the face of the sounding board independently of the other strings and hence will provide what may be termed a flexible hitch line; in other words the whole strain produced upon a string by the impact of its hammer 4 thereon between the bearing bar 9 and the bridge hereinafter referred to as composing the post 32 and tubular head 34 will not be absorbed solely by the elasticity of the

string but the greater part will be absorbed by the resilient supporting member for the string.

By reason of this distribution of the force of impact, the string will retain its correct tone for a much longer period than would be the case where the end of the string is fixed to a substantially rigid support and is compelled to sustain the entire force of such impact. Furthermore the expression of tone of the string so supported will not be unnecessarily limited. Neither will said tone be affected by changes wrought in the shape of the sounding board by absorption or loss of moisture due to changes in the atmosphere.

Any appropriate means may be employed for transmitting the vibrations of the string received from the impact of said hammer to the sounding board, but herein individual means are provided for each unison consisting preferably of a metal post 32 attached directly to the sounding board. The post shown in the present example includes a threaded stem 32 extending through a sounding board reinforcing strip 33 and into the sounding board itself. The upper end of said post is preferably in tubular form at 34 to provide bearing points 35 and 36 for each string, said bearing points being formed by drilling laterally through the head 34 of said post to form holes through which each of the strings of the unisons 25 are inserted, and interpositioned preferably between the two bearing points 35 and 36 is another bearing point 37 that is opposed to the bearing points 35 and 36 to insure a positive and continuous contact between said several points and the string, said bearing point 37 herein consisting of a rod 37' of a size large enough to slightly deflect said strings when under tension and thus prevent relative longitudinal and lateral movements between the posts and said string during vibratory movements of said string, the tension on said string producing sufficient friction to prevent any such longitudinal movement. Obviously where a unison is created with less than three strings, the upper end of the post 32 will be of a length to correspond and be provided with the requisite number of bearing points.

In Fig. 1 of the accompanying drawings only a portion of the treble strings are shown and in substantially all of the cases indicated, at least three strings compose each group to produce a unison of tone, but it should be borne in mind that the supporting member 13 is applicable to each and every individual string of a pianoforte whether such string consists of a single element or a plurality of elements and, in each instance, each element may be provided with an independently movable or resilient supporting member.

It should also be borne in mind that, within the scope and purpose of the invention, the length of the supporting member 13 may be varied to correspond with the fundamental length of the particular string or group of strings which it supports.

In Figs. 6, 7, and 8 I have shown a resilient string supporting member mounted in a slightly different manner from that shown in the preceding figures and, having its free end formed somewhat differently from the form previously described. In these figures, 5 represents the usual sound board and 6 the plate or frame of the piano just as in the preceding instance, said sounding board having a bridge 40 of the usual formation attached thereto and provided with the oppositely inclined pins 41 and 42 for securing the string 43 to said bridge in order to transmit vibrations from said string to said sounding board. A string group 44 is shown consisting of three separate elements 45, 46 and 47 each of which is secured to the outer free end of a supporting member 48 having a fixed point 49 interposed between the ends of said strings, said member 48 being attached at said point 49 to the rigid frame or plate 6 herein by two screws 50 and 51. To provide proper bearings for said member 48 upon said plate, positioning washers 52, 52 extending in part into the member 48 and in part into the plate 6 are provided one for each of said screws, the lower faces of said washers being bevelled at 53 to engage corresponding recesses in the plate 6.

In this example the member 48 is not slit longitudinally to provide for the independent deflection of each string element but all three elements of the string vibrate in unison. Any appropriate means may be provided for securing said string elements to the free end of said member 48 but herein the outside elements 45 and 47 of the group extend from the bridge 40 over the member 48 a slight distance thereabove to a bearing rib, herein a pin 54 arranged transversely of the member 48 within a groove provided therefor. The elements 45 and 47 are of the same piece of wire which forms a loop 54' at the end of the member 48 which loop extends from the contact pin 54 downwardly around the underside of said supporting member (as shown in Figs. 7 and 8). The middle element 46 of the group extends over the contact pin 54 around the end of said member 48 within a properly formed groove 55 and upwardly into a small hole 56 drilled from the underside of the member 48 to receive it. This end passes through the loop 54' and is firmly clamped by said looped end against the underside of the member 48, thus firmly binding the single end in place within the hole 56. The opposite ends of all three elements may be and

preferably are secured to separate tuning pins in the usual manner.

Obviously within the scope and purpose of the invention the string supports 13 may be varied in length and placed at different distances from the bridge 40 or post 32 but herein said supports are all of the same length although they are shown placed at different distances from said posts in Fig. 1, the purpose being to make the tails of the strings which are the lengths extending from the bridge or post 32 to the contact 31 at the end of said support 13, in harmonic proportion with the fundamental length of the string or that length between the bridge or post 32 and the bearing bar 9, this proportion or ratio being known as the Duplex scale.

From the foregoing description it will be obvious that when a hammer strikes a string, the vibrations produced upon said string by the impact of said hammer will be prolonged for a greater period owing to the resiliency of the support 13 than will be possible in pianos or with strings wherein the tails form a rigid or fixed hitch line as distinguished from the flexible hitch line produced by mounting the hitching or securing means for each string on independently or relatively movable elements, or at least upon elements that may move laterally of the sounding board but have practically no longitudinal movements.

Moreover the tone produced by a string or strings mounted in this manner will diminish in volume more gradually than would be possible with strings having their tails hitched to a relatively rigid frame, in which latter case the diminution of the tone is more likely to be gradual for a short period and then terminate abruptly or "break" so to speak.

While I have herein shown and described for illustrative purposes certain embodiments of my invention and have disclosed and described in detail the construction and arrangement incidental to such disclosure, it is to be distinctly understood that the invention is limited neither to the mere details or relative arrangement of parts, nor to the specific applications shown, but that numerous substitutions and alterations may be made without departing from the principles thereof.

Claims:

1. In a piano, the combination with a plate and a string, of a resilient support for said string, rigidly secured to said plate at a point between the ends of said string.

2. In a piano, the combination with a plate and a string, of a tuning pin at one end of said string and a resilient support for the other end of said string, said support being rigidly secured to said plate at a point between the ends of said string.

3. In a piano, the combination with a plate and a string stretched over said plate hitching means for said string and a laterally yielding support for said hitching means, rigidly secured to said plate intermediate of the ends of said string.

4. In a piano, the combination with a plate and a string having one end attached to said plate, of a resilient support for the other end of said string including a spring rigidly secured to said plate at a point between the ends of said string.

5. In a piano, the combination with a plate and a string having one end attached to said plate, of a resilient support for the other end of said string including a substantially flat spring having one end rigidly secured to said plate at a point between the ends of said string.

6. In a piano, a plate, a string stretched over said plate, a resilient supporting member for one end at least of said string arranged substantially parallel therewith, the outer end of said support having connection with said string, the inner end of said support being rigidly secured to said plate at a point substantially between the ends of said string to permit lateral yielding of the end thereof to which said string is connected but preventing longitudinal yielding of said string.

7. In a piano, the combination with a plate and a plurality of groups of strings stretched over said plate, of individual laterally yielding supports for said groups, each of said supports being rigidly secured to said plate at a point intermediate the ends of its respective groups of strings.

8. In a piano, the combination with a plate and a plurality of groups of strings stretched upon said plate, of individual laterally yielding but substantially longitudinally unyielding supports for said groups of strings, each of said supports being rigidly and detachably secured at said plate at a point intermediate the ends of strings composing its respective group.

9. In a stringed instrument, the combination with strings and a sounding board of individual laterally resilient supports for the ends of said strings, and means interposed between each of said strings and said sounding board to individually transmit vibrations of said strings and said resilient supports to said sounding board.

10. In a piano, in combination, a plate, a group of strings and individual supports for each element of said group rigidly secured to said plate to allow lateral yielding of the ends of the strings secured to said supports but eliminating elongating tendency of said strings.

11. In a piano in combination, a plate, a plurality of strings, a laterally yielding longitudinally unyielding support for each

of said strings secured to said plate substantially between the ends of said strings, a sounding board and bridge means for transmitting vibrations from said string to said board, the positions of said bridge means between the ends of said strings being such as to cause the vibrations of the tails of the strings to harmonize with the vibrations of the active portions of said strings.

12. In a stringed instrument, the combination with a plate and a string having one end adjustably connected to said plate, of a resilient support for the other end of said string adapted to yield in a direction transverse to the longitudinal median line of said string but relatively non-yielding longitudinally thereof, said support having a fixed point between and substantially in the line of said string, means to sustain the thrust due to the tension of the string upon said resilient support and means to secure said resilient support to said plate.

13. In a stringed instrument, a substantially rigid frame, strings stretched over said frame, supporting means for the tail ends of said strings to allow lateral vibratory movements of said tails with a consequent drawing together of the extremities of said strings substantially sufficient to compensate for the tendency to increase the tension of said strings during vibrations thereof, said means including resilient supporting members secured to said frame intermediate of the ends of their respective strings.

14. In a stringed instrument, a plate, a series of strings stretched over said plate, laterally resilient supports interposed between the tails of said strings and said plate, the degrees of lateral deflection of said supports varying in proportion to the number of vibrations per second of said strings.

15. In a stringed instrument, a plate, a series of strings stretched across said plate and laterally resilient supporting means for the tails of said strings mounted upon said plate at points substantially intermediate of the ends of said strings and constituting a flexible hitch line for said series of strings.

16. In a stringed instrument, a plate, a series of strings stretched across said plate and laterally resilient supporting means for the tails of said strings mounted upon said plate at points substantially intermediate of the ends of said strings and constituting a flexible hitch line for said strings extending substantially throughout the extent of said series of strings.

17. In a stringed instrument, a substantially rigid frame, strings stretched across said frame, supporting means for the tail ends of said strings arranged to allow lateral vibratory movements of said tails, said supporting means being secured to said frame and constituting a resilient hitch line

extending substantially throughout said series of strings.

18. In a stringed instrument, a substantially rigid frame, strings stretched across said frame, supporting means for the tail
5 ends of said strings arranged to allow independent lateral vibratory movements of said

tails, said supporting means being secured to said frame and constituting an interrupted resilient hitch line extending substantially through said series of strings. 10

In testimony whereof I have signed my name to this specification.

EDWARD W. POWERS.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,576,545, granted March 16, 1926, upon the application of Edward W. Powers, of Boston, Massachusetts, for an improvement in "Pianos," errors appear in the printed specification requiring correction as follows: Page 4, line 45, claim 8, for the word "at" read *to*, and line 82, claim 12, after the article "a" insert the words *spring having a*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of April, A. D. 1926.

[SEAL.]

M. J. MOORE,
Acting Commissioner of Patents.

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