C. BROWN.

Key-Board for Musical Instrument.

No. 205,044. Patented June 18, 1878.

FIG. 1.

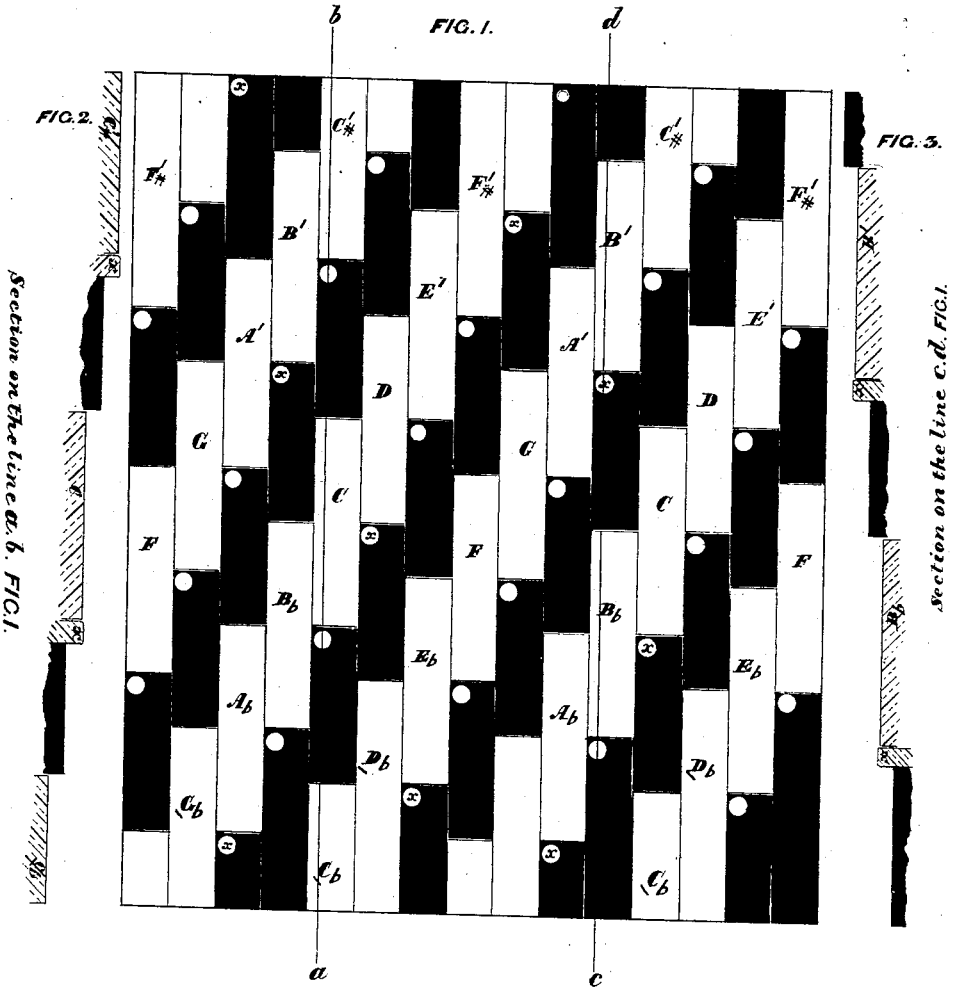

FIG. 2.

Section on the line a. b. FIG. 1.

FIG. 3.

Section on the line c.d. FIG. 1.

Witnesses:

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IMPROVEMENT IN KEY-BOARDS FOR MUSICAL INSTRUMENTS.

Specification forming part of Letters Patent No. **205,044**, dated June 18, 1878; application filed August 21, 1876.

To all whom it may concern:

Be it known that I, COLIN BROWN, of Glasgow, in the county of Lanark, North Britain, have invented Improvements in Musical Instruments having Key-Boards, of which the following is a specification:

This invention has for its object the playing of the musical scale in any and every key with just or perfect intonation on instruments requiring key-boards or finger-boards.

This object is accomplished by reconciling or adjusting the mathematical and musical proportions or relations of the sounds of the harmonic series, and of the musical scale in all keys, by means of a new or improved key-board or finger-board, constituting my said invention, and which I have termed the "Natural Finger-Board."

On the sheet of drawings hereunto appended, Figure 1 is a plan of the new or improved finger-board constituting my said invention, Figs. 2 and 3 being transverse or vertical sections of the same on the lines *a b* and *c d*, respectively, on Fig. 1.

In the subsquent parts of this specification the words "key" and "keys" are employed as indicating pitch, and not as referring to the finger-pieces which are acted upon by the player in producing tones or sounds from the instrument.

The finger-board is the system of finger-pieces, otherwise called "digitals," by which performers play on instruments having key-boards or manuals, such as organs, pianos, and harmoniums.

The digitals on the new or improved finger-board constituting my said invention are arranged on the principle that any musical sound at any fixed or absolute pitch (say, on the key of C at the assumed pitch of two hundred and fifty-six vibrations in a sound) forms an integral part of the musical scale in four separate, but immediately-related, keys. For example, in the key of C this sound of two hundred and fifty-six vibrations is the first sound of the scale, or the tonic. In the key of F the same sound of two hundred and fifty-six vibrations is the fifth sound, or the dominant. In the key of G the same sound of two hundred and fifty-six vibrations is the fourth sound, or the sub-dominant; and in the key of B-flat this same sound is the second sound, or the super-tonic. Thus any one sound at the pitch of any given tonic or key-note in the same manner forms an integral part of the scale in four keys immediately related to each other—namely, the first, second, fourth, and fifth sounds in such scales, respectively.

Further, a second sound at the absolute pitch of a major third above any given tonic, say of the previous example of two hundred and fifty-six vibrations, and in that case vibrating three hundred and twenty times in a second, or in the ratio to each other of five to four, represents or forms an integral part of the scale in three separate and immediately-related keys. Thus, this second sound becomes the third sound in the key of C, or the mediant, the sixth sound in the key of G, or the sub-mediant, and the seventh in the key of F, or the leading note.

The two digitals of the finger-board by which the two sounds hereinbefore referred to by way of example are produced thus represent between them the seven sounds of the diatonic scale, 1, 2, 3, 4, 5, 6, 7, in different keys.

The digitals of the new or improved finger-board constituting my said invention may be made of any convenient length.

In the said sheet of drawings an inch of the scale to which the drawing is made is allowed for the scale in each key of which the digital is a portion. Thus, the digital representing one sound in four keys is four inches long, and the digital representing one sound in three keys is three inches long, and these two digitals, everywhere taken together in a line of seven inches, produce the seven sounds of the scale in the several related keys, in the following order:

Digital of four inches in length, or the white digital.

In the key of—	B-flat	F	C	G
This digital represents the	2d, or Re	5th, or So	1st, or Do	4th, or Fa

Digital of three inches in length, or the colored digital.

In the key of—	D	A	E
This digital represents the	7th, or Te, or Si	3d, or Me	6th, or La

Or, when read in the opposite direction, as follows:

Digital of three inches, or the colored digital.

In the key of—	E	A	D
The digital represents	6th, or La	3d, or Me	7th, or Te, or Si

Digital of four inches, or the white digital.

In the key of—	G	C	F	B-flat
The digital represents	4th, or Fa	1st, or Do	5th, or So	2d, or Re

These digitals, representing each a series of four or three tones or sounds in different keys, are or may be distinguished from each other by any color or colors, or by any distinguishing mark or marks.

In the further description of my said invention it is assumed that the digitals of one set are colored white, those of the other set being black, as indicated on Fig. 1 of the drawings.

Having provided a sufficient number of digitals of both colors, they are laid side by side, in the manner shown at Fig. 1, and in the order of the musical scale 1, 2, 3, 4, 5, 6, 7, and so on, each number coming in its natural order, thus forming a finger-board on which the musical scales in various keys are found in due order, reading along the finger-board from left to right, as in the drawing, or vice versa, if so read, and the various keys are arranged side by side in parallel lines, looking across the key-board from front to back, or vice versa, such keys rising above each other in their natural order or succession by intervals of one-fifth, or falling below each other by intervals of one-fourth, of the musical scale.

The finger-board, when so constructed, (and when the instrument has been tuned throughout by intervals of perfect fifths in the ratio of two to three vibrations, and the different sets of digitals connected by perfect major thirds in the ratio of four to five vibrations, say the colored set connected to the white set, and the separate digitals hereinafter described as providing the leading note or major seventh in the minor scale connected to the colored set,) presents the following results: Looking along the finger-board in every key, the intervals of the major-scale are as follows: From the first to the second, from the fourth to the fifth, and from the sixth to the seventh sounds the intervals are large tones, or steps in the ratio of eight to nine vibrations; from the second to the third, and from the fifth to the sixth, the intervals are lesser tones or steps of nine to ten vibrations; from the third to the fourth, and from the seventh to the eighth, the intervals are small tones, (semi-tones,) vibrating as fifteen to sixteen with each other, the series being eight to nine, nine to ten, fifteen to sixteen, eight to nine, nine to ten, eight to nine, fifteen to sixteen, the relations of the scale in every key being the same, looking from left to right along the finger-board. From white to white digital, or from colored to colored digital, as in the said drawing, Fig. 1, the interval is always eight to nine, from white digital to colored digital always nine to ten, and from colored digital to white digital always fifteen to sixteen, the scale in each key being read in direct line.

Looking from front to back across the finger-board from the end of every white digital, as in the drawing, to the end of every colored digital next above in line, the interval is that of a chromatic semi-tone, or chroma, one vibrating with the other as one hundred and twenty-eight to one hundred and thirty-five times; and from the end of every colored digital to the end of every white digital immediately above it in line the relation or difference is that of a comma of eighty to eighty-one vibrations. Thus, looking across the finger-board, at the digitals endwise from white to colored, the interval is always that of a chroma, and from colored to white always that of a comma, chroma, and comma, or comma and chroma alternately.

It may further be noted that on my finger-board the schisma of the scale, being as thirty-two thousand eight hundred and five to thirty-two thousand seven hundred and sixty-eight vibrations, or a difference of thirty-seven, will always be found between every two scales at a distance of eight keys or removes, inclusive. Thus between E-flat and D-sharp in the key of E this interval appears, and the same will be found in all other similar positions.

As a result of the arrangement above described, the progression of the fingering of the scale in all keys is the same, the first, second, fourth, and fifth sounds of every scale being produced by the white digitals, and the third, sixth, and seventh sounds by the colored digitals, arranged as shown in the appended drawings.

The instrument may be so constructed that either side of the new or improved finger-board can be turned toward the performer, so that the different keys of the scale may proceed in a progression of musical fourths or fifths from the front to the back of the key-board. The digitals may also all be placed on the same plane or level, or in an inclined or sloping position; or, as shown under one arrangement at Figs. 2 and 3 of the drawings, they may, as a matter of convenience, and for the more easy distinction of the keys, gradually rise above each other, thus giving different levels to the finger-board at every comma, and at every chroma there being a rise of level (more or less) throughout as the keys go backward from the player.

It is a peculiarity of my said invention that no separate digitals similar to the five black digitals of the ordinary key or finger board are required to produce the chromatic tones or sounds of the major scales. The seventh tone or sound of the scale in each key is the acute, or sharp tone or sound in its own scale;

and the fourth tone or sound of the scale in each key is the grave, or its flat tone or sound, and these are utilized for the chromatic tones or sounds in the other scales or keys. For this and other reasons the finger-board constructed as hereinbefore set forth is called the "Natural Finger-Board."

In every case it will be found that, passing upward (in the arrangement of finger-board hereinbefore described) from the white to the colored digital immediately above it, the interval is the chromatic sharp tone or sound in every key; and, vice versa, passing from the colored to the white digital immediately below it, the chromatic flat tone or sound is found in the various keys.

While the chromatic tones or sounds of the major scales are thus provided for, a separate digital, either round or of any other form, is introduced between the fifth and sixth digitals of each major scale, as seen at *x*, Fig. 1 of the drawings hereunto appended. This separate digital is tuned in the ratio of fifteen to sixteen vibrations to the sixth of the major scale, or tone or sound immediately above it, and in the ratio of twenty-five to twenty-four vibrations to the fifth of the major scale, or the tone or sound immediately below it. The digital *x*, so tuned, gives the true leading tone or sound, or the major seventh, to the tonic of the relative minor scale of each key; and the similar digital belonging to the key or scale two keys or removes off, and lower—say, as from key C to key B-flat—being in the relation of eight to nine to the seventh, above described, gives the true sharpened sixth to the same relative minor scale, these two digitals thus introduced completing (and perfectly) the modern or ordinary form of the minor scale—say, 1, 2, 3, 4, 5, 6, sharp 7, sharp 8.

The finger-board formed as hereinbefore described may be extended through any desired number of keys on an instrument tuned in the manner described, and, if colored, presents a marked symmetry throughout. Further, if not all on one level, it presents a series of levels regular in order, but irregular in the edges formed by the longer and shorter digitals.

In the drawings hereunto annexed, the white and colored digitals are, respectively, four and three inches long of the scale to which the drawing is made, thus giving an inch for each key represented by the digital; but in order to reduce as much as possible the difference in the lengths of the digitals, and thereby produce the greatest average breadth on each level, so that the keys may be brought as much as possible within the compass of the hand of the player, the longer digitals may be reduced in length, or the shorter ones increased, and that in whole or part, as may be found convenient; or any digitals may be lengthened in part of their breadth, so as to overlap those next above or below. They may also be increased or diminished in breadth, if found necessary or wished; and coloring may be applied and varied in any way to distinguish the different notes of the scale, or to distinguish the different keys from each other.

The finger-board constituting my said invention may be extended to any desired number of keys, and to any number of octaves in such keys, and be adapted to any instrument wherein one or more finger-boards are required.

For the purpose of producing musical sounds by the operation thereon of the player, a reed, string, pipe, or other sounding medium, or several of each, if desired, is provided in conjunction with each digital of the new or improved finger-board; and the mechanism connecting the digitals with the sounding medium may be similar to that in common use, or modified to suit the requirements of each instrument.

Should, in any circumstances, the scales and keys of the instrument, as before described, be read in reverse order to that represented on the said sheet of drawings—say, the scales from right to left, or the order of the keys from back to front—necessarily the reading of the various relationships of some or all of the notes and keys to each other used in this specification will also require to be inverted.

I claim—

1. The hereinbefore-described key or finger board for musical instruments, composed of digitals adapted for the production of the tones or sounds of the musical scale in perfect intonation, relatively arranged as shown and set forth, whereby any one of said digitals falls in one line running lengthwise of the finger-board with all the other digitals, which, (in any key in which the sound produced by this one digital forms one note,) together with this one digital, forms a musical scale, as specified.

2. The key or finger board for musical instruments, composed of digitals adapted for the production of the tones or sounds of the musical scale in perfect intonation, arranged in a series of rows transversely of the finger-board, any one digital in one row differing from the next digital in the same row toward the front of the finger-board by a comma, and from the next digital toward the rear by a chroma, or the reverse, and each of the digitals composing the key or finger board falling in one line running lengthwise of the finger-board with all the other digitals, which, (in any key in which the sound produced by this one digital forms one note,) together with this one digital, forms a musical scale, as shown and set forth.

In witness whereof I have signed my name to this specification in the presence of two subscribing witnesses.

COLIN BROWN. [L. S.]

Witnesses:
WILLIAM BALFAUR,
HUGH CAMERON.