(No Model.)

L. S. BURRIDGE.

HARPSICHORD.

No. 264,856. Patented Sept. 26, 1882.

Fig. 1.

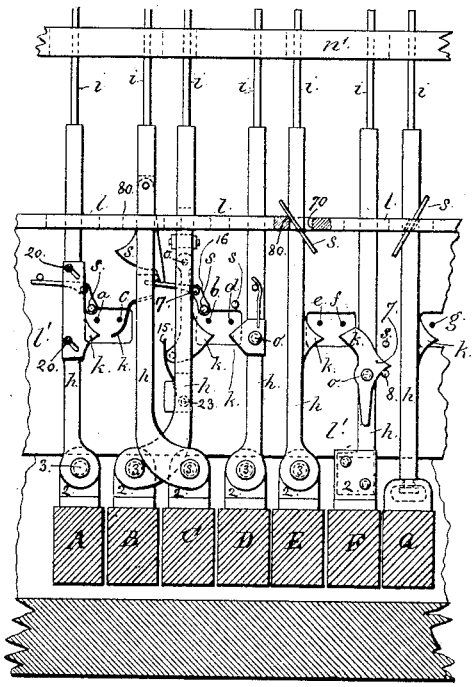


Fig. 2.

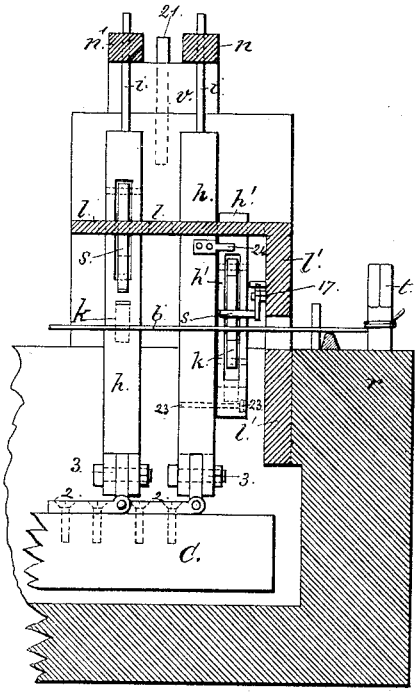


Fig. 3.

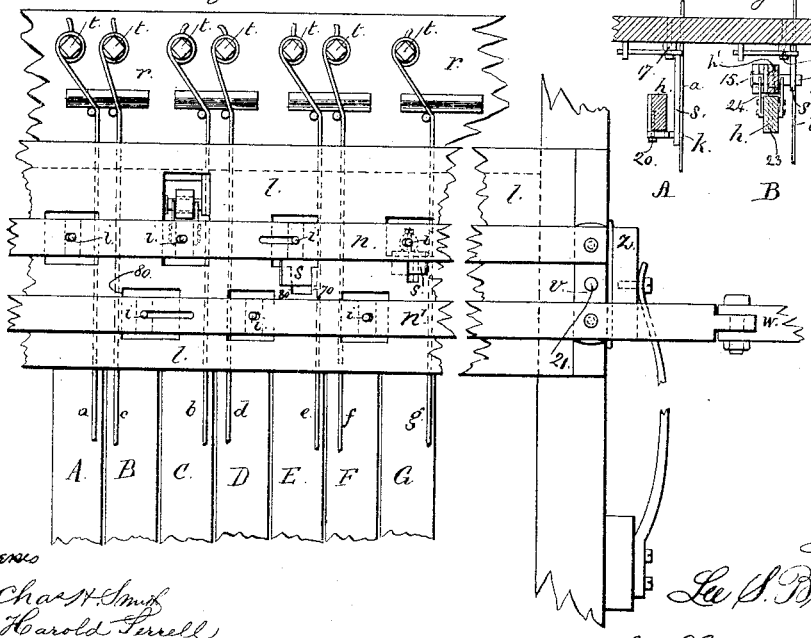


Fig. 4.

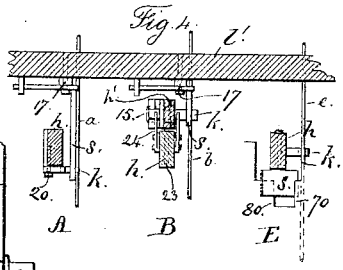
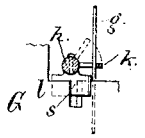


Fig. 5.



Witnesses
Chas. H. Smith
Harold Serrell

Inventor
Lee S. Burridge
per Lemuel W. Serrell
atty

UNITED STATES PATENT OFFICE.

LEE S. BURRIDGE, OF NEW YORK, N. Y.

HARPSICHORD.

SPECIFICATION forming part of Letters Patent No. 264,856, dated September 26, 1882.

Application filed January 3, 1882. (No model.)

To all whom it may concern:

Be it known that I, LEE S. BURRIDGE, of the city and State of New York, have invented an Improvement in Harpsichords or Similar Instruments, of which the following is a specification.

Harpsichords have been made with strings and keys, and picks operated by the keys to move the strings and drop them, so that they vibrate. These picks have usually been made of quills that bend in dropping the strings. These are liable to lose their elasticity, become injured, and are difficult to keep in order. Besides this, the pick passes beyond the string in picking the same, and as the pick returns it touches the string in reaching its normal position and checks the vibration, lessening the tone and giving a false sound. I employ switch mechanism for moving the pick back out of the way of the vibrating string when the key is returning to its normal position. I also combine with the pick and its jack a graduating-rod that is controlled by the pedal, so as to cause the picks to move the strings more or less before dropping them, thus increasing or diminishing the loudness of the tone.

In the drawings, Figure 1 is a vertical section transversely of several of the keys and strings. Fig. 2 is a section of the wrest-plank and guide-bar, and elevation of two of the jacks. Fig. 3 is a partial plan, showing portions of the graduating-bars, keys, and strings. Fig. 4 is a sectional plan, representing details of the picks and jacks used with keys A, B, and E; and Fig. 5 is a sectional plan of the jack and pick on key G.

It is to be understood that this harpsichord is to contain any desired number of octaves or notes, and that usually the strings will run in the same direction as the keys, and each string will be of a proper length and tension to produce the required tone. In some portions of the instrument the strings, being short, require a more sharp and sudden picking operation than the longer or bass strings.

I have represented various details in the shape and character of the picking devices and the switch mechanism, whereby the maker can select the particular mechanism that is best adapted to the space in which the mechanism is to be introduced, or to the leverage of the key, or the position of the string to the key.

In the drawings I have represented seven notes, and the keys are marked A B C D E F G and the corresponding strings are marked *a b c d e f g*. The keys are pivoted as in ordinary pianos, and the strings rest upon bridges and against pitch-pins, and are turned by the studs *t* in the wrest-plank *r*, as usual. Each key is provided with a jack, *h*, and a pick, *k*, and a switch mechanism, *s*, for causing the pick to return in a different path from the one in which it moved in picking the string, so as not to come in contact with the string and check or deaden the vibration thereof. The strings are placed together in pairs, so that there will be more space for the respective jacks than there would be if the strings were equidistant, as two jacks pass up in each wide space and act, one on the right string and the other on the left.

It is usually preferable to hinge the lower ends of the jacks near the inner ends of the keys by the butt-hinges 2, that allow motion in one direction, and by the joints 3, that allow the jacks to swing transversely to the keys. At the upper ends of the jacks they pass through mortises or openings in the guide-bar *l*, that is supported by *l'* at or near the edge of the wrest-plank and above the strings. The support *l'* is preferably against the vertical face of the wrest-plank *r*, and there are openings in *l'* for the strings to pass through freely.

Upon the side of the jack *h* which is connected with the key *c* is the pick *k*, in the form of a curved piece of metal. This is available with cat-gut strings, but is objectionable with metal strings, unless coated with parchment or similar material. For metal strings I use a pick of india-rubber or similar material in a triangular form, as shown at *k*, on the jack of the key B; or the pick may be on the pivoted stocks that are represented as attached to the jacks of the keys B D F. With these keys the pivots *o* allow the pick to swing upon the jacks, and in order to deflect the picks away from the strings as the jacks descend I employ the switch-pins *s*. The switch-pins that act with the keys D F are stationary. They project from the vertical part *l'* of the guide-bar *l*. The pick of the key F is pivoted, and the switch-pin *s* acts to swing it laterally after the pick has acted upon the string, and as the key is released and its inner end and the jack descend the point of the pick will be sufficiently

far from the vibrating string not to touch the same; but the pin 8, coming in contact with the projection 7 as the pick descends, swings the pick back beneath the string. The pick *k* on the jack of the key D is also pivoted, and it is provided with a spring pressing against a stud on the jack, but which spring allows the pick to yield in passing the string and the switch on the up movement. The switch *s* swings the pick up and back as the pick and jack descend, turning the spring back from its stop. The pick swings back to place under the string by the action of gravity, the point of the pick being the heaviest.

The switch *s* is upon the jack of the key E, and the jack itself swings laterally to keep the pick clear of the string as it descends. The switch *s* in this instance is in the form of an inclined plate, which, after the jack has been lifted sufficiently to cause the pick to pick the string *e*, comes in contact with the stationary part 70 of the guide-bar *l*, or against a pin at said place, and the jack is pressed aside laterally to the left and descends with the point of the pick clear of the string *e*, and as soon as said point of the pick is below the string the jack and pick are moved to the right by the inclined switch *s* coming into contact with and sliding down the stationary projection at 80.

It will be seen that the jacks of the keys, especially of B and C, are not in the same transverse plane, one being behind the other, and such jacks are curved and inclined toward the right and left, so that their weight will tend to make the jacks fall toward their respective strings *b c*. The switch *s* of the jack on the key C is in the form of a hanging cam, the lower end of which is inclined. As the key is struck and the jack lifted the cam swings clear of the contact-point 80, but, rising above it as the note is sounded, said switch swings to the left, and as the key descends the inclined surface of the switch slides down said point 80, carrying the jack to the right and causing the point of the pick to clear the string. When the switch slips off the point 80 the jack falls by its weight to the left and swings the point of the pick beneath the string, ready for the next movement of the key. The pick *k* of the key B is pivoted above the string, and a muffled spring, 15, presses the pick out toward or beneath the string, and the pick lifts the string and sounds the note. As the key is struck the pick-spring 15 yields to allow the string to slip off the end of the pick and the pick passes above the switch-pin *s*. This pin may either be a fixture in *l'*, or it may be at one end of a bent lever, 16, that swings on the fulcrum 17 on *l'* as the pick passes up above the pin *s;* but said pin swings back beneath the pick before the jack drops, and causes the inclined lower surface of the pick to move back toward the left, the pick swinging on its pivot, or the jack itself swinging, so that the point of the pick is clear of the vibrating string *b*, and passes below the same. This pick *k* is shown in a mortise in a supplemental jack, *h'*, that is pivoted at 23 to the jack *h*, and a regulated amount of swinging motion is allowed to this supplemental jack *h'* between two fingers, 24, that project from the jack *h*. The supplemental jack and the pick fall toward the string because the principal weight is that side of the pivot 23, and they yield and swing back by the action of the switch *s*. The action of the pick *k* on the jack of the key A is the same as last described, the switch-pin *s* causing the pick to move toward the left as the jack descends, in consequence of the pins 20 on the jack running down the inclined slots in the body of the pick, as said pick is partially supported by the switch-pin *s* swinging below the point of the pick. If small cranks of wire took the places of the slots and pins, the action of the parts would be the same.

In some places on the harpsichord, particularly in the treble, the pick requires to be rigid and have but little lateral motion. For these places I employ the rotary jack *h*, as shown upon the key G. This jack is free to move up and down in a hole in the guide-bar *l*, and the lower end is formed as a vertical pivotal attachment to the key G.

The switch *s* is similar to that upon the jack of the key E; but as there is no space in the guide-bar *l* for the lateral movement of the jack, said inclined switch only acts to give a partial rotation to the jack as it rises to turn the pick aside after the string has been picked. The reverse turning movement as the key descends turns the pick back beneath the string.

The loudness of tone depends upon the extent of lifting action of the pick. I therefore arrange that the pedal when depressed shall swing the jacks and move the picks farther across below the strings to increase the hold of the pick on the string when the former is lifted and increase the picking action and loudness of the instrument. A second pedal may be used to move the graduating-bars the other way and render the sound soft.

The jacks are arranged in two transverse planes. Those that act to the left on the strings are in one plane; those that act to the right are in the other plane. I provide upon all the jacks that are to be connected with the pedal a vertical pin, *i*, at the upper end of each, and these pass into slotted holes in the graduating-rods *n n'*, the pins of A B E G passing through the graduating-bar *n* and the pins *i* of C D F passing through *n'*. The holes in these bars *n n'* not only allow the pins *i* to move vertically through them freely, but also allow of the lateral motion if the jack swings away from the string, and the ends of the slots in these graduating-rods determine the distance the picks shall swing in under the wires. Hence when end motion is given by the pedal to these bars in opposite directions the loudness of tone is regulated. I prefer to connect the graduating-bars at each end by the short oscillating links *v* on pivots 21, and apply the

pedal-lever *w* to the end of one of the graduating-bars to move the same. A spring-bearer, *z*, acting against one of the links *v*, restores the parts to their normal positions when the pedal is relieved.

If the guide-bars are made of two longitudinal strips and connected in a similar manner to the graduating-bars, so as to be moved by one or more pedals, they may perform the duty of graduating-bars as well as guide-bars.

I am aware that a finger has been used to vibrate a metal tongue, and that such finger has returned to the normal position without touching such tongue. In a string the vibration is very different from that of the metal tongue. Such tongue vibrates only in one direction; the string vibrates laterally in all directions. Hence the pick has to be drawn away, not from the string alone, but from the entire path in which it may vibrate; otherwise it will not clear the string on the return movement. Furthermore, the pick must have an inclined end; otherwise it will not separate from the string. This is not the case with the finger and the metal tongue, as they separate in consequence of the arcs of circles described by each.

I claim as my invention—

1. The combination, with the string in a harpsichord or similar instrument, of a pick with an inclined end to act upon the string, a jack to which such pick is pivoted, a key to move the jack, and a switch to withdraw the pick out of the path of the vibrating string, substantially as set forth.

2. In a harpsichord, the combination, with the keys, jacks, and picks, of strings placed near each other in pairs, with wide spaces between the pairs of strings for the jacks and picks, acting alternately to the right and left, substantially as set forth.

3. The combination, with the keys and the strings placed together in pairs, of the two jacks acting in the space between the two pairs of strings, one jack being in front of the other, substantially as set forth.

4. In a harpsichord, the combination, with the keys and strings, of the jacks and picks arranged in two planes transversely to the keys, so that the picks on one range of jacks act toward the left on the strings, and the picks on the other range of jacks act toward the right on the strings, substantially as specified.

5. In a harpsichord, the combination, with the keys and strings in pairs, of the jacks having curved lower ends, hinges for connecting the jacks to the keys, picks upon the jacks, and the guide-bar *l*, substantially as set forth.

6. The combination, in a harpsichord, of the keys, jacks, and picks with the graduating-rod and pedal-connection, whereby the picks are moved in their relative positions to the strings, for the purposes and substantially as set forth.

7. In a harpsichord, the graduating-bars *n n'*, connecting pivoted links, and pedal-connections, in combination with the jacks, picks, and keys, substantially as and for the purposes set forth.

8. The combination, with the keys and strings, of picks and jacks, the latter pivoted to the keys and the former to the jacks, so as to swing laterally toward the strings by their own weight, substantially as set forth.

9. The combination, with the keys, and jacks hinged to the keys, of picks formed of rubber, and having an inclined surface to act upon the string, substantially as set forth.

10. The combination, in a stringed instrument such as the harpsichord, of picks to act upon the strings, means for preventing the picks coming into contact with the string on the return motion, and graduating-bars or their equivalents to modulate the action of the picks upon the strings, substantially as set forth.

Signed by me this 28th December, A. D. 1881.

LEE S. BURRIDGE.

Witnesses:

GEO. T. PINCKNEY,

WILLIAM G. MOTT.