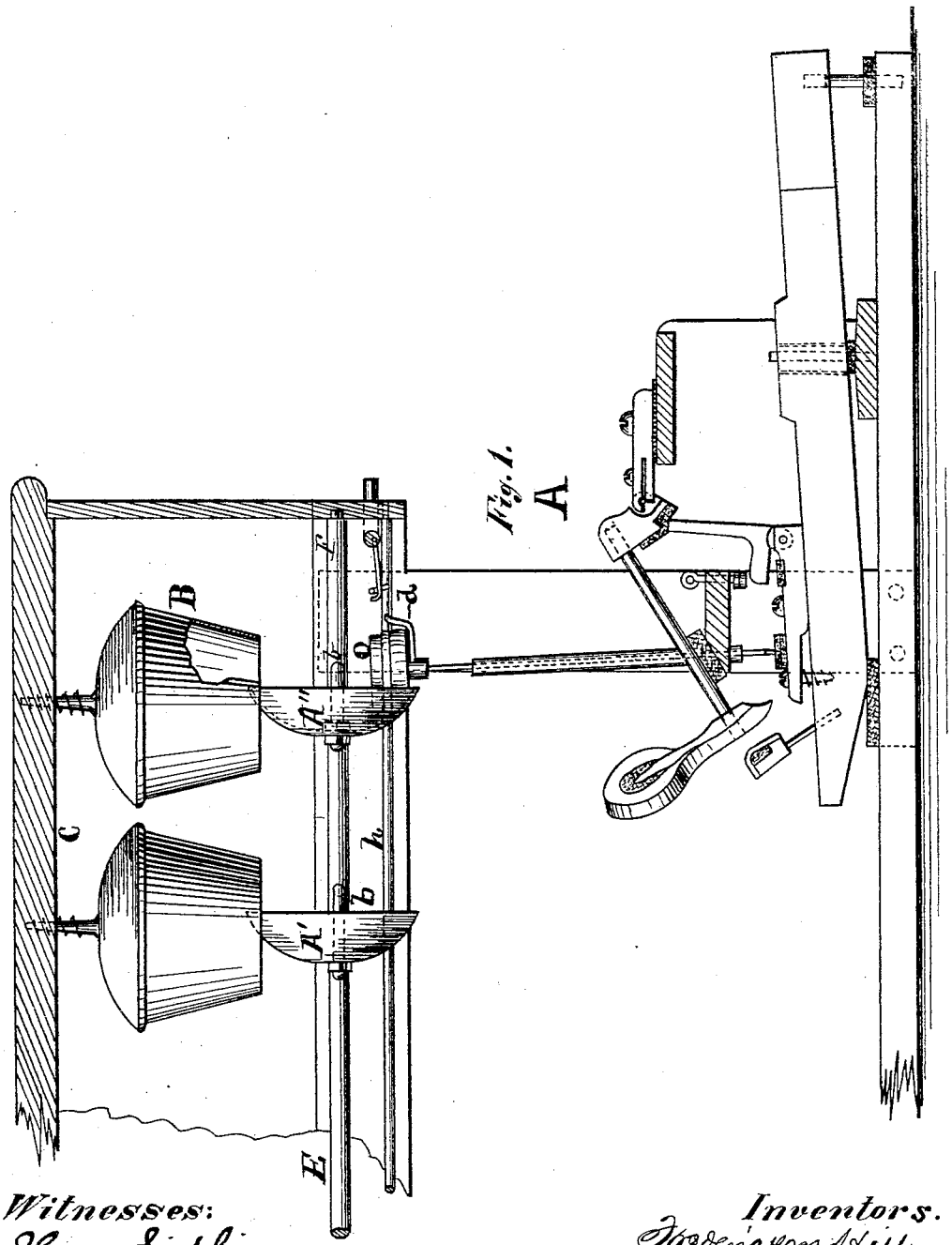
F. M. HILL & F. L. WING.

BELL PIANO-FORTES.

No. 181,169. Patented Aug. 15, 1876.



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IMPROVEMENT IN BELL PIANO-FORTES.

Specification forming part of Letters Patent No. **181,169**, dated August 15, 1876; application filed April 5, 1876.

To all whom it may concern:

Be it known that we, FREDERICK M. HILL, of Brooklyn, New York, and FRANK L. WING, of New York, N. Y., have invented certain Improvements in Musical Instruments, of which the following is a specification:

The following is a description of our newly-invented musical instrument, and the manner of making and using the same.

It will enable any person skilled in the art to manufacture and use them, when aided by the drawings hereunto annexed.

This invention has reference to a new musical instrument as an article of manufacture. It consists of a combination of, first, vibrating bells; second, of cavities, or resonant air-holders; and, third, of striking-hammers, which are actuated by any of the ordinary piano-actions. This combination depends upon the acoustic quality of the resonance between columns of air and vibrating bodies. We make use of such vibrating bodies as shall yield great duration and purity of vibrations. These then are aided by a resonator, which develops additional power, as the sounding-board does for the strings of the piano. We employ, however, a resonator or reflector for each note of the scale. The resonator is made of a size which will contain a column of air whose vibrations will be as nearly as possible in tune with its own vibrating body, so that it will respond to the vibrations, and give a pure "voice-like" tone, and so cover the noise of the stroke of the hammer, and the disagreeable harmonics. When these air-holders or chambers are fastened to a sounding-board or sounding-box, the combined tones of the vibrators and air-columns are diffused, and the maximum of pure and powerful musical vibrations is obtained.

Figure I shows an end view of one of the vibrators and its accompaniments, which will comprehensively explain the construction of a scale of similar mechanisms constituting a musical instrument.

A shows the hammer, jack, keys, back check, &c., arranged and adjusted in the same manner as the common square-piano action, so well known as to require no more specific description here. The vibrators and air-holders are arranged in slightly divergent transverse lines, with hammer-rails parallel to those lines. The regulating-rests may be either rails, like the hammer-rails, or small individual supports for each shank and button. A″ A′ show the vibrating bells, supported at their centers by the small arms *b*, which project from the transverse shaft E. These vibrators (in the lower five octaves) are cut out of sheet metal in the shape of disks, a chuck is made of the proper curvature, and the disk is spun over it by the ordinary process of "metal-spinning." We may turn inward at the center at the same time a shoulder, which may have a thread cut on to fasten the bells to the supporting-arm. This method of making sound-producing bodies is entirely new for the purpose of musical instruments.

The different "registers" in the musical scale are obtained by us as follows: The two upper octaves in the treble consist of cast bells of equal diameters, and from one-eighth to one-quarter inch in thickness at the outside, and thinned gradually toward the center. The different "intervals" are here produced by graduating the thickness of the curvatures. The next thirty curvatures are similarly graduated as to thickness, but are spun into shape as above described, (or stamped, if desired.) The remaining thirty vibrators, constituting the bass-register, are graduated as to diameters rather than thickness, to permit the proper intervals. We thus complete the musical scale. Two vibrators may be used as "unisons" for each note, if desired. B shows one of the air-holders or resonance-cavities. The shape we prefer is a truncated cone, with concave bottom, which furnish, besides their general quality of resonance, a condensing and reflecting capacity. The mouth of the air-holder should contain the focal point of the reflecting surface. These air-holders may be, however, of any shape or configuration, provided they inclose the proper air column. They vary in height and diameter in proportion to the intervals of tone, so that they shall be in tune with their respective vibrators, which partly enter the mouth of the cavities. Small concave reflectors are substituted in the two higher octaves in the treble;

they condense and reflect the vibrations, which are not capable of exciting a great degree of resonance in a column of air. Lips may be placed between adjacent cavities, so as to prevent the influence of one vibrating body upon the cavity next to it. C is a bridge, which supports the air-holders by screws, as shown. This frame may be fastened instead to a sounding board or box, running the length of the instrument. The box may be similar to the body of a bass-viol or violoncello. This completes the description of the mechanism for generating the tones.

We control or damp them by dampers identical in operation with ordinary piano-dampers, the damper-heads O being modified in shape to conform to the shape of the vibrators. The wires may pass through bushed tubes and rest on the keys, as in the piano. These dampers are operated simultaneously by pedals, and pedal-rods, and levers, as in the upright pianos. The wires themselves are lifted by small pins, as *d*, projecting from a rock-shaft, *h*, connecting with the pedal-levers. Should it be found desirable to economize space, an octave of the bass mechanisms may be placed below the level of the key-board, and operated by "trackers" from the said key-board, which connects with an action similar to that in the upper part.

An instrument of our improved construction can be completed, as to its musical efficacy, without dependence upon a case, as it has neither tensions nor serious weight. For this reason we shall confine ourselves to no specific description of case. It may be of any of the existing styles of piano-cases, or of original designing. The upright-piano case may be very easily adapted for the purposes of this instrument.

We have devised, finally, the practical application (in a manner similar to the one described) of a scale of these new tones combined with organs, (pipe and reed,) and also to pianos. The combination gives brilliancy to an organ, and to the weak registers in the piano a very desirable substitute. The making of the combinations can be easily effected by any one skilled in the art without further description here. The same keys may be used (in the case of reed-organs) to open the reed-valves, and also operate the system of jacks, hammers, &c. These latter may be rendered either operative or inoperative by a rod interposed and removed by the player at his option.

The claims in this application relate to an entirely new combination of bodies for the purpose of a musical instrument, the component bodies themselves being also of new and original construction.

We specifically claim—

1. The combination, in a musical instrument, of a series of bells, gongs, or similar-shaped sounding bodies, A′ A″, with a series of vessels or tubes, B, arranged to re-enforce and intensify the sounds of the said bodies, and with a key-board mechanism for actuating the same, substantially as described.

2. In combination with the subject-matter of the preceding claim, a sounding board or box, C, substantially as described.

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