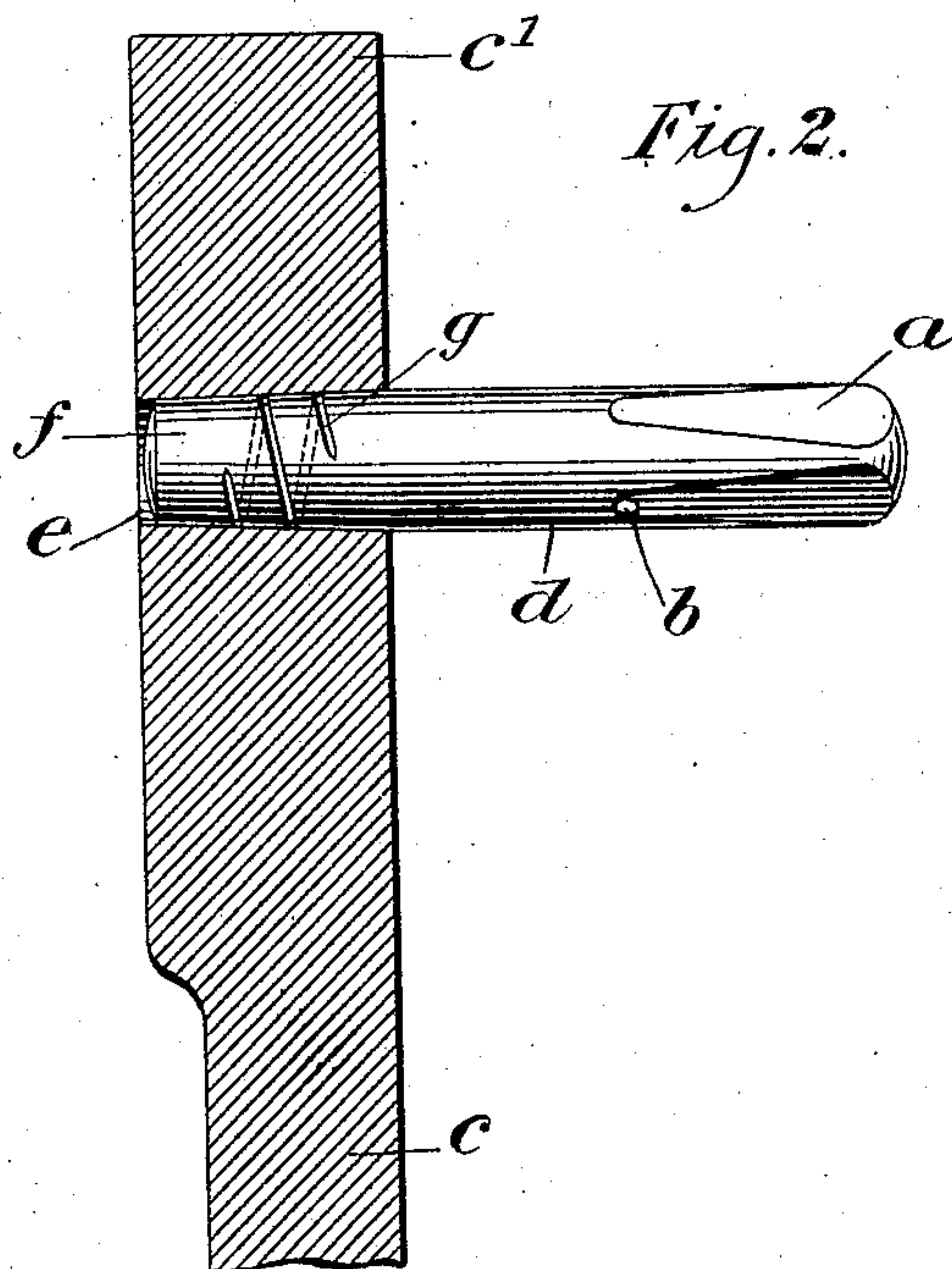
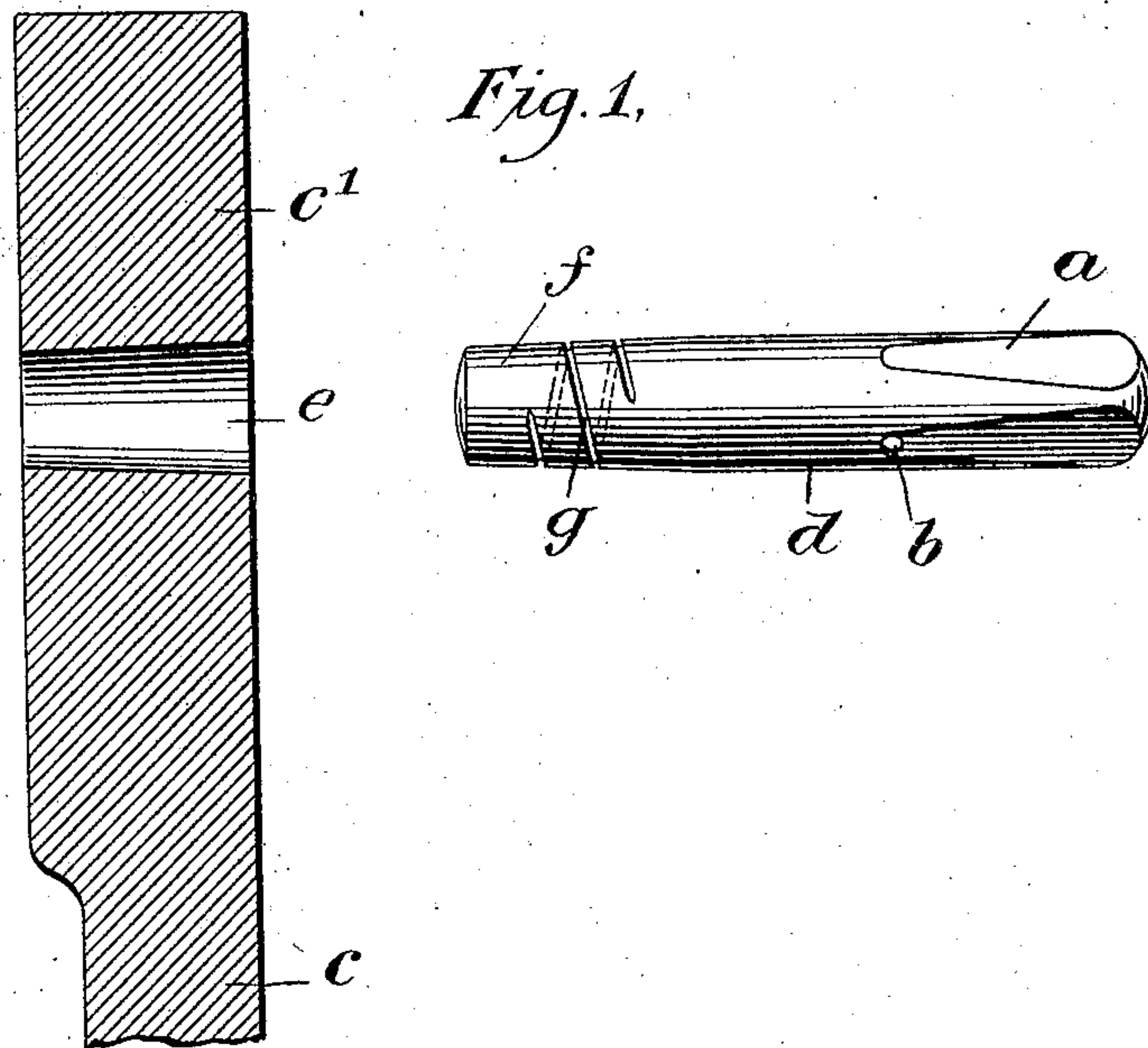


No. 847,216.

PATENTED MAR. 12, 1907.

C. S. WEBER.
TUNING DEVICE.
APPLICATION FILED AUG. 20, 1904.



WITNESSES:

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CHARLES S. WEBER, OF NEW YORK, N. Y.

TUNING DEVICE.

No. 847,216.

Specification of Letters Patent.

Patented March 12, 1907.

Application filed August 20, 1904. Serial No. 221,500.

To all whom it may concern:

Be it known that I, CHARLES S. WEBER, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Tuning Device, of which the following is a full, clear, and exact description.

This invention relates to a tuning device for pianos and similar stringed instruments wherein a metal plate is used to resist the strain of a number of metallic strings. Its object is to do away with the wooden tuning-block or wrest-plank used to-day almost exclusively, either shielded by the iron plate or exposed, to keep the tuning-pins of a piano from slipping.

Heretofore tuning-pins have been made with a roughened surface to enable them to hold firmly. They were either cylindrical or had a taper of about one thirty-second of an inch to the inch, and the presence of a lubricant has been carefully avoided. These features have especial reference to the wooden tuning-block and have been necessarily employed with it. It is not necessary to set forth here the advantages that the metal plate would have over the wooden block if it could be made practical, as they will be readily recognized by those skilled in the art. The disadvantages of the wooden block have long been recognized, and several attempts have been made to secure a pin which could be used with an integral plate and block composed of metal. None of these attempts has met with success, however, and no such all-metal plate device has proven satisfactory in every respect except where the present invention has been applied, although these other inventions, some of which are my own, have been thoroughly tested in practice. Now I have succeeded by the combination of three very simple features in achieving this long-desired result, which no one else has been able to attain.

The invention consists, essentially, in providing a musical instrument with an all-metal wrest-plate having a thickened portion provided with a hole tapering on an angle of less than one degree and fitted with a tuning-pin tapered to the same degree, the pin being provided with a groove in the form of a screw-thread for holding and retaining a lubricant, the latter being interposed between the engaging surfaces of the pins and the holes.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in both the figures.

Figure 1 is a sectional view of a metal plate and a tuning-pin, the taper being shown exaggerated; and Fig. 2 is a similar view with the tuning-pin in place.

c is the metal plate of a piano, and it is provided with an enlargement *c'*, integral with it, which constitutes the tuning-block or wrest-plank.

a shows the conical tuning-pin to be used with the metal plate *c* of a piano. It has the usual string-hole *b*. The portion *d* is cylindrical. The portion *f*, inclosed in the pin-hole *e*, is tapered, turned true, and polished to a dead smooth surface instead of being roughened by fine threading, as are the tuning-pins now on the market.

g represents a spiral or other groove or depression for retaining oil.

The portion *f* is lubricated; but to offset the action of the lubricant, which would render the conical pin liable to slip, I reduce the taper in the tuning-pin, as well as in the tool designed to ream out the pin-holes, until said taper becomes of less than half the pitch as found in the reamers now in the market, in which it is one thirty-second of an inch to the inch in length, which is an angle of nearly two degrees between the surface and the axis of the cone. I preferably use a taper of one degree or less, or about one sixty-fourth of an inch to the inch; but a smaller taper, as low as twenty-seven minutes, has been found to work better when the plate was of hard enough metal to prevent the pin from gradually sinking too far into the hole. By this reduction I gain a double advantage: First, a smaller pressure against the pin's head will steady it against the pull of the string; second, the tendency of the lubricated pin to be ejected from the conical pin-hole *e* during the act of tuning is diminished.

The polishing must be very carefully done, so as to make a true fitting and a reflecting-surface. It is preferably done before the pin is applied, but obviously might be accomplished by repeatedly turning the pin in the lubricated hole. The hole may also be polished and should be perfectly true. Thus a simple means is obtained which permits doing away with any accessory device needed to bring a permanent pressure on the tuning-

pin, as has been attempted heretofore. For the present improvement a temporary pressure in the shape of an occasional tap from the tuning-hammer will prevent the pin from slipping by the pull of even the heaviest string in a piano.

The object of polishing the binding-surface is not the same as it is where the elimination of friction is the only object, and that is limited only by our inability to completely attain it. In my device it is found that the difficulty confronting us will be almost invariably the absence of sufficient friction and rarely the presence of an excess of it. Even if the pin is left as rough as the roughest in the market there is seldom too much friction. A rough pin, however, when subjected to a few turns (under the great pressure required for attaining a sufficient degree of frictional resistance in the lubricated contact-faces) will sink more and more into the metal plate and will stop sinking only when all the minute elevations of its surface have become smoothed down. From this it will be evident that the polishing (like the lubricant) is not merely an aid or an intensifier of action, but is indispensable for the successful working of the device.

The lubricant at *f* in combination with this tuning-pin is also an important and novel point. While in other forms of tuning-pins the use of lubricant is guarded against, I oil the tuning-pin to prevent grating as between the pin and plate and to obtain a perfectly smooth turn of the pin. To bore the pin-holes slanting, so as to obtain a continuous pressure as a resultant of the pull in the string, is considered an unnecessary complication of the present improvement.

To my recollection in all cases where lubricants have so far been used the object aimed at was a complete elimination of friction between the surfaces lubricated. Thus the effect is too self-evident for the combination to be patentable in the case of a wheel that must turn easily. True, the tuning-pin must also turn, and turn smoothly, perhaps, for a few seconds in a month or in a year. For the rest of the time its function is the opposite, which is refusing to be turned even when subjected to the strain of the heaviest steel strings of a piano. Now when the mechanic by means of the lubricant improves the function of tuning it is evident that he will interfere with or possibly destroy the function of resisting. Therefore in this special device the lubricant instead of being too self-evident assumes a complex relation to the mechanical elements as soon as we inquire into the working of the combination.

Supposing, for instance, the pins were just able to resist the pull of the strings, but they turned in a jerky manner under the tuning-hammer, it is obvious that even if the remedy should work perfectly on the first-

mentioned function it will prove fatal to the last-mentioned function; but supposing they resisted with considerably more than the required force when dry, practical experience teaches that the lubricant at once renders them unable to remain firm under the great strain of the heavier bass strings of a piano. Only in case the resisting force is excessive before the application of the lubricant is there a possibility of success. Even then the combination will result in failure unless the polishing and reduced tapering above mentioned are carried out with a mechanical precision, so far unusual in the manufacture of tuning-pins. Thus success in this combination can only be attained by first increasing the frictional resistance to a degree that by any practical tuner or maker of pianos would be declared unreasonable, as it must be carried beyond a point where the first function mentioned above is already rendered impossible. This is the obstacle that hid the road to a simple solution of the problem of securing a tuning-pin direct in the metal plate of a piano without resorting to any of the more or less ingenious, but complicated, locking devices patented by inventors with a view of substituting metal for the old wooden pin-block. It can be shown that all those devices are calculated to work dry. It also can be shown that at no time has a tuning-pin with lubricated contact-surfaces been in public use, and the prior patents will prove that inventors have not believed that a combination with a lubricant would lead to success in a device where a high degree of frictional resistance in the very surfaces lubricated is a most important requirement. In my specification it is shown that the lubricant is not merely an aid to or an intensifier of action, but forms an integral part of my device.

The lubricant at *f* is interposed between the sides of the tuning-pin and its hole *e* in contact and may be applied to either. This lubricant may be oil or the like and may be applied in a liquid state in any suitable manner. This lubricant interposes a medium between the hard surfaces of the tuning-pin and its hole in the plate *c* to prevent cohesion of said surfaces and the grating and cutting thereof incident to turning the pin, which would prevent a smooth movement, which is a requisite to correct tuning.

Where a lubricant is not used, the pin and metal surface will cohere, and small particles of metal will be separated from one and adhere to the other, thus preventing the parts from working smoothly together. Heretofore it has not been thought possible to lubricate the pins, because the result of such treatment is to decrease friction, which of course is not desired in a device in which the movement of the parts on each other has to be prevented; but I have discovered that by

the combined use of the three features mentioned—namely, lubricant, dead smooth surface, and reduction in taper—the desired result is obtained in perfection.

5 It has been found that after considerable use the pins begin to show signs of sluggishness, due to the drying of the extremely small quantity of lubricant that can be held between the close-fitting polished surfaces.
 10 To remedy this defect, I cut a small reservoir *g* for the lubricant either on the pin or within the pin-hole, preferably so that the contents shall not be exposed to the oxygen of the air after the pin has closed the opening, thereby
 15 preventing the oil from drying. The preferred form of reservoir cut on the pin is in the form of a screw-thread. This acts also as an aid to keep the pin from slipping out of the pin-hole and in turning the pin in the
 20 opposite direction aids in withdrawing the pin should necessity arise. As the space occupied by this groove or any form of reservoir shown occupies but a very small fraction of the contact-surface, no drawback of any
 25 kind is noticed in the working of the device.

I am aware of the patent to Daniel Long, granted December 1, 1903, and numbered 745,643. The patentee discloses smooth
 30 contact-faces and limits the taper to one degree and twenty-two minutes. This taper is too large to work without a locking device, which he finds it necessary to provide. He would have to provide it even if he lubricated the pin, which was a matter that evidently
 35 did not occur to him. Therefore it will be obvious that his patent is a confession that the use of smooth surfaces and the reduction of the taper to one degree and twenty-two

minutes did not provide for holding the pin in place without additional fastening means. 40 By the further reduction of the taper and the application of a lubricant in addition to the thorough polishing of the pin I succeed where Long failed.

Having thus described my invention, I 45 claim as new and desire to secure by Letters Patent—

1. In a stringed musical instrument, the combination of an all-metal plate having a thickened portion provided with a tapered 50 hole, and a tuning-pin having a tapered portion polished to a reflecting-surface fitted in the said tapered hole, the taper of the hole and pin being less than one degree, said pin having a groove in the form of a screw-thread for 55 holding and retaining a lubricant, and a lubricant being interposed between the engaging surfaces of the tuning-pin and its hole.

2. In a stringed musical instrument, the combination of an all-metal wrest-plate hav- 60 ing a thickened portion provided with a hole tapering on an angle of less than one degree, and a tuning-pin having a portion tapered the same amount and fitting in said hole, said pin having a groove in the form of a 65 screw-thread for holding and retaining a lubricant, a lubricant being interposed between the bearing-surfaces of the pin and the hole.

In testimony whereof I have signed my name to this specification in the presence of 70 two subscribing witnesses.

CHARLES S. WEBER.

Witnesses:

ALBERT E. FAY,
 EVERARD BOLTON MARSHALL.