

G. P. ROBERTS.
 Harmonic Attachments for Piano-Fortes.
 No. 218,900. Patented Aug. 26, 1879.

Fig. 1.

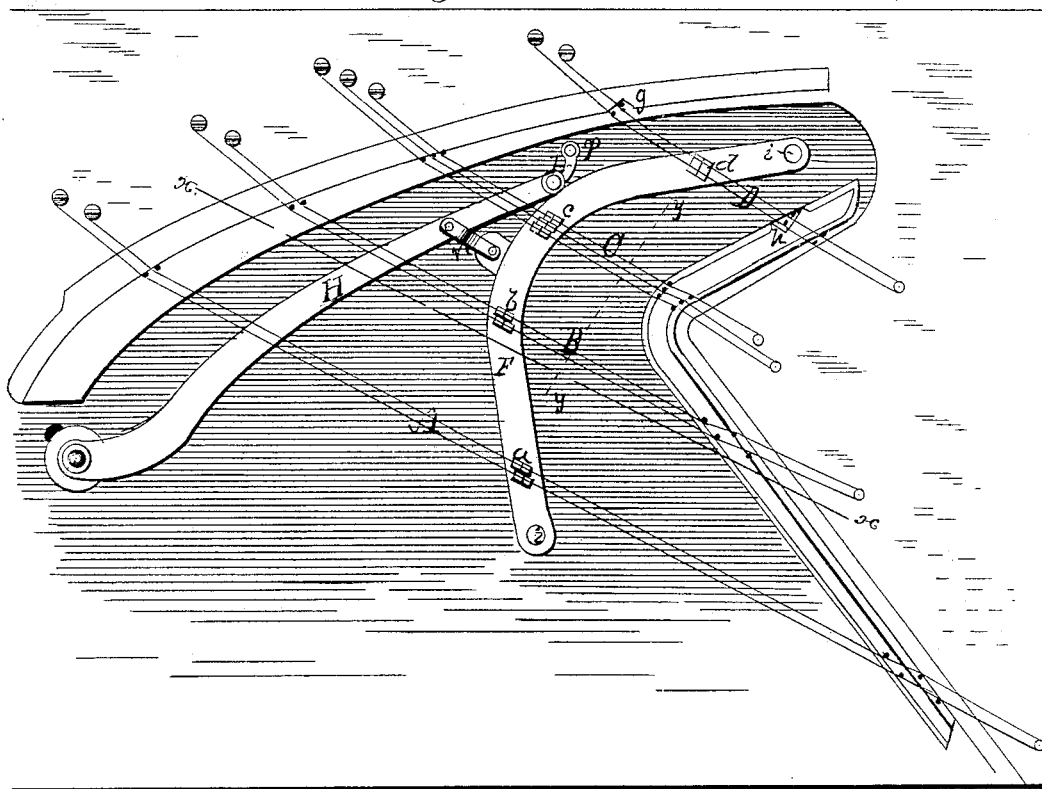


Fig. 2.

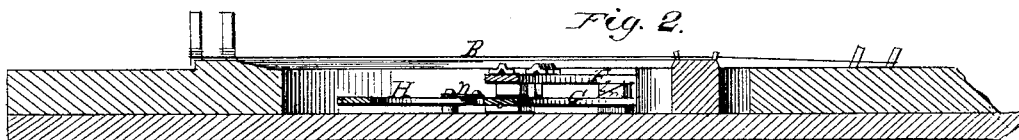


Fig. 3.



Fig. 7.

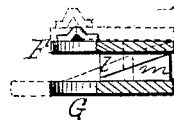


Fig. 8.

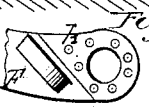
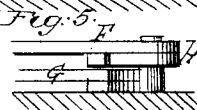
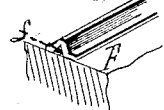
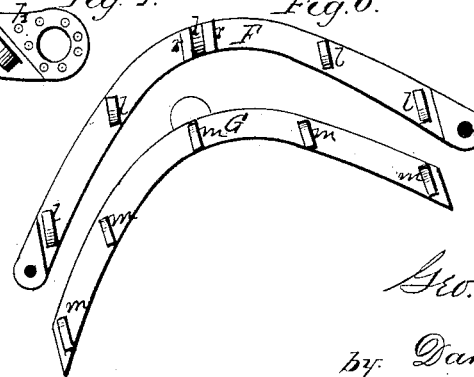


Fig. 6.



Witnesses
 Fred G. Dieterich
 J. H. Brown.

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 Geo. P. Roberts
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UNITED STATES PATENT OFFICE

GEORGE P. ROBERTS, OF COLUMBUS, OHIO.

IMPROVEMENT IN HARMONIC ATTACHMENTS FOR PIANO-FORTES.

Specification forming part of Letters Patent No. **218,900**, dated August 26, 1879; application filed April 28, 1879.

To all whom it may concern:

Be it known that I, GEORGE P. ROBERTS, of Columbus, in the county of Franklin and State of Ohio, have invented an Improved Harmonic Attachment for Piano-Fortes and other Musical Instruments; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification—

Figure 1 being a top view of parts of a piano-forte sufficient to represent my improvements; Fig. 2, a vertical section taken in a plane indicated by the line *xx*, Fig. 1; Fig. 3, a vertical section taken in a plane indicated by the line *yy*, Fig. 1; Figs. 4, 5, 6, 7, and 8, views of parts in detail.

Like letters designate corresponding parts in all of the figures.

My improvements consist, first, in features of construction and arrangement of the cushions of a harmonic attachment to adapt them fully and perfectly both to single wires or strings, or to two or more wires or strings in unison, on piano-fortes and other wire or string musical instruments to which such attachments are capable of application; and, second, in an improved means of operating and controlling the harmonic attachment, all substantially as hereinafter specified.

In the drawings, A B C D represent double and triple sets of unison-wires on a piano-forte, to illustrate the different constructions and arrangements of such musical instruments to which my improved harmonic attachment is fully adapted; and *a b c d* represent, respectively, harmonic cushions or cushion-sections, as adapted and applied to the several arrangements of the wires.

In practically adapting and applying harmonic cushions to the wires or strings of piano-fortes or other musical instruments, I have found certain difficulties to overcome and conditions to fulfill which are essential or very important to the production of full and clear harmonic tones. One important requisite to this end is that the surface of the cushion which comes in contact with the wires or strings shall be somewhat yielding or compressible, especially for the following reasons: First, since the heights or positions of the contact-

surface of the several wires or strings will with the best constructions vary more or less from the plane or other normal arrangement assigned to them, either from slight unevenness of the surfaces on which the wires or strings bear, or from various other causes; second, since the cushion or cushion-sections must bear with some degree of pressure on the wires or strings, and this pressure should be nearly equal on all the wires or strings to produce uniformity of tones; third, since a hard or unyielding surface produces a rattling or buzzing sound when the cushion is brought into contact with the wires or strings, and any such material consequently is unfit for the contact-surface of harmonic cushions, while on the other hand exceeding plasticity or compressibility is unsuitable for the contact-surface of harmonic cushions, because, by indenting too readily, such material does not press the wires or strings with sufficient force and firmness, and because, by indenting too deeply, the breadth of their contact with the wires or strings becomes extended beyond the limits which will produce perfectly pure and clear harmonic tones, as will be hereinafter set forth.

Among the substances which furnish a degree of compressibility and consistency between the extremes above defined, and which are more or less exactly suitable for this purpose, may be named soft india-rubber, leather of the softer kinds, and felt. The first-named material I find to be practically suitable for this use and durable.

Another desideratum in harmonic cushions I find to be that the cushions should yield to the contact with the wires or strings more readily and sensitively than the substance possesses which is suitable for the contact-surface, because the contact of the several cushions is more or less uneven and unequal from the causes above mentioned, and the proper consistency of the material for the contact surface is too firm to allow its indentation or compression to overcome this inequality. To obviate this difficulty I back the cushions with a material which is of a consistency and elasticity that will allow the required readiness of yielding, and yet retain a contact material of the requisite firmness, as above defined. For

this purpose the back of the cushion strip or strips, of india-rubber or equivalent surface material, is made hollow or with a groove or depression, as shown in Fig. 8 at *f*; and the cushion bridge or support *F* may be notched, grooved, or hollowed to enlarge the space for the reception of the backing material.

I find that felt fiber, fine wool, and other substances of like degree of elasticity and delicacy of yielding are suitable for this backing. I have before patented an air-back cushion for the purpose, and it is well adapted to this use, especially for the highest tones and most delicate cushions; but an elastic substance of solid form and of the consistency herein specified I find to be very desirable for grading the delicacy and adapting the harmonic cushions to different-sized wires.

I also find that there is a feature in the arrangement of the harmonic cushions in relation to the wires or strings which it is necessary to attain under all circumstances, both with single wires or strings and with groups or sets of two or more unison wires or strings, in order to produce perfectly clear and pure harmonic tones; and this is that, in addition to the requisite of their accurately crossing the wires or strings on their nodal points, the contact line or edge of the cushions should be at right angles, or very nearly so, to the line or axis of the wires or strings, though a variation of a few degrees therefrom may be admissible without serious detracton from the best effect. To effect this arrangement involves no difficulty where single wires or strings are used; but for unison sets, especially with the various constructions of piano-fortes, and the arrangement of the unison-wires therein, whether double or triple, more or less difficulty arises. When the wires run obliquely to the bridges and the unison-wires are of unequal lengths, as shown at *A B C* in Fig. 1 of the drawings, the cushions or cushion-sections *a b c* applied thereto I arrange in zigzag lines as to their edge or edges, as shown, and thus attain the desired right-angled position in relation to the wires. Where the bridge-rests of the wires are both at right angles to the wires, and the wires of the unison are of equal length, as shown at *g h*, of the unison-wires *D* in Fig. 1, the harmonic cushion *d* is continuous, and the edge of contact for both wires is in one straight line, as shown. At *A*, *B*, and *D* the cushions are arranged in relation to double unison-wires, and at *C* is shown the arrangement for triple unison-wires.

The harmonic cushions are mounted on a bridge composed of two sections—the upper section, *F*, to which the cushions are immediately attached, and which has a direct up-and-down movement under the wires or strings, to bring the cushions in contact therewith or withdraw the same therefrom, and the lower section, *G*, on which the upper section, *F*, rests, and by a lateral movement of which the said upper section is moved up and down. The up-and-down movement of the upper sec-

tion is guided, and the proper position of the section and its cushions is always maintained, by means of vertical pins *i i*, which enter holes in the said bridge-section, near the ends thereof, or by any equivalent or suitable means. There may be blocks *k*, Figs. 4 and 5, under the ends of the upper section, leaded as shown, to secure the prompt fall of the section when the other section is moved to allow the descent.

At several points under the length of the upper cushion bridge-section are secured transverse inclined planes or blocks *l l*, Figs. 3, 6, and 7, and corresponding inclined planes *m m*, reversed in inclination, are secured to the upper side of the lower bridge-section, and respectively separating the inclined planes *l l*, thus keeping the two bridge-sections parallel; and by these inclined planes the upper section is raised and lowered as the lower section is moved laterally. This lateral movement of the lower section is produced by connecting it, through a connecting-rod, *n*, with a lever, *H*, which has the same movement as the usual soft-pedal damper of piano-fortes, one end thereof being secured by a swing or shackle link, *I*, to a pin, *P*, on the rim of the sounding-board, while the outer end has connection with the pedal by means similar to the said soft-pedal damper, whereby the harmonic attachment is operated with the foot.

Guides *r r*, Figs. 3 and 6, on the two sides of one inclined plane, *l*, and reaching down beside the corresponding inclined plane *m*, keep the two bridge-sections in proper relative positions. The lower bridge-section is supported by buffed rests *s s*, Fig. 3, upon the sounding-board, which also supports the guide-pins *i i*.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a piano-forte or other stringed musical instrument wherein two or more wires or strings in unison are employed, zigzag or equivalent cushions arranged in relation to the said unison wires or strings, for producing both a right-angled and nodal or central contact thereon, substantially as and for the purpose herein specified.

2. In a piano-forte or other stringed musical instrument, a harmonic cushion whose outer or contact-surface is made of a material having the compressibility, as described, and back or beneath the same composed of a lightly-yielding elastic material, substantially as herein specified.

3. The combination of the two bridge-sections *E G*, provided with transverse inclined planes *l l m m*, and the lever *H*, operated by a pedal, substantially as herein specified.

The foregoing specification signed by me this 24th day of April, 1879.

GEO. P. ROBERTS.

Witnesses:

J. S. BROWN,
DANIEL BREED.