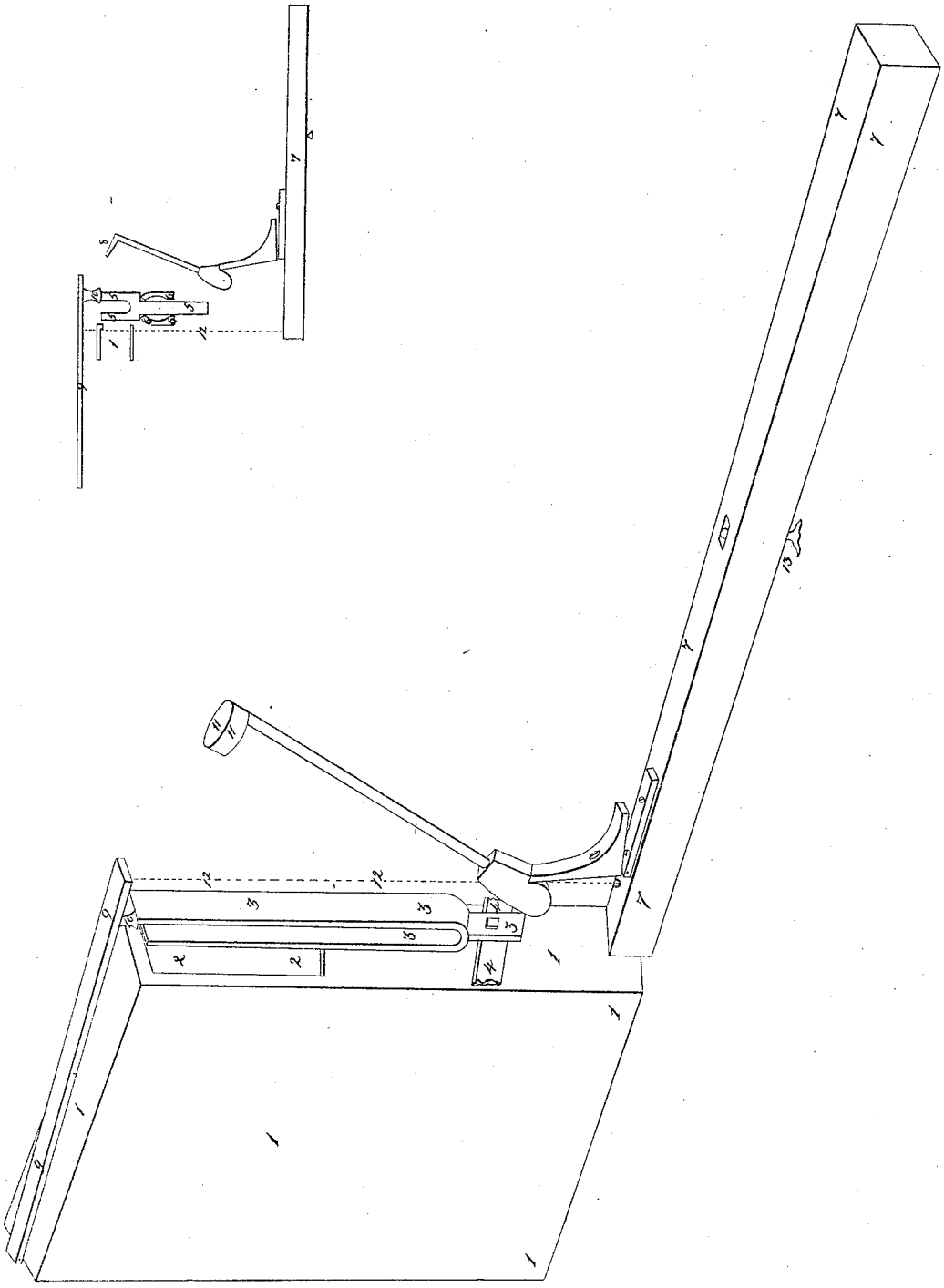
2 Sheets—Sheet 1.

U. C. & C. F. HILL.

MUSICAL INSTRUMENT.

No. 5,164. Patented June 19, 1847.



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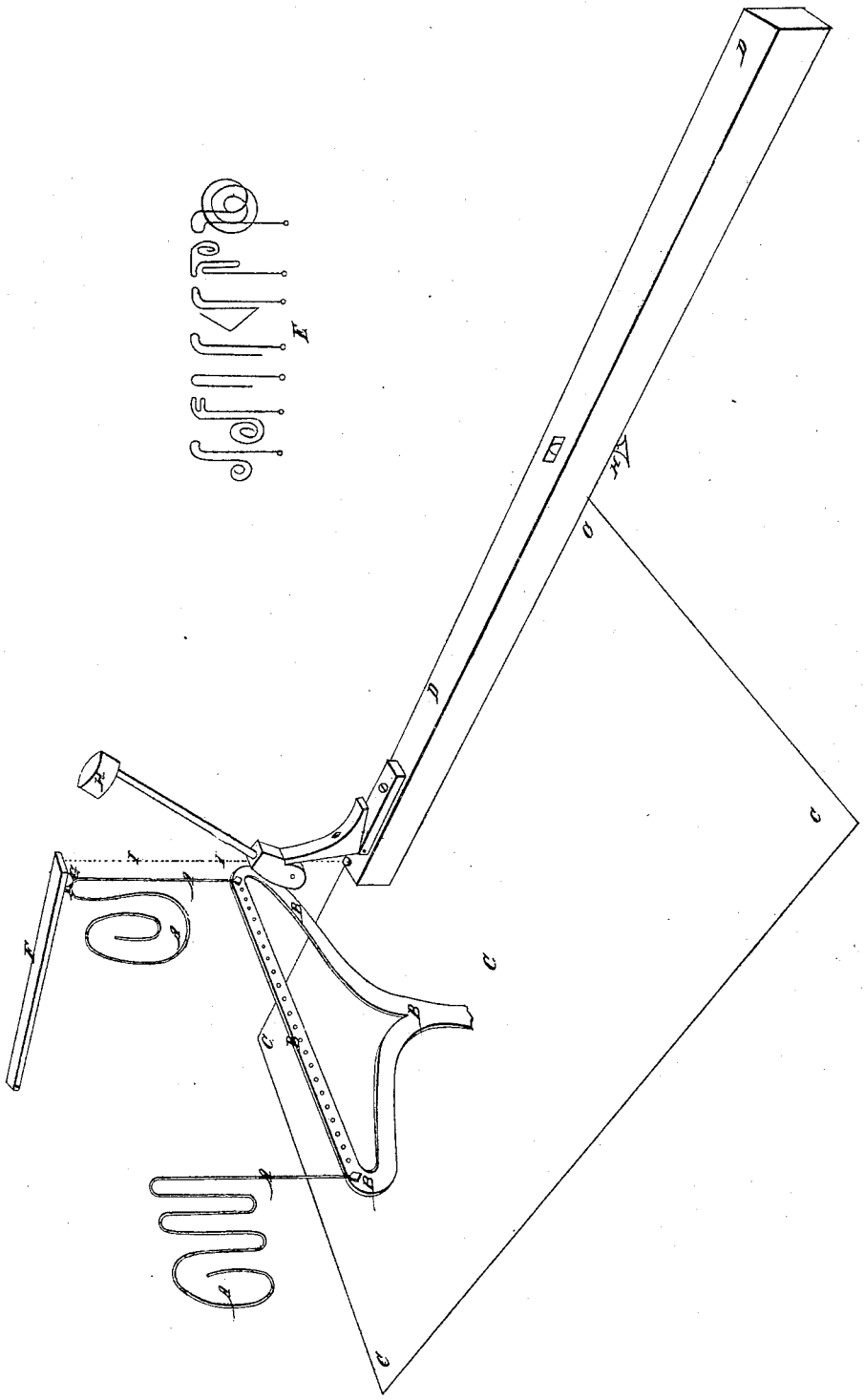

UNITED STATES PATENT OFFICE.

U. C. HILL AND C. F. HILL, OF NEW YORK, N. Y.

MUSICAL INSTRUMENT.

Specification of Letters Patent No. 5,164, dated June 19, 1847.

To all whom it may concern:

Be it known that we, URELI C. HILL and CHARLES F. HILL, of the city, county, and State of New York, have invented a new Musical Instrument, which we have named the "Hilleno"; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings.

The principles used to produce the sounds in this instrument are these: Forks, like the ordinary tuning-fork, vibrate over apertures in chambers of air; and springs, which are wires bent and fastened at one end to a conductor or rack, vibrate on a sounding board. The forks are used in the treble, middle, and part of the bass; the springs complete the lower part of the scale. Keys and action nearly as those of the upright piano are used to set these springs and forks in vibration, or the whole may be put to a horizontal action. If a pitch middle C tuning-fork vibrate over the mouth while open to a certain capacity, a strong tone will be given, and as the mouth is opened to more, or closed to less than that given capacity, the tone of the fork will be impaired, for the capacity of the mouth would thus become too small or too large for the C. fork, though not for a higher or lower note than C. The larger capacity would require a lower fork, and the smaller capacity a higher fork.

Cells, or chambers. See Figure 1, Drawing 1.—The materials of which the chambers may be made are various. Wood, metal and glass we have found to answer nearly equally well. The apertures or mouths (Fig. 2, Drawing 1) in the chambers may be about half the length and about the width of the prongs of the forks corresponding to them, (see Fig. 3, Drg. 1). We have not found thin wood (like veneer), or thin lead, or common tin to answer well, only for the small chambers; the larger chambers want thicker or stiffer material. In the Hilleno for compactness and facility we use chambers, narrow and square, unless in the upper notes, where holes cut or bored through a block of wood in a line with the lower chambers, we find simple and satisfactory. These chambers or cells when all glued and put together we call a stack,—the larger end of which contains the bass (or lower) chambers, and the small end the treble chambers. We find that two forks, a semitone apart will do, over one chamber, by having the chamber of a tone between the adjoining semitones, which would give six chambers to the octave; but in the upper notes we prefer a chamber to each note, as the width of the key gives room enough for doing so; and by widening the action, single chambers may be applied to every semitone. In this stack we find the right hand side of a chamber to do for the left hand side of the chamber above. In making these chambers of wood, the material ought to be no less than a quarter of an inch thick, especially in the lower ones. Perhaps the chambers are best in the larger ones if tight, only opening at the apertures or mouths for the forks. (Though they may be open at both ends, especially in the high notes.) And a hole or two may be bored in the rim of the chamber to raise the pitch of it. Thus, a chamber for middle "C," might be raised to the "D," above; or by thinning the side of the C. chamber it may be flattened to B or B. flat. If a chamber be stiffened by a bar, or bars, or by a post or firm connection of the sides, it raises the pitch of it. The pitch of a chamber may be found by blowing in the aperture, or by striking the side of it. The aperture or mouth to the chamber may be through a short tube or neck to the prong of the fork. The fork should be quite close to the aperture, as represented in Fig. 2, Drg. 1.

Forks and fork-rail. See Figs. 3 and 4, Drg. 1.—The forks in the Hilleno are nearly like the ordinary tuning-fork. The shaft (or handles) we prefer flat or square. The lower forks are longest, gradually decreasing until they become very short in the higher notes. The fork may have prongs about five inches long, $\frac{3}{8}$ of an inch wide, $\frac{1}{10}$ of an inch thick and $\frac{1}{2}$ an inch apart; with a shaft or handle three inches long, $\frac{1}{8}$ inch thick and same width as the prongs. The forks at about middle A or C. may be nearly like the common tuning fork; and the same may be used to the top of the scale by shortening the prongs, (Fig. 5, in Drawing 1). From about 7th leger line treble F to the top of the scale, a shoulder, (Fig. 5, Drg. 1,) may be of service delicately to suspend, or hold them. The forks from about said F on 8th leger line to the lowest fork, may be screwed or fastened to an iron, brass, or perhaps wooden, rail, (see Fig. 4, Drg.

1,) an eighth, or a quarter of an inch thick, and ¾ of an inch wide in the bass, and gradually lessening toward the treble. The forks from about said F to the top of the scale, ought to be lightly held in a socket (see Fig. 6, Drg. 1,) (or by small wires or cord.) The ends of the shafts, or handles, should not touch anything, especially in the upper forks. The fork rail stands obliquely, to bring the top of the forks in a horizontal line, and the forks are arranged on the rail, to correspond with the keys and hammers (see Figs. 7, 8, and 11, Drawing 1, and letters D, E, and H, Drawing 2.) Leather or cloth between the rail and forks prevents in a measure unnecessary noise from the stroke. The rail should be supported on unvibrating material as cloth, or the like to prevent noise and yet be firm to prevent the fork from touching the chamber, which it should be near to. The forks are arranged perpendicularly at the back ends of the keys; the prongs point upward and match the upper line of the apertures in the chambers behind them.

Springs, spring-rack, and sounding-board. (Letters A, B, and C, Drg. 2.)—Where the forks become hard to agitate and the chambers inconveniently large, springs are used to complete the scale. The springs are best of steel wire, and the wire becomes longer as the tones descend, though the same wire being differently bent will give different tones. A wire about fifteen inches long and about ⅛ inch diameter by being bent somewhat in the form of the right hand spring, Drg. 2, letter A, might give bass 3 line D or the E or F above and by cutting off at the end, the tone would rise; or by filing it thinner it may be lowered, so of other forms. About three feet of the same wire may be bent into larger circles, or parallels as A, A, Drawing 2, and may produce about the low C of the grand piano; but the vibrating forms of springs used are very various. (See E, Drg. 2.) If two wires are the same in length and in form, but of different sizes, the large wire tends to the higher sound, and the small wire to the lower sound. A spring that does not sound well, may by some slight difference in the bending be greatly improved. These springs at one end are firmly fastened to a rack by rivets or screws at the same distance apart as the width of the keys, where one spring is used to each note. This rack (see letter B, Drawing 2) is placed on a sounding board which lies in the bottom of the instrument, and under the keys (see letter C, Drawing 2) and the springs rise perpendicularly for about six or more inches above the fastenings, until in a horizontal line with the forks, where the springs bend toward the back of the instrument into their various forms.

Dampers and general bringing together of the parts. See Fig. 9, Drwg. 1, and letter F, Drawing 2.—The dampers (see Fig. 9, Drg. 1, and letter F, Drg. 2,) are hinged on a frame at the back and top of the instrument. They are horizontal, and at right angles with the back near which they are hinged. They are about of equal lengths, and on the lower side of the front ends are the damper heads 10, Drg. 1, and G, Drawing 2, which fall on the horizontal line and ends of springs and forks. Under the dampers and back of the forks are placed the chambers. Just under and before the damper heads and horizontal line of the forks and springs are the hammer heads, (see Fig. 11, Drg. 1, and letter H, Drg. 2,) each hammer head fronting a fork or spring. Perpendicularly under the dampers and hammers and in front of the line of springs and forks are the keys No. 7, Drg. 1, and D, Drg. 2. From the back end of the keys, to the front end of the dampers above, are damper wires No. 12, Drg. 1, and I, Drg. 2, which as the back ends of the keys rise, lift the dampers off the springs and forks by the same motion that throws the hammers against them. The action used in illustration is like the upright cottage piano and the tones correspond with the key board in chromatic succession.

Sundry additional remarks.—The hammer heads in the bass are soft, gradually hardening, until near or above 7th leger line treble F. A point of metal or wood covered perhaps with parchment will bring the best tones. The upper forks (above the piano compass or scale) depend much less on the chambers than those below. The upper chambers though smaller than ladies' thimbles, yet improve the tones some. Chambers may be applied to the springs; but we have not found them of much importance. If a small weight be fastened on the loose end of a spring it will lower its tone, but probably impair it. Lower springs may, or may not be wrapped with covering wire. Chambers or cells may be of almost any hard material and of almost any form, the spherical form perhaps being best; but the narrow form most compact. The same capacity of different materials of different resistance gives different tones. So the form of the chamber in the same capacity we believe gives different effects. The soft pedal may be produced by interposing something soft between hammers and springs and forks; or by moving the boxes from the forks. Without spreading the keys, the chambers may be conveniently used to 2d space base C. The springs can as conveniently be carried to the octave above.

The cells, we call single, double, open and close, the single cell has one note, or fork—the double cell has two notes, or forks:

the open cell, by being open at each end, the vibrations pass through it. The close cell, having but one opening, the vibrations return to that opening. A stack of cells may be constructed thus: From the C, in the second space in the bass—or from the F, on the fourth line—to the C, above, double close cells may be used. The backs of these cells may be movable, but must fit tight, in order to raise, or lower the pitch of each. Tune each cell to the lower of its two tones, then over the key to the lower of the two tones, have a hole in the bottom of the cell which shall raise the pitch to the upper of its two notes. In striking the key of the lower tone it must close the hole that produces the upper tone of the two. Then continue up an octave with close double cells, each tuned to the tone between adjoining semitones, without the semitone holes below. For the third octave have either double, or single cells, close, or open. For the remainder have single open cells, and use them to above the high C of the grand piano. The smaller the mouth of a cell the flatter will be the pitch of it, and vice versa. Cells may have pipe-mouths to be used, (as in an organ) or metal reeds (as attached to the piano) may be put to the Hilleno. Cells may have tuning slides to increase or diminish their capacity. Forks, struck at a distance, produce a swell on being brought near, the cells. Forks may be of more than two prongs—if, of four, two may be in unison, and two at an octave or fifth from those unisons—a division may be made in the cell to suit the different vibrations of the prongs. The Hilleno should have fretted ends and be of open, not confined, construction. The prongs of the upper forks are thick in proportion to their lengths, being about an eighth of an inch thick—the shank if too long or too thin, will spoil the vibration—the same will be the effect if the socket pinch the shank of high forks—the sockets may be brass with thin leather front and back between it and the fork-shank. The two prongs of the upper forks must be alike, or they will not sound, or but poorly—they ought to vibrate loud for nearly, or quite, a quarter of a minute—the stroke of the hammer against them must not be too strong. The rack may stand on one or more points. The shorter the wire of a spring to produce a given note (in that spring) the less harmonics there will be in the said spring.

What we claim and wish to secure by Letters Patent, is—

1. Combining in musical instruments, cells or chambers (open at one, or both ends) with strings, or reeds, or springs, or tuning forks, substantially upon the principles and for the purposes above set forth.

2. We claim also the manner of sustaining, or suspending the forks used for the high notes as described.

3. We also claim using hard points upon the hammers used to strike the high notes.

4. We also claim the employment of metallic springs, of the character described, in conjunction with tuning forks, in a musical instrument, substantially in the manner described.

5. We also claim the employment of a rack, B B B B, intervening between the sounding board and said metallic springs.

6. We also claim the peculiar mode of constructing the forks, for the high notes, giving them such relative proportions in the shaft (or stem) and prongs as to bring out the sounds, all in the manner described.

In witness whereof we have hereunto subscribed our names this twenty sixth day of January 1847.

U. C. HILL.
CHARLES F. HILL.

Subscribed in presence of us:
J. W. WESTERWELT,
J. C. ALBERTSON.