

O. Bull,

3 Sheets, Sheet 1.

Piano.

No. 109,172.

Patented Nov. 15, 1870.

Fig. 1.

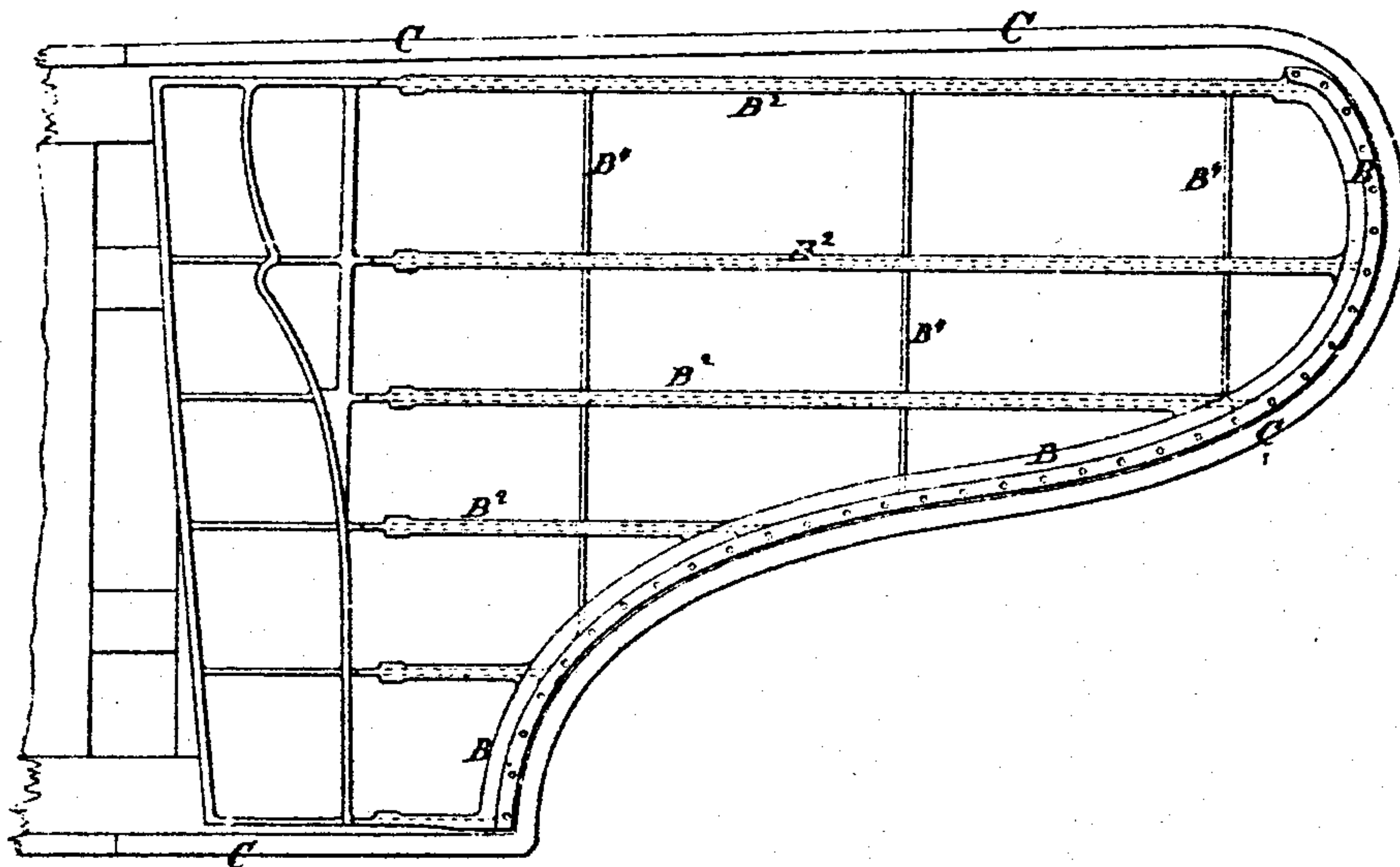
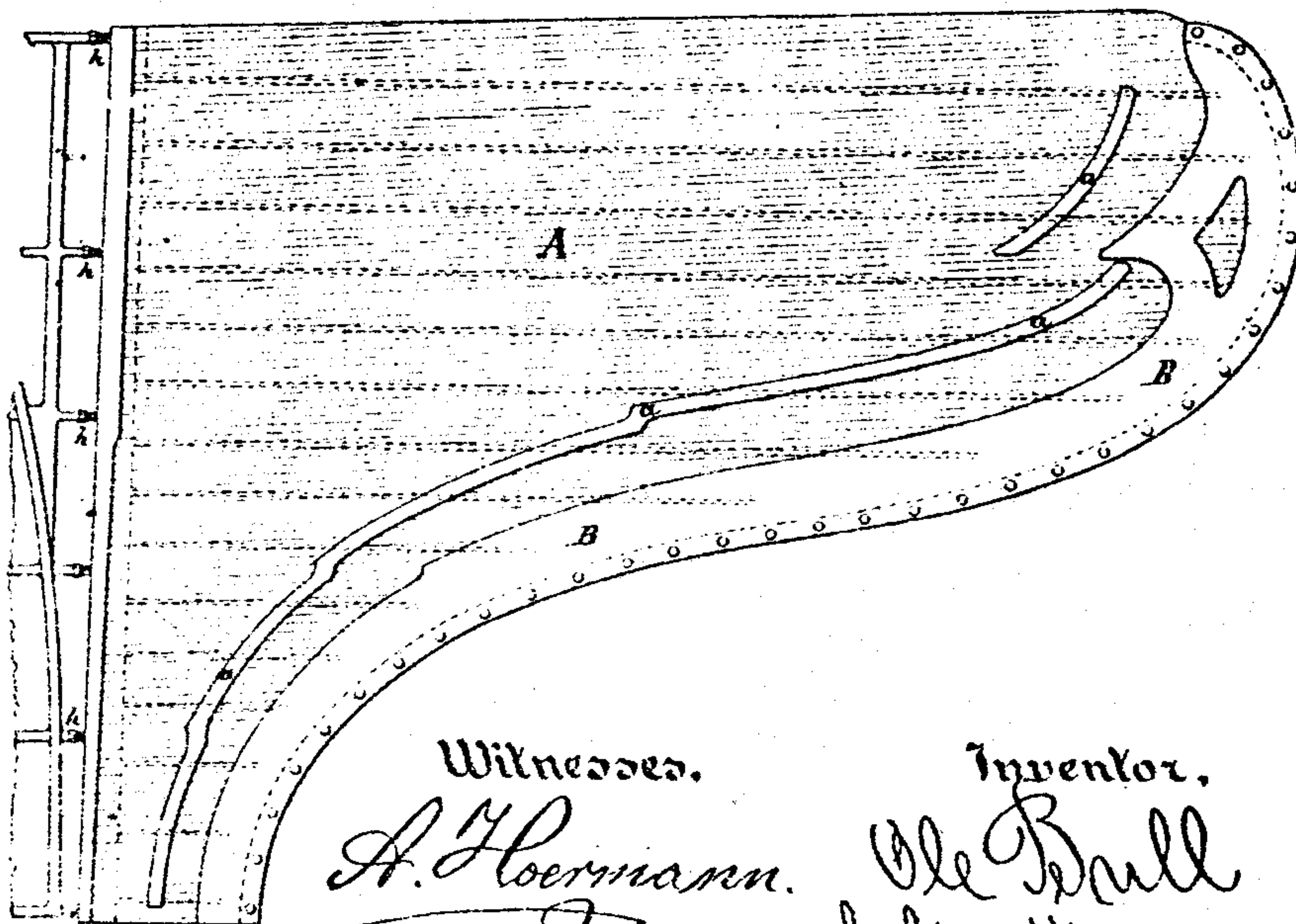


Fig. 2.



Witnessed.

Inventor.

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Campbell & Livingston

by his atty  
C. S. Stetson

3. *Stems, Sheet. 2.*

No. 109,172.

*Patented Nov. 15. 1870.*

Fig. 3.

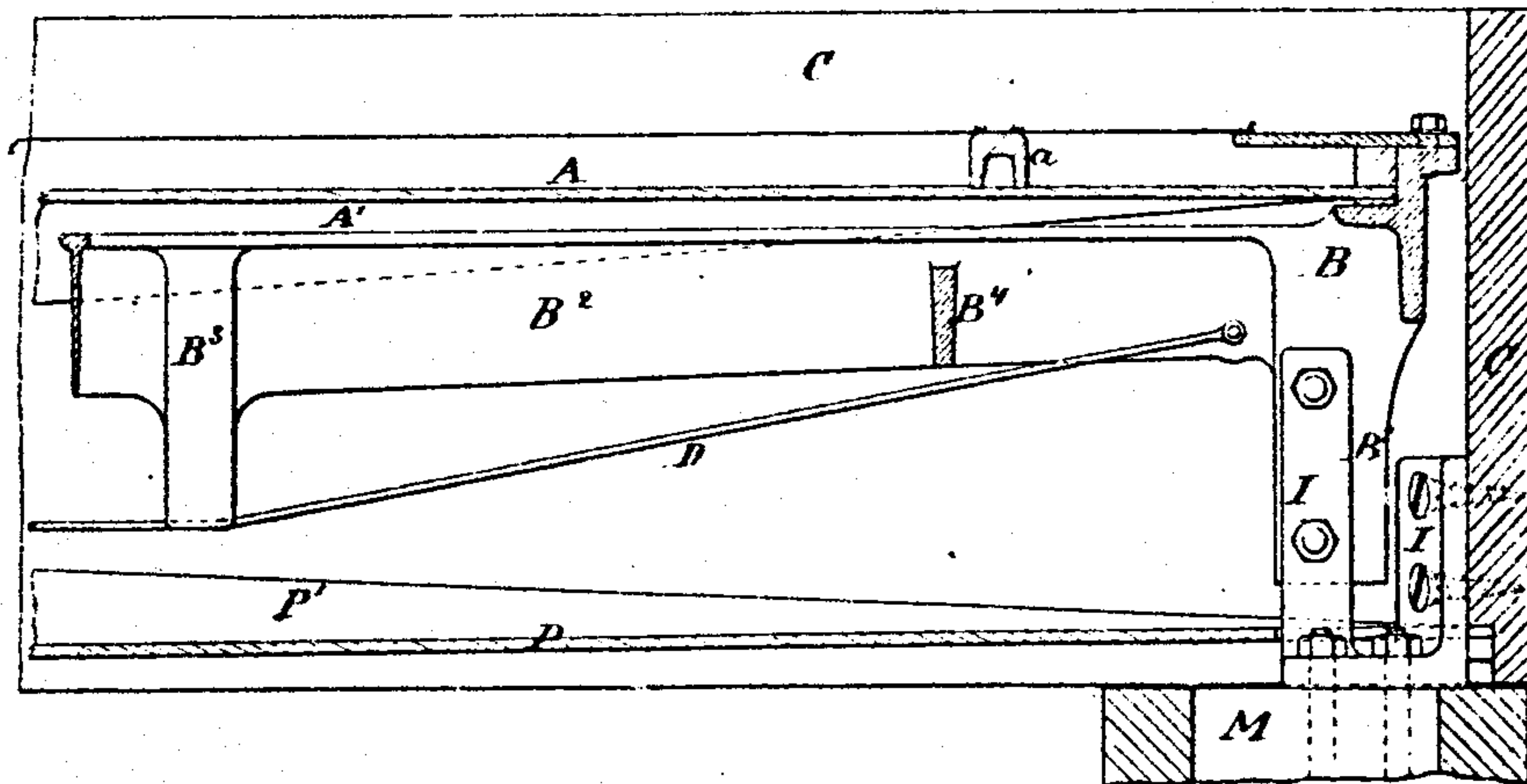


Fig. 4.

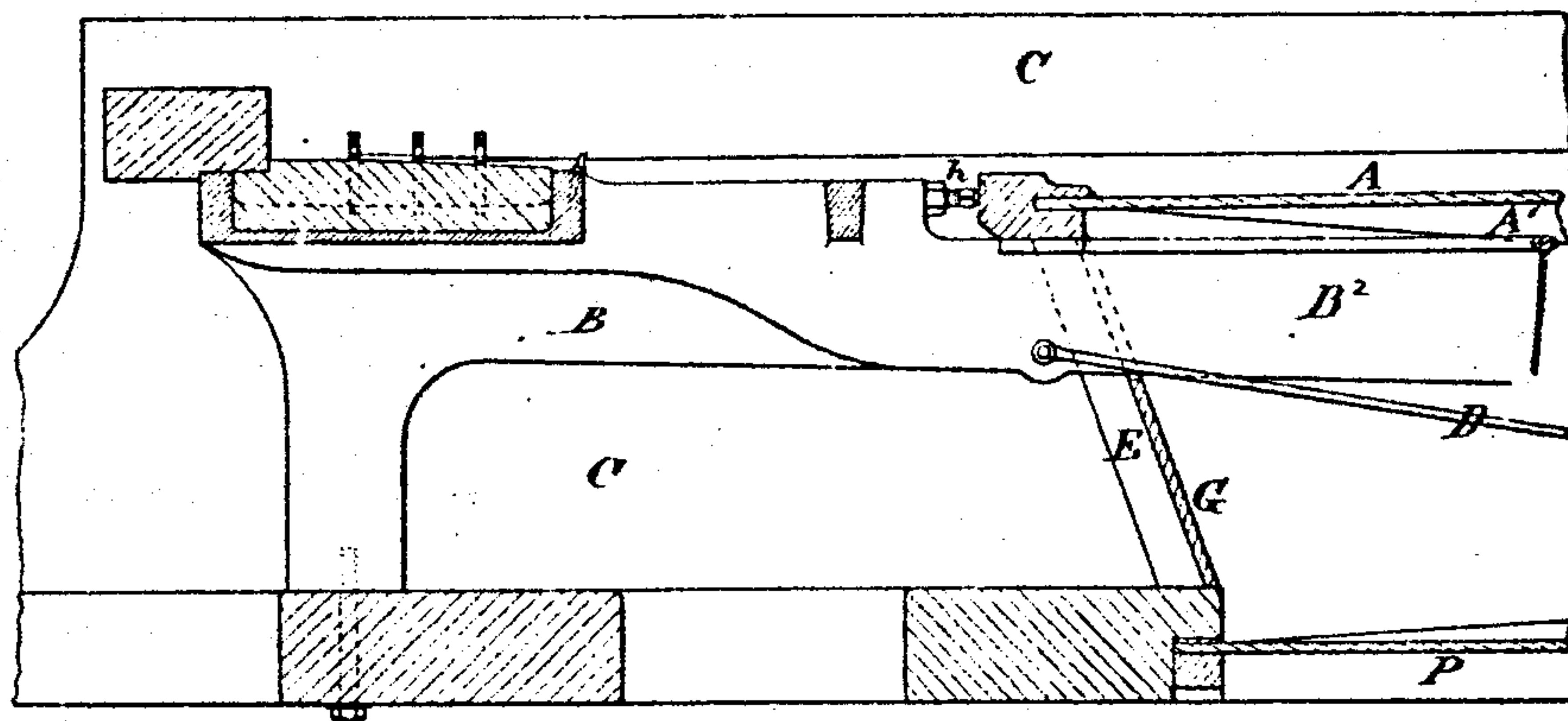
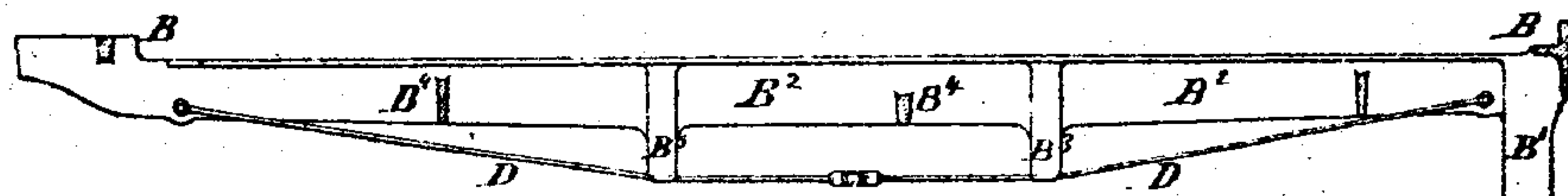


Fig. 5.



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Piano.

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Fig. 6.

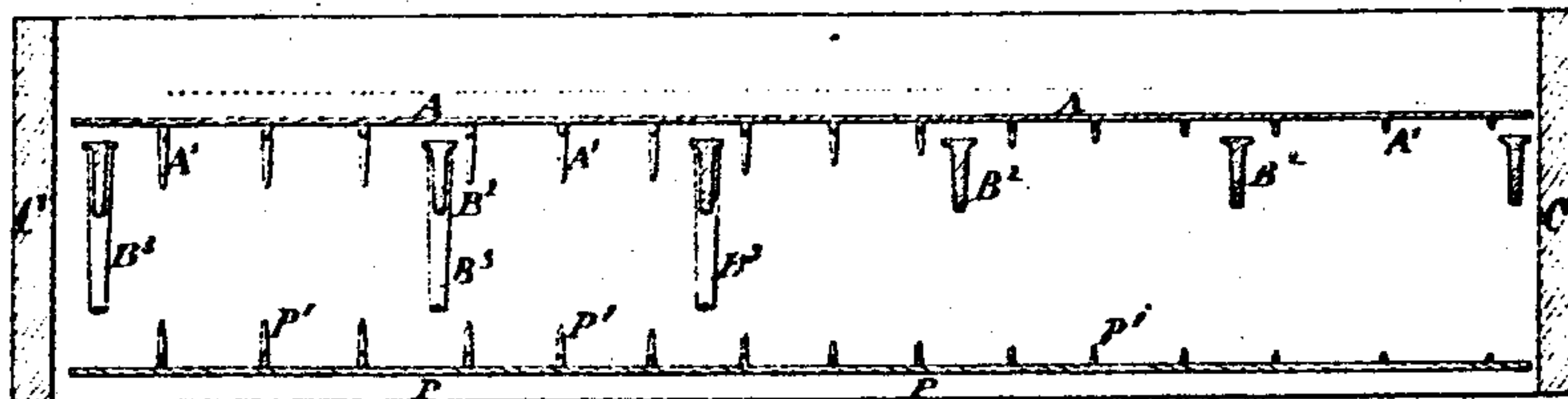


Fig. 7.



Fig. 8.

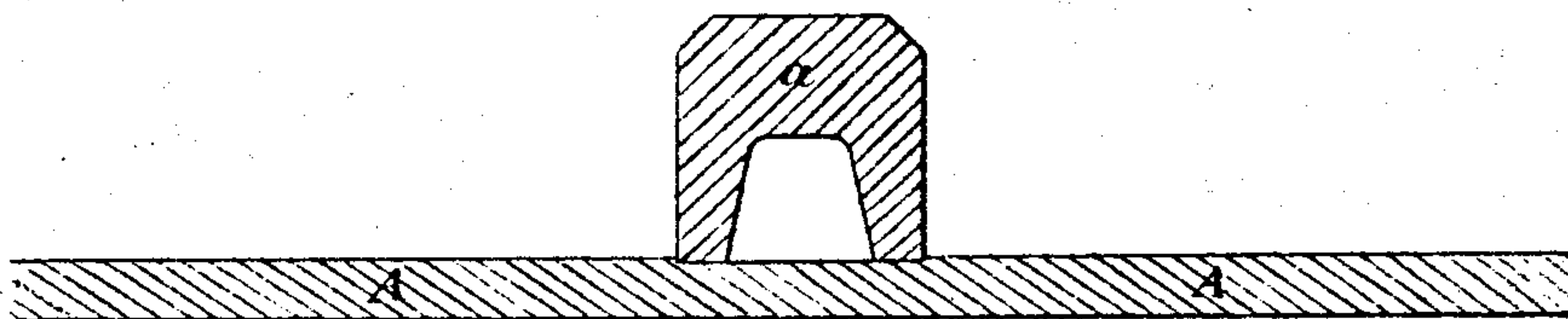


Fig. 9.

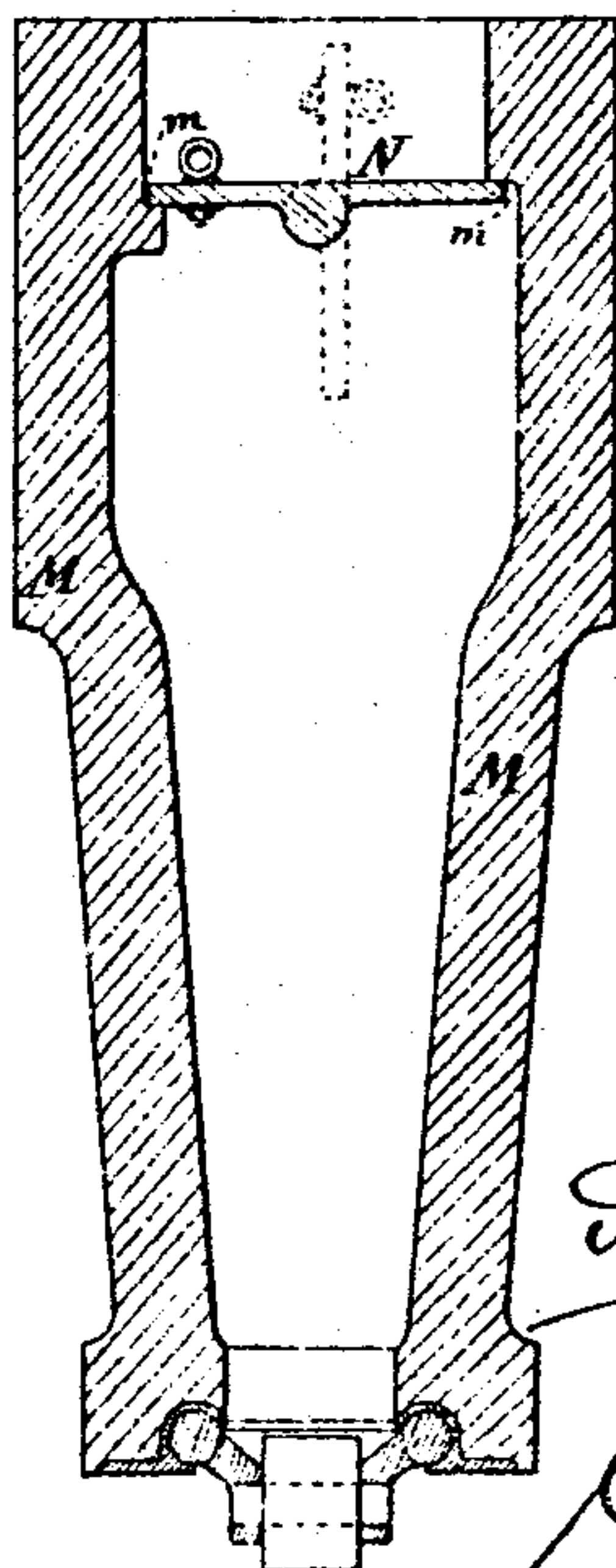
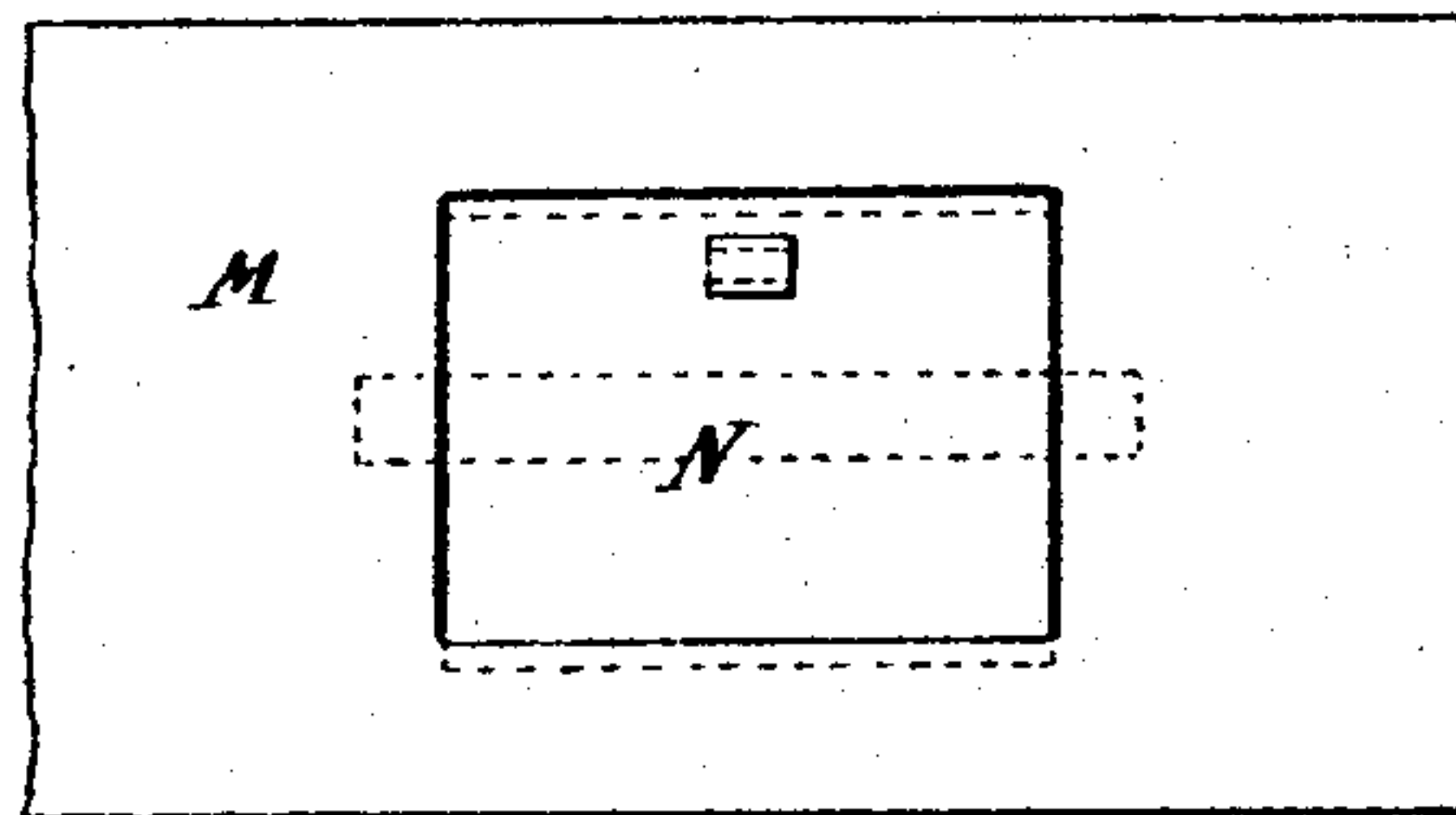


Fig. 10.



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# United States Patent Office.

OLE BULL, OF NEW YORK, N. Y.

Letters Patent No. 109,172, dated November 15, 1870.

## IMPROVEMENT IN PIANOS.

The Schedule referred to in these Letters Patent and making part of the same.

### *To all whom it may concern:*

Be it known that I, OLE BULL, professional musician of Valestrand, near Bergen, Norway, residing a large part of the time in the city, county, and State of New York, have invented certain new and useful Improvements in Pianos; and I do hereby declare that the following is a sufficiently full and exact description thereof, to enable others skilled in the art to successfully put my invention in practice.

I will proceed to describe the novel features of my piano, with so much of the ordinary features as seems necessary to properly indicate their relation thereto.

The accompanying drawing forms a part of this specification.

Figure 1 is a plan view of the iron frame with some of the accompanying parts.

Figure 2 is a plan view of the sounding-board and bridges, with a portion of the iron frame-work.

Figure 3 is a vertical section through a portion of the sounding-boards and frame, including also the casing at the back, and a portion of the leg.

Figure 4 is a corresponding section through some of the parts nearer the front.

These last two figures are on a much larger scale than either of the preceding.

Figure 5 is a vertical section through the iron frame on a smaller scale.

Figure 6 is a transverse section through the case, including also the sounding-boards and frame.

Figure 7 is a longitudinal section through the entire sounding-board.

Figure 8 is a section through the bridge and the adjacent part of the sounding-board on a larger scale.

Figure 9 is a vertical section through a leg.

Figure 10 is a plan view of the leg.

The action, keys, pedals, &c., as also the exterior case, may be of ordinary, or any suitable construction. I will assume that it is a grand piano of the best construction.

I strengthen the iron frame on which the strings are stretched by deep narrow bars, extending in the direction of the strings. These bars are exposed to a strain of compression, and, being below the level of the strings, the tendency of the strain of the strings is to curl the frame upward. To prevent this, I apply truss-rods, of iron or steel, with turn-buckles, to allow the rods to be tightened. These rods press under arms, extending downward from the before-described narrow bars, and I set them tight before tightening the strings. The frame is furthermore strengthened by cross-bars.

By this arrangement of the frame I avoid any interfering with the continuity of the sounding-board by necessitating any hole or holes therein.

The grain of the wood in the sounding-board is parallel or nearly parallel to the direction of the strings.

I glue, on the under side of the sounding-board, ribs or strengthening strips of wood, which are of little breadth, but of greater depth. The depth is greatest in the middle, and decreases toward each end. Instead of gluing these transversely, or directly across the grain of the wood in the sounding-board, I place them very nearly longitudinally or parallel to the grain, but I put them a little oblique. I esteem this matter one of great importance to the success of the invention in giving a loud and perfectly clear tone.

I prefer to make this obliquity only a little more than sufficient to cover the entire grain of the board, with the obliquity of the strengthening ribs; that is to say, if a series of lines is drawn along the surface of the sounding-board, corresponding to the grain thereof, the obliquity of the ribs is such that the front end of one rib touches or slightly crosses the line which is touched or slightly crossed by the back end of the adjoining rib. I have given much attention to this subject, and esteem this the preferable degree of obliquity; but it may be made a little greater or a little lesser without materially interfering with the purity of the tone.

This construction of the sounding-board, with the ribs thus arranged, provides not only for the perfection of the sonorous qualities of the sounding-board when new, but avoids any appreciable deterioration with age. I find this improves with age.

The best example in which I have embodied my improvements—a grand piano, of excellent workmanship and materials—has considerably improved during the few months which it has been tuned and in use. At each examination it has been found to excel its previous condition. I ascribe this result, in part at least, to the peculiar construction of the sounding-boards.

I have devised peculiar means for isolating the sounding-board and frame from the external case of the instrument. I can bolt or otherwise fasten the parts together directly or through the medium of glass or other material of good sonorous qualities, in addition to my mode of mounting, if I please; but I have succeeded best by entirely disconnecting or isolating the frame from the case, by bolting both firmly upon a U-shaped iron, which is, in turn, firmly mounted upon the legs. I make two such connections at the rear, and these are the only unions between the frame and the case, except at the front. The sounding-board is supported upon an iron frame at a proper distance below the strings.

The unity of structure of the sounding-board, and the absence not only of any holes or interruptions from such cause, but also of any cross-glued or cross-



connected parts, as also of any screws or analogous foreign parts to interfere with its vibration, gives an effect not before produced in this class of instruments.

I press the sounding-board back firmly, so as to maintain a very solid bearing, by the aid of screws distributed at short intervals along the front of the sounding-board. I make the bridges hollow. I can secure them to the sounding-board either by gluing or simply sinking them to a slight depth into the material of the sounding-board. I prefer the latter construction, believing that any part glued across the grain of the sounding-board is liable to interfere with the effect. The hollow structure of the bridge gives an increased sonorous character to the instrument. It sounds louder as well as purer.

At the front of the sounding-board I mount a series of posts, inclined forward, and a board similarly inclined. The principal object of this is to cause the sound to be reflected or reverberated upward, and to prevent it from traversing too much forward into the action.

I attach much importance to this feature of the invention. I consider that much of the sound which travels forward into the action and into the recesses in the front part of the instrument is practically lost in its effect upon an audience. The chief effect of this part of my invention is to increase the loudness of the sound.

I make the legs of the piano hollow. I also provide openings therein which may be closed at pleasure by suitable valves. All the ordinary and most approved appliances may be used for preventing the escape of sound through the floor, such as glass-casters, or the like.

My invention does not prevent the employment of most of the improvements known in pianos, but harmonizes therewith, and contributes to the good effect of each.

I have above explained that the ribs under my sounding-board should extend nearly parallel with the grain of the board, but slightly inclined. I find that by varying the relative depth and thickness of the several ribs, I can vary the qualities of the sound within considerable limits. The ribs should always be deeper in the middle and tapering toward each end, as indicated in figs. 3 and 7, and the sound will, with construction of the sounding-board, as here represented, be highly clear and pure. By placing the ribs more nearly parallel with the grain of the board, and making them narrower and deeper, I can make the tone peculiarly brilliant, and by making the ribs thicker and less deep, and placing them a little more oblique than here represented, I can give, in some measure, a contrary effect, and make the tone less brilliant and more mellow.

By proper attention to these points I can modify the character of my pianos to suit the uses for which they are more particularly intended, or the tastes of the purchasers.

Some parts of my invention may be applied with success in square, upright, and all the several varieties of pianos, and the modifications necessary to adapt these to each form will be obvious.

Referring to the drawing—

A is the sounding-board;

B, the stout frame of iron or steel in which it is supported; and

C, the external case.

The ribs on the under side of the sounding-board A are marked A'.

The arms extending down from the frame B are marked B'.

The ordinary stout bars which serve as struts to resist a crushing strain, are marked B'', and extend across the frame in a direction nearly or exactly parallel with the string.

The tension due to the strings being exerted in a

plane considerably above the plane of the frame B and bars or struts B'', there is a tendency of the entire frame B to curl upward, that is, to rise at the front and rear and to sink in the middle. But I counteract this strain effectually by tension-rods, or truss-rods, D, arranged as represented.

The strain on these rods D tends to curl the frame downward at the front and back, and upward in the middle. I so proportion the tension of the strings that the tendencies to curl the frame in opposite directions counterbalance each other.

The inclined posts, under and near the front of my sounding-board, are represented by E.

The corresponding board is marked G.

The screws, which press heavily against the front of the sounding board, are marked h.

The hollow bridge, sunk slightly in the sounding-board A, is marked a.

I connect the frame B by the aid of arms B', to one arm of the U-shaped iron I, and I connect the back portion of the frame C to the other arm of the same iron. I bolt the lower portion or bend of this iron I to the top of the back leg M.

All the legs of my piano are made of the best and most sonorous wood, and are made hollow, as indicated by fig. 9.

They are provided with a seat, m, and valve in place.

These valves, N, of which there may be many, variously arranged to fit upon corresponding seats, are operated by connections, not represented, by means of a pedal conveniently placed to be acted on by the performer.

I can make the bottom of my hollow legs either entirely closed or partially open. I have represented the construction which I prefer, in which the bottom is permanently open, and is provided with casters which turn with great freedom.

I do not confine myself to the precise form of the several details.

The bars B'', in the frame B, form, in connection with the rods D, a species of strengthening frame, analogous to the truss-work of bridges, and I propose to employ various modifications of the forms and proportions of these parts, which I designate generally as trussing.

I have thus far said nothing of two features which I consider important, though some portion of the benefit of my invention may be obtained without any other single feature. In other words, although I prefer to use all my improvements and combinations, I do not limit myself thereto.

The features remaining to be described are the cross bars B' in the cast-iron frame, and the second or sub-sounding-board P.

The cross-bars B' are cast in one with the main frame B, and with the longitudinal bars B'', and serve to stiffen both, and particularly to defend the latter against buckling or bending toward one side or the other.

The second sounding-board P has its ribs, P', corresponding in form and arrangements to the ribs A' on the upper or main sounding-board A, but in an inverted position.

The ribs P' are on the upper face of the lower sounding-board, which rests on screws which press it up firmly into a rebate in the lower edge of the casing C.

I claim as follows:

1. The series of parallel ribs A', on the whole lower surface of the sounding-board, and standing nearly parallel to the grain of the wood therein, as and for the purposes specified.

2. In connection with the above the truss-rods D, the rigid frame-work B', arranged relatively to each other and to the piano-strings, as specified.

3. The U-shaped irons uniting the legs, c, c, and



sounding-board, and its connections, and holding the sounding-board practically isolated from the case, as specified.

4. The screws *h h*, pressing against the front edge of the sounding-board to graduate and insure a sufficiently firm pressure thereon, and arranged, as shown, relatively to the inclined front board *G*, as specified.

5. The valves *N*, arranged as represented, to control apertures in the hollow legs of a piano.

6. The inclined front-board *G*, arranged as repre-

sented, and reflecting the sound backward and upward, as specified.

7. The sounding-board *P P'*, arranged, as represented, near the lower edge of the casing *C*, in connection with the inclined front-board *G*, as set forth.

In testimony whereof, I have hereunto set my name in the presence of two subscribing witnesses.

OLF BULL.

Witnesses:

THOMAS D. STETSON,  
C. C. LIVING.