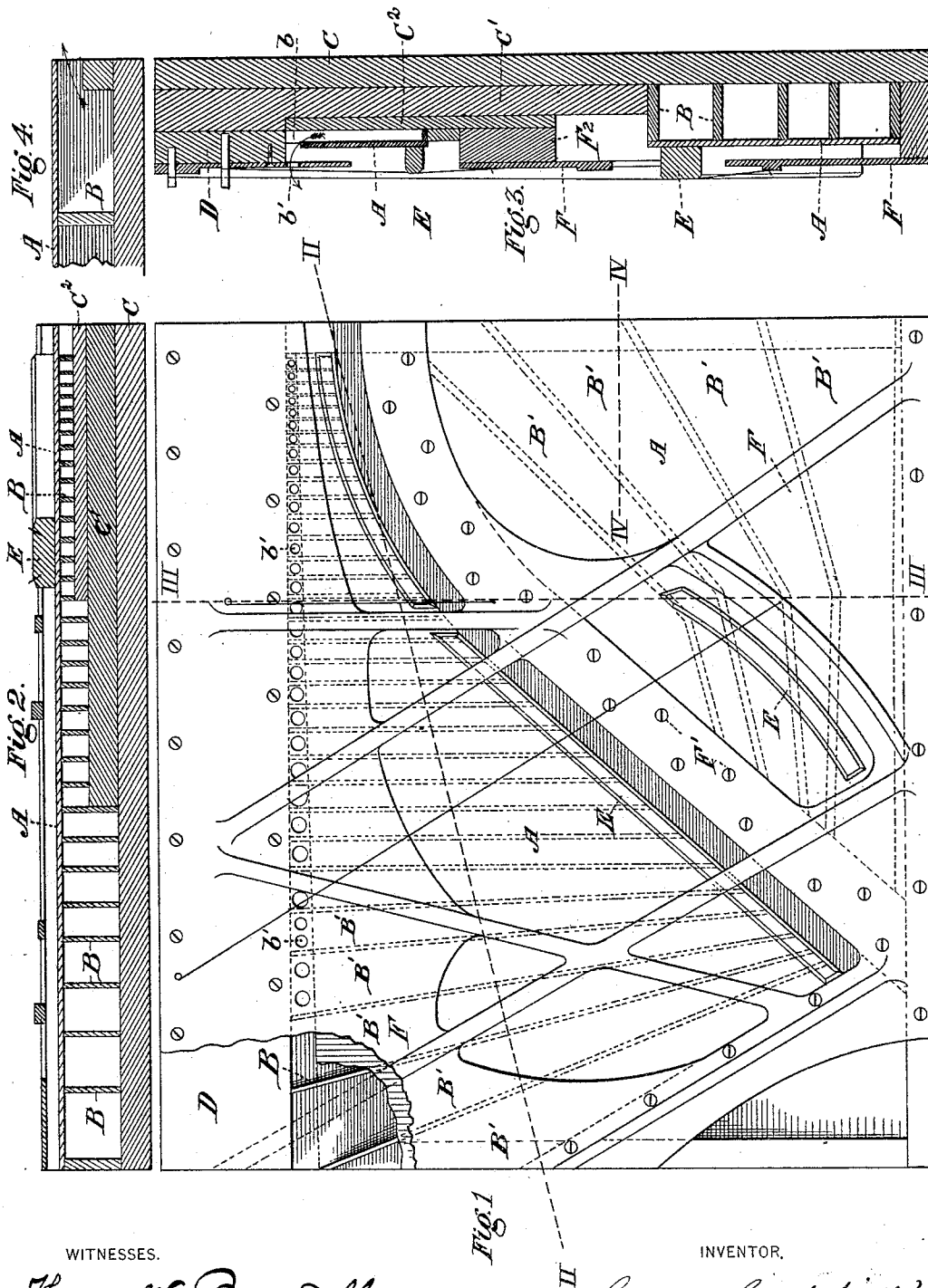


(No Model.)

G. CADDICK.
PIANO FORTE.

No. 454,204.

Patented June 16, 1891.



WITNESSES.

Thomas W. Bawdell

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GEORGE CADDICK, OF ALLEGHENY, PENNSYLVANIA.

PIANO-FORTE.

SPECIFICATION forming part of Letters Patent No. 454,204, dated June 16, 1891.

Application filed April 15, 1889. Serial No. 307,236. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CADDICK, of the city of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Piano-Fortes, of which the following is a full, clear, and exact description.

I shall describe my improvement with reference to the accompanying drawings, in which—

Figure 1 is a plan view of the sound-board of the piano provided with my improvement. Fig. 2 is a cross-section on the line II II of Fig. 1. Fig. 3 is a vertical section on the line III III of Fig. 1. Fig. 4 is a section on the line IV IV of Fig. 1.

Like symbols of reference indicate like parts in each of the figures.

It is a known principle in acoustics that if a tuning-fork of a certain pitch be put in vibration and held to the mouth of an organ-pipe whose tone corresponds to the tuning-fork in pitch the pipe will be put in vibration and will produce a sound of the same pitch as the tuning-fork, the vibration of the tuning-fork being in exact relation to the air in the pipe, and that if a tuning-fork be put in vibration and set on a hollow tube or box open at the end and containing the relative cubic inches of air required in a pipe to produce a sound of the same pitch as the tuning-fork the tone of the fork will be augmented and modified by the vibrations imparted to the air in the tube. These principles are embodied in my improved apparatus, which I will now proceed to describe, and which consists in combining with the strings of a piano air-tubes of corresponding pitch, which are adapted to respond thereto.

In the application of the invention I prefer to construct the tubes by partitioning the space between the sound-board and the back-frame board, by which means I am enabled to support the strings out of line on an elevated bridge set on the sound-board, thereby obtaining a more solid bearing of the strings on the bridge and imparting their full vibration to the sound-board and underlying flue-pipes. These partitions consist, preferably, of interposed wooden strips glued to the back-frame and sound board, thus forming flues

or pipes, which may be made of exactly the size and proportion required, and which are preferably open at the end nearest the wrest-plank and closed at the end nearest the bridge, though, if desired, the openings may be formed next to the bridge and the closed ends situate at the wrest-plank. I prefer the construction first named, because I am thereby enabled to obtain much better results than if the closed ends are at the wrest-plank. A sound-board thus constructed does not require any ribs, because the partitions forming the flues or pipes answer the same purpose and impart to the structure strength sufficient to support the bridge.

It is not only requisite that the tube shall contain the number of cubic inches of air necessary to produce the tone needed, but that the open end of the pipe shall be of proper proportion, and I find I obtain the best result when the area of the opening is the fifty-seventh or one hundred and fifteenth part of the area of the interior of the pipe.

Referring to the drawings, A represents the sound-board.

C is the back-frame board.

D is the wrest-plank.

E E are the bridges set on the sound-board.

F is the usual iron frame, which is firmly secured to the back-frame board by a number of screws or bolts at the margin of the frame. In addition to such bolts I provide, also, a series of bolts F', extending through the hitch-pin strip of the iron frame into a supporting-plank F². This series of bolts imparts great stiffness and strength to the frame of the piano.

The partitions B between the sound-board and the back-board afford a number of flues or pipes under the strings, and the proper relative dimensions of such pipes are secured by spacing the partitions at proper distances from each other, and for the treble-strings of the piano there can be employed further plank pieces or plates C' and C² placed on the back-frame board to reduce the dimensions of the flue to the proper degree. The construction and relative arrangement of the tubes and strings are clearly illustrated in the several figures of the drawings. Each tube has an

opening *b* at the end next the wrest-plank, and corresponding openings *b'* are made in the iron frame to register with the openings *b*. It will be observed that toward the base part of the piano and in the over-string bass, the space being limited, it becomes necessary for each of the several tubes, which I have designated by the reference-figure *B'*, to answer for several tones. The air-spaces of these tubes may be calculated to the simplest relative sound—such as octaves, fifths, and fourths, adding the thirds where the space will admit of it—leaving the remaining tones to vibrate in sympathy with them. The tubes respond by sympathetic vibration, and are scaled similar to organ-pipes to proper lengths and breadths. For the treble and middle strings of the piano I employ a tube for each set of strings or tone arranged according to the chromatic scale, except that for the last octave I may omit the partitions altogether.

It is not absolutely necessary for the tubes to be immediately under the set of strings to which they respond, as I find they will respond if some distance away; but it is desirable to have them placed as near to the strings they belong as the scale of the piano will admit.

My invention may be applied either to upright or grand pianos, and its advantages in securing fullness of tone will be appreciated by the skilled musician. In pianos of the construction heretofore employed there has always been difficulty experienced in that the sound-board in time loses its elasticity, thereby injuriously affecting the tone of the piano. In my improved construction, where the air-tubes take the place of the sound-board, this cannot happen. I am also enabled by the use of the partitions to obtain a strong support for the bridges, and thereby to prevent the evil con-

sequences resulting from sinking of the bridge away from the strings.

My invention is susceptible of modification in form, proportions, and details of construction by those skilled in the art.

What I claim is—

1. In a piano-forte, the combination, with the sound-board and strings, of pipes or flues in contact with the sound-board and arranged in position to receive the vibrations of the strings and corresponding thereto in pitch, said strings being arranged outside the pipes or flues, substantially as and for the purposes described.

2. In a piano-forte, the combination, with the sound-board and strings, of pipes underlying and in contact with the sound-board and corresponding in pitch to the strings, substantially as and for the purposes described.

3. In a piano-forte, the combination, with the sound-board and strings, of pipes underlying and in contact with the sound-board and corresponding in pitch to the strings, said pipes being open at one end and closed at the other, substantially as and for the purposes described.

4. The combination of the sound-board and back frame, interposed partitions connecting them and forming pipes underlying the sound-board, an elevated bridge situate on the outside of the sound-board and supported by the partition, and strings which pass over the bridge on the outside of said pipes, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 8th day of April, 1889.

GEORGE CADDICK.

Witnesses:

THOMAS W. BAKEWELL,
JAMES K. BAKEWELL.