W. Steinway,

Piano,

No. 55,385. Patented June 5, 1866.

Fig. 1.

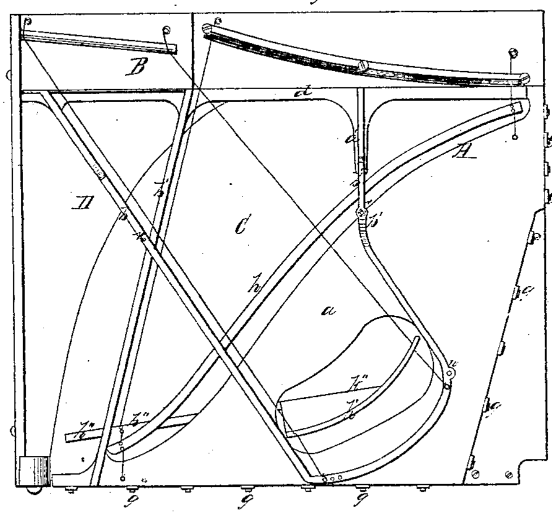


Fig. 2.

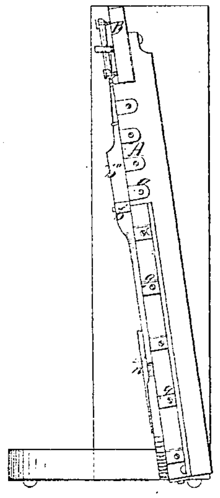


Fig. 3

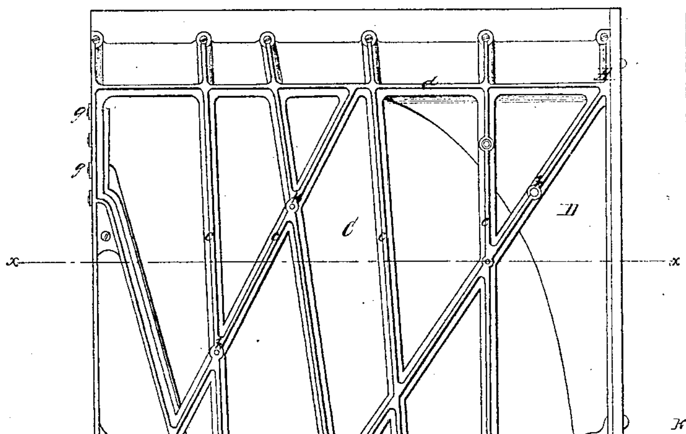
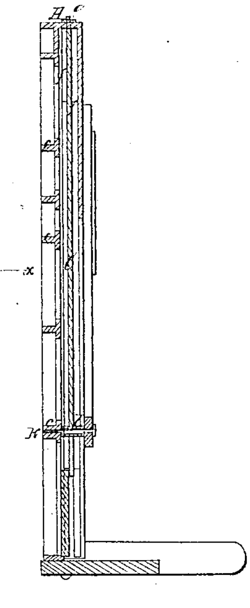


Fig. 4.



Witnesses

[illegible]

Wm [illegible]

Inventor.

Wm Steinway.

AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS)

UNITED STATES PATENT OFFICE.

WILLIAM STEINWAY, OF NEW YORK, N. Y.

IMPROVEMENT IN PIANO-FORTES.

Specification forming part of Letters Patent No. **55,385**, dated June 5, 1866.

To all whom it may concern:

Be it known that I, WILLIAM STEINWAY, of the city, county, and State of New York, have invented a new and useful Improvement in Piano-Fortes; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification in which—

Figure 1 represents a front view of an upright piano constructed according to this invention. Fig. 2 is an end view of the same. Fig. 3 is a rear elevation of the same. Fig. 4 is a horizontal section of the same, the line *x x*, Fig. 3, indicating the line of section.

Similar letters of reference indicate like parts.

This invention relates to certain improvements in upright and grand piano-fortes, which, however, are also applicable, with certain restrictions, to square piano-fortes.

The invention consists in casting the blockings or rafters solid with the ordinary metal plate in such a form that the sounding-board can be inserted therein from one side and fastened from the ends, leaving it free to vibrate with its full force; also, in providing the metal case, cast as above stated, with a series of set-screws or other equivalent devices, which bear upon the edges of the sounding-board in such a manner that the tension of the sounding-board can be regulated with the greatest ease and accuracy; also, in the connection of two or more sounding-board bridges, whereby the vibrations of the springs are uniformly divided over the entire surface of the sounding-board.

A represents a metal case, the upper or front part of which is composed of the ordinary metal plate *a* and the braces *b b′ b″*, whereas its bottom or rear part consists of a series of rafters, *c*, which are cast solid with the rim or flanges *d* and with the plate *a*.

If the metal case A is for an overstrung upright piano-forte, the wrest-plank B is fastened to the flange *d* by screws or other suitable means, as shown in Figs. 2 and 3; or in some cases the wrest-plank may be placed back of the flange, or the flange may be dispensed with altogether and the wrest-plank fastened to the projecting braces *b*, the latter being sunk into the wrest-plank so that it will not rest upon the frame of the metal case.

The front of the case A shows three braces, *b b′ b″*, and in an overstrung upright piano-forte the brace *b′* is shaped in such a manner that it runs from the frame-piece *d* to the brace *b*, below the level of the covered bass-strings, and then it rises and passes over and above the sounding-board bridge. By these means room is obtained for the passage of the sounding-board with its bars and bridges on it. The brace *b″* is supported by the plate *a* and a lip, *a′*, extending from the frame-piece *d*, and it is strengthened by a "square angle addition," *b**, so that the same, notwithstanding its thickness, which must necessarily be limited, is amply strong enough to resist the strain of the strings.

The plate *a*, which occupies a large portion of the front of the case, serves to give to said case sufficient power to resist the strain of the strings, and the case itself forms a groove for the reception of the sounding-board C, and of the piece of wood D which forms the support for the rounded edge of the wrest-plank, and also serves as a brace for the metal case, to save the same from being broken or injured by an accidental fall or blow. The sounding-board C is strengthened on its edges by strips *f*, of wood or other suitable material, and it is secured in its position by a series of set-screws, *g*, which pass through the edges of the metal case A and bear upon the edges of the sounding-board from three sides. These portions of the case, into which said set-screws are tapped, may be strengthened, as shown in the drawings.

By securing and straining the sounding-board from the edges we are enabled to build durable and effective metal-cased stringed instruments, as will be readily understood from the following observations:

The tone of a stringed instrument, in which the sound is produced by the blow of hammers, is regarded most perfect the louder and longer the strings will continue to sound after being struck. If a string is stretched upon an iron frame, it will vibrate very long, but will produce very little if any sound. The stiffer the string is stretched the stronger will be its tendency when set in motion to return to a straight line; but how long it continues to vibrate depends

upon its length in proportion to its thickness and upon the degree of firmness of the hitch-pins or bearing-points of the string.

Since wood yields considerably under a strong strain, manifold experiments have been made to attain the requisite unyielding firmness by fastening metal plates upon the wooden blockings, but with only partial success, as the wood, being of great length, in consequence of its natural softness would always yield to a certain degree. This result, although disadvantageous as far as the desired firmness is concerned, still has a beneficial effect upon the sounding-board, which, though unknown to many piano-forte makers, is by this involuntary action chiefly caused to have a good tone.

The long continuing and strong motion of the string, which is technically termed "transversal vibration," is not perceptible to the ear except by its action upon another body, which is generally termed the "sounding-board," and which usually is made of spruce, this being the best material for the purpose. The difficulty of attaining the greatest possible reproduction of the vibrations of the strings, which reproduction is technically known as "molecular vibration," is well known to every expert.

This molecular vibration, according to my own recent experiments, is governed by laws directly reverse to those governing the vibrations of the strings, for while the strings vibrate in the most perfect manner the stiffer they are stretched, the sounding-board receives the greatest capability of reproduction, not by being stretched like a drum-skin, but by the reverse action of a pressure which constantly presses said sounding-board from the ends or edges toward its center, thereby causing the different fibers of the wood to press against and support each other, and enabling the sounding-board to reproduce even the slightest transverse vibrations, and transmit the same to the column of air resting upon the sounding-board. The concussion thus produced is only perceptible to the ear, and is called "sound" or "tone."

By the involuntary yielding of the wooden blocking in ordinary piano-fortes many times the requisite strain on the sounding-board is obtained; but this effect is purely accidental, as has been previously stated, and is beyond the control of the manufacturer. If, in the course of time, the sounding-board shrinks more than the blocking will yield, the original powerful and sonorous tone disappears, and this defect generally is attributed to many different causes, but very seldom the right cause is suspected.

In our improved piano-fortes the requisite end strain on the sounding-board can be regulated with the greatest nicety by the set-screws *g* bearing on the edges thereof, and the case A, being made entirely of metal, forms a perfectly firm and unyielding support for the strings. The vibrations of the strings are transmitted to the sounding-board over its entire surface by means of bridges *h h' h''*, the bridge *h* being used to support the steel strings, the bridge *h'* for one and the bridge *h''* for the other portion of the covered strings. This latter bridge runs through and passes under the plate *a*, and forms a connection between the bridges *h* and *h'*. The strings which touch the bridge *h''* close to the bridge *h* are held a second time upon this latter bridge to prevent that part of said bridge which is disconnected from the sounding-board from making transverse vibrations. This arrangement is rendered necessary by the extreme shortness of the lower portion of the strings in an upright piano-forte, and may be considered a decided improvement in such instruments.

My metal case A is strengthened by bolts R, which pass through suitable holes in the braces and rafters, and which are provided with heads at one and with nuts at the opposite end, to prevent the case from yielding outwardly. Between the inner surfaces of the braces and plate and of the rafters are inserted tubes *l*, (see Fig. 4,) through which the bolts *k* pass, and which form braces to prevent the case A from yielding inward.

These improvements are particularly intended for upright and grand piano-fortes, and in some measure even to square piano-fortes, and by their use the strength and durability of the instruments and the richness and brilliancy of their tone are considerably improved.

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

1. The use in piano-fortes of a metal case cast in one solid piece, consisting of the plate *a*, braces *b*, rafters or brace-frame *c*, and a connecting piece or flange running round on three sides of the case and supporting the regulating apparatus, leaving one side open for the insertion of the sounding-board with its bars and bridges, substantially as described.

2. The method herein described of supporting the sounding-board by means of screws, springs, wedges, wire-draws, or any other equivalent means bearing on and bracing against the edges thereof, substantially as and for the purpose set forth.

3. Supporting a number of the lowest steel springs and highest covered bass-strings a second time between the regular sounding-board bridge and the hitch-pins, either upon a prolongation of the regular sounding-board bridge or upon an independent bridge, for the purpose of equalizing the transition from the steel strings to the covered bass-strings, thus preventing any break in the tone.

WILLIAM STEINWAY.

Witnesses:

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W. HAUFF.