(No Model.) 2 Sheets—Sheet 1.

E. N. CUMMINGS.

PIANO.

No. 454,901. Patented June 30, 1891.

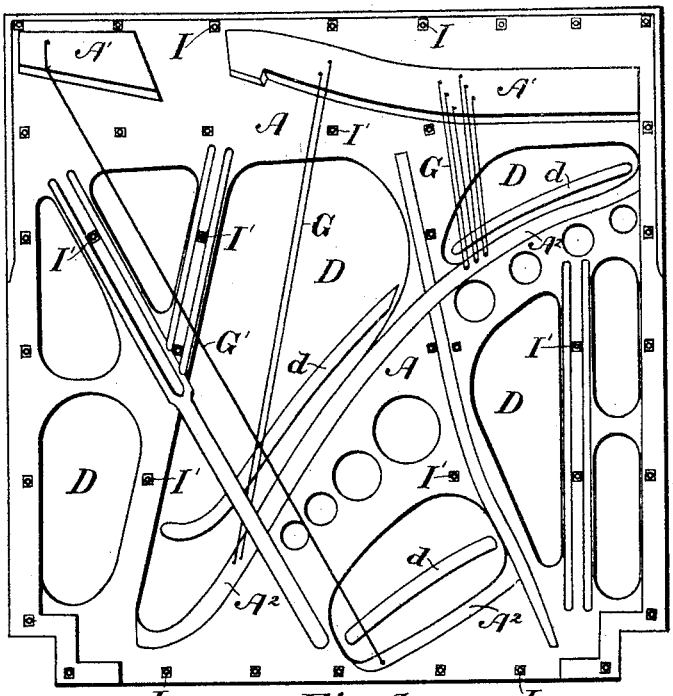

Fig. 1.

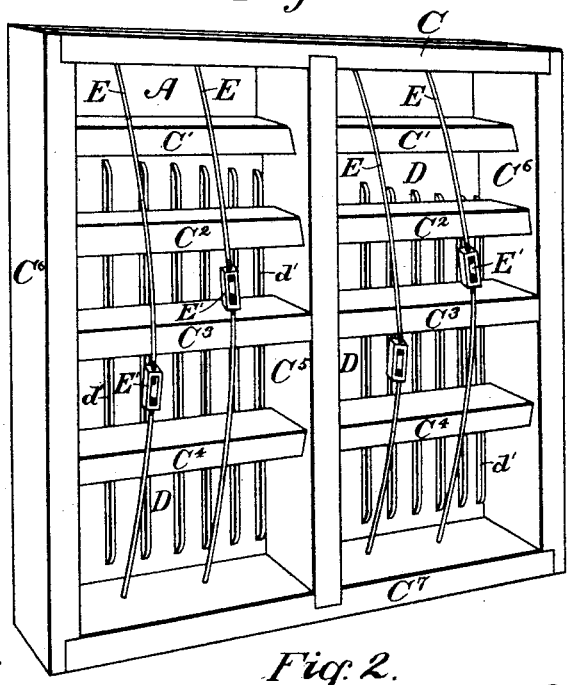

Fig. 2.

Witnesses

Albert E. Leach.

M. H. Thompson.

Inventor

Edward N. Cummings

by Wm H Dunn

Atty.

(No Model.) 2 Sheets—Sheet 2.

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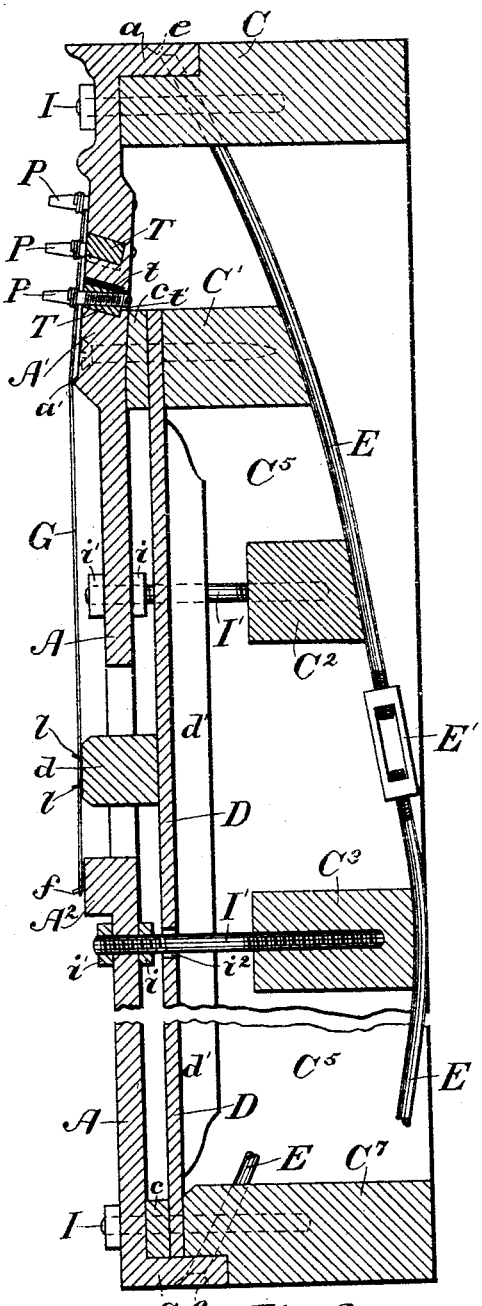

Fig. 3.

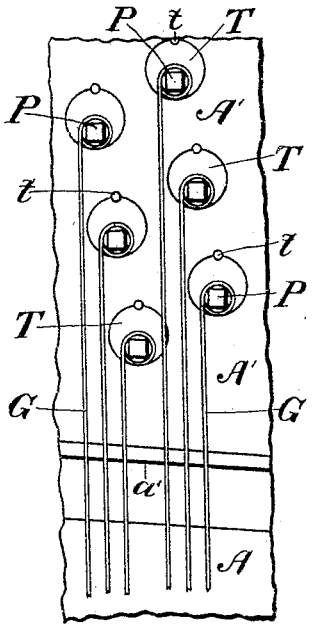

Fig. 4.

Witnesses

Albert E. Leach

M. N. Thompson.

Inventor

Edward N. Cummings

by W. S. H. Dawes

Atty.

UNITED STATES PATENT OFFICE.

EDWARD N. CUMMINGS, OF LYNN, MASSACHUSETTS.

PIANO.

SPECIFICATION forming part of Letters Patent No. 454,901, dated June 30, 1891.

Application filed February 7, 1890. Serial No. 339,548. (No model.)

To all whom it may concern:

Be it known that I, EDWARD N. CUMMINGS, a citizen of the United States, residing at Lynn, in the county of Essex and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Pianos, of which the following is a full specification.

The object of my invention is to so construct the piano-plate and adjacent parts as to secure the greatest possible freedom from liability to get out of tune when once properly adjusted in this regard.

In pianos as commonly constructed the strings are held at one end to the metal plate and at the other to tuning-pins driven into a wooden pin-block separate from the plate, the pin-block being secured to the frame or skeleton independently of the plate. There are various ways of doing this; but ordinarily when a full plate is used the plate covers the pin-block, holes being drilled through the plate considerably larger than the pins to allow the same to enter the block underneath without bearing against the plate. On this account the distance from the point of attachment of the string to the pin to the point where the pin enters the pin-block is necessarily considerable, being rather more than the thickness of the plate. There is thus a great amount of leverage for the pin to spring and pry on the pin-block. The tension of the strings between one end of the plate and the separate pin-block at the other end amounts to about fifteen tons, and it is obvious that the slightest movement of the parts, whether by the springing of the plate itself or of the pin-block, or by the turning of one of the pins therein, would seriously affect the tune of the piano. The wooden pin-block, moreover, is constantly liable to shrinkage or warping or swelling, due to changes of weather or climate.

In my improved piano I decrease to a minimum the tendency of the instrument to get out of tune in two ways, first, by the construction of the plate and pin-block in one piece and the peculiar arrangement and construction of plate-supporting frame and stays, whereby all springing of the plate itself or of the plate with reference to the pin-block is entirely prevented, and, second, by the arrangement of the tuning-pins, whereby they are so firmly held that they cannot be accidentally turned.

Of the accompanying drawings, which represent my improvement as applied to an upright piano, Figure 1 shows in front elevation a diagram of the plate, showing the arrangement of strings, stay-bolts, &c. Fig. 2 is a rear perspective view of the skeleton or frame supporting the plate. Fig. 3 is a sectional elevation on a larger scale through the plate sounding-board and frame from top to bottom, and Fig. 4 is an enlarged plan view showing the arrangement of the tuning-pins in the pin-block.

In my improved instrument I do away with a separate pin-block and employ a full metal plate A, having the bridge a' and the pin-block A′ integral therewith. The pin-block A′ is provided with holes at the proper places to receive bushings T, of wood or any other suitable material, within which bushings the tuning-pins P are tightly held. The bushings are made, preferably, by first plugging the holes through the pin-block with the wood or other material and then boring out the plug itself for the reception of the pin. By this construction the plug forming the bushing, being larger than the hole, is condensed in being driven into the pin-block, especially if wood is used for the bushing and the hole bored through the bushing is preferably smaller than the pin, so that when the pin, which is preferably provided with a fine screw-thread, is driven into the bushing it is very firmly held therein. The pin-block A′ is rearwardly beveled on its upper side from the bridge down, as shown in Fig. 3, and each string G being held at one end to the plate in any suitable manner, as by the pin f, is carried therefrom, first over a bridge d on the sounding-board, as hereinafter described, and then over the bridge a' directly to the tuning-pin P. By this construction the pressure-bar with its bolts, which is ordinarily used between the bridge a' and the tuning-pin, is entirely done away with. In this way I very much reduce the liability of the string to break, since when a pressure-bar is used the strain on the string when tuning is not equally distributed through the string, but is greatest between the bridge and the tuning-

pin, since the string is deflected under the bar. By beveling the pin-block, as described, the string bending downward at the bridge is held sufficiently firm without any pressure-bar, and passing directly to the pin the strain is equally distributed through the entire length of the string. Furthermore, by having the pin enter the pin-block firmly at the surface of the plate, as shown, I am enabled to attach the string thereto at a point very near the pin-block, which, as above described, cannot be accomplished in the old arrangement, where the plate has to be drilled through before reaching the pin-block, and I thus get very little leverage on the pin that would tend to loosen the same.

I preferably bore the hole for the pin P diagonally through the bushing, as shown in Fig. 3, the pins themselves being more nearly perpendicular to the surface of the pin-block than the bushings. By this arrangement the pins, being driven so hard into the bushings, cannot turn therein, being as firm as though held in iron, and, moreover, the bushings, being inclined at an angle to the pin, cannot by the tension of the strings be turned in the pin-block. As an additional safety device to insure against the turning of the bushings, I preferably employ a spline *t*, which is driven into a groove made before the bushing is inserted along the hole in the pin-block and so arranged as to lie partly in the material of the bushing, as clearly shown in Fig. 4, and partly in the pin-block metal. The pins being entirely supported by wood the tone of the strings is entirely free from metallic contact. The holes for the bushings T are not bored entirely through the pin-block, so as to avoid any possibility of the bushings being driven through the pin-block when the pins are driven in. Beyond the bushing, however, the pin-block is bored out, as at *t'*, somewhat larger than the pin itself for the reception of the projecting tip of the pin. By this method of inserting the pins in the pin-block so firm a bearing for the pins is insured that I am enabled to employ a much thinner and lighter pin-block than ordinarily, by which there is considerable saving of material both in the plate itself and in the shorter pins required. Moreover, by having a thin pin-block there is much less risk in casting, since a large comparatively thin plate is quite liable to break in cooling if some parts are very much thicker than others by reason of the unequal shrinkage.

The plate in an upright piano is usually supported upon a skeleton or frame, the bars or standards of which run vertically from top to bottom. With such a frame it is difficult to employ stay-bolts to fasten the plate to the frame at points where they are most required. I employ a frame (see Figs. 2 and 3) in which the timbers C' C^2 C^3 C^4 run horizontally and are placed at any point whereby the stay-bolts I' may be placed at the most favorable points to firmly support the plate. The plate is secured to the frame, as shown in Fig. 3, by bolts I screwing into the top and bottom timbers of the frame, while at any desired intermediate points stay-bolts I', having preferably two nuts *i i'* embracing said plate, as shown, screw into the intermediate horizontal beams C' C^2 C^3 C^4.

The sounding-board D, with its strengthening-ribs *d'*, is secured to the frame in the manner shown in Fig. 3, *c* being pieces interposed between the sounding-board and plate. The sounding-board is bored out, as at i^2, with holes considerably larger than the stay-bolts wherever said bolts pass through it, in order not to be in contact therewith.

d are bridges on the sounding-board, over which the strings run near the bottom thereof, the strings being arranged to run, in the usual manner, from the pin-block A' to the raised ridges A^2, Fig. 1.

The plate A is provided at top and bottom with flanges *a*.

E E are truss-bolts, each consisting of two parts having flaring heads *e*, countersunk into the flanges *a* of the plate, the said bolts passing through holes in the top and bottom pieces C and C^7 and over the beams C' C^2 C^3 C^4, in the manner shown in Figs. 2 and 3, the two parts forming each pair being provided with screw-threads at their ends and coupled together by right and left handed couplings E', so that any desired strain may be applied to the truss-bolts. Any number of these truss-bolts may be employed running from the top to the bottom flanges of the plate at the back of the frame C C' C^7, being of sufficient number and strung to such a tension as to entirely counteract the tendency of the plate to spring through the tension of the strings on its forward surface. With these truss-bolts and the stay-bolts I' the plate, even when made extremely thin, is rigidly held in place and cannot spring.

The plate and pin-block being made together, it follows that both, with the springs, may easily be removed from the piano in case of accidental breakage of the plate. This cannot be done in the ordinary form of piano, since the wooden pin-block is commonly glued or permanently fastened to a skeleton separate from the plate and cannot be removed therewith.

The entire frame C C' C^7, with the plate bolted thereto in the manner described, is in my improved instrument fastened in the case by bolts, instead of being glued in, as ordinarily. By simply removing the bolts the frame and plate may be easily taken out of the case, and by removing the bolts I I' and truss-bolts E the plate and pin-block may be removed from the frame, being made in one piece. Moreover, by my improved construction of thin pin-block, in which the tuning-pins pass completely through, should one pin become broken it may easily be driven out from the back without harming the pin-block. A piano thus constructed will not be

seriously affected by changes in atmosphere or climate, since the plate and pin-block are of one piece of metal, so that when once tuned the instrument will remain in tune a long time.

I claim—

1. In a piano, a metal pin-block provided with holes having bushings, in combination with tuning-pins set in said bushings at an inclination with the central axis of the bushings, substantially as and for the purposes described.

2. In a piano, a metal pin-block provided with holes having condensed bushings, in combination with tuning-pins set in said bushings at an inclination with the central axis of the bushings, and splines lying partly in the material of the pin-block and partly in the bushings, substantially as and for the purposes described.

3. In a piano, a full metal plate having a pin-block integral therewith provided with condensed bushings and tuning-pins set therein at an angle to said bushings, said plate having flanges at the top and bottom, in combination with a separate frame bolted to said plate having horizontal timbers, and truss-bolts connecting the flanges of said plate and passing over said frame, substantially as and for the purposes described.

4. In a piano, a full metal plate having a pin-block integral therewith provided with condensed bushings and tuning-pins set therein, said plate having flanges at the top and bottom, in combination with a separate frame bolted to said plate having horizontal timbers, and truss-bolts, each made in two pieces headed in said flanges and connected by right and left screw-threaded couplings, whereby the tension of said truss-bolts may be varied, substantially as described.

In witness whereof I have hereunto set my hand.

EDWARD N. CUMMINGS.

Witnesses:
WM. B. H. DOWSE,
ALBERT E. LEACH.