No. 638,154. Patented Nov. 28, 1899.

L. WALKER.

PIANO TUNING PIN.

(Application filed Apr. 17, 1897.)

(No Model.)

Fig. 1.

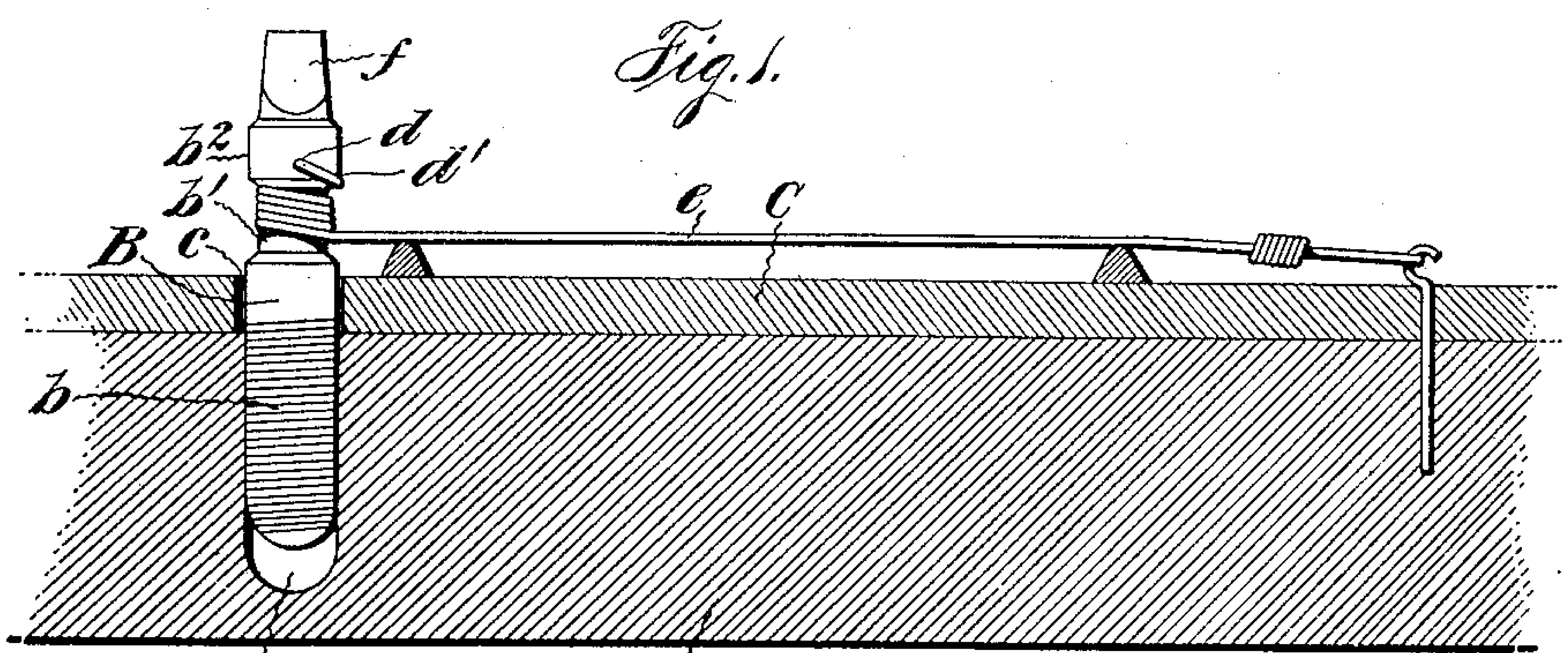
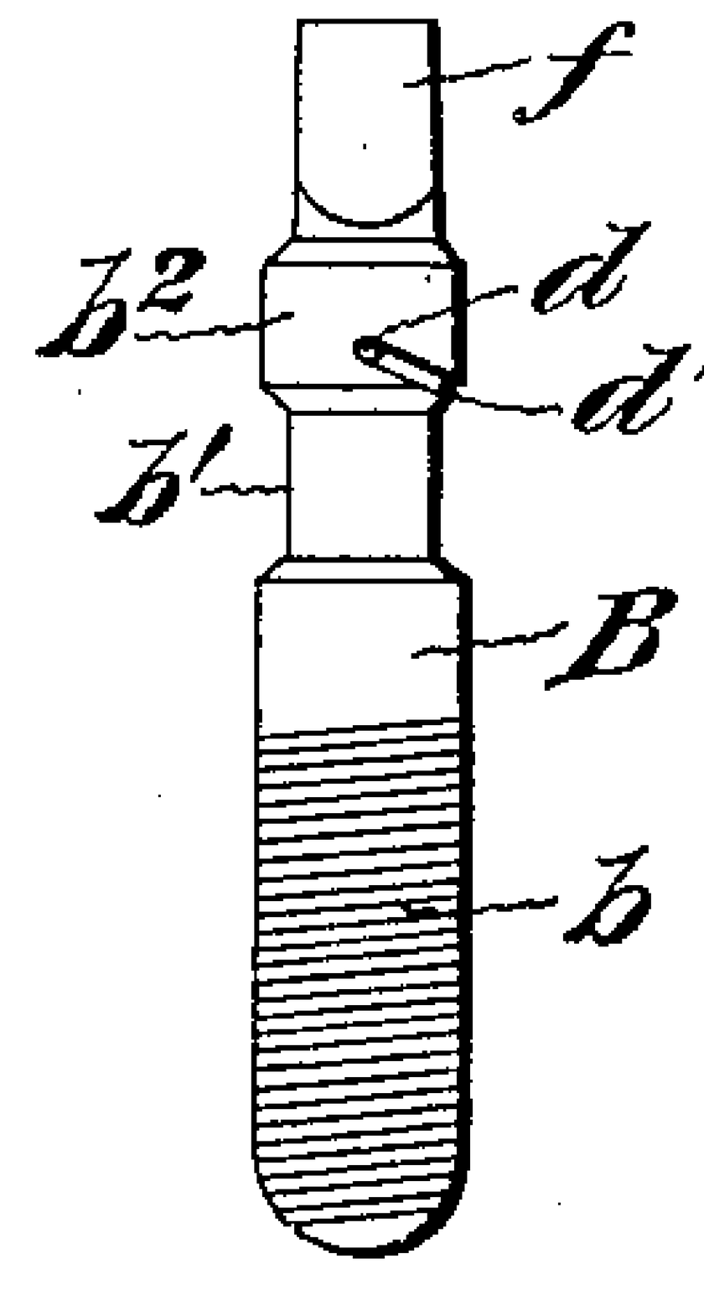


Fig. 2.



Witnesses:
B. J. Ober.
B. H. Sommers

Inventor:
Levi Walker.
by [illegible] Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LEVI WALKER, OF CHATHAM, CANADA.

PIANO TUNING-PIN.

SPECIFICATION forming part of Letters Patent No. 638,154, dated November 28, 1899.

Application filed April 17, 1897. Serial No. 632,640. (No model.)

To all whom it may concern:

Be it known that I, LEVI WALKER, a subject of the Queen of Great Britain, residing at Chatham, in the county of Kent and Province of Ontario, Canada, have invented certain new and useful Improvements in Piano Tuning-Pins, of which the following is a specification.

My invention relates to tuning-pins, and more particularly to the tuning-pins used in pianos.

I am a piano-tuner by profession with an experience of many years. I am thoroughly familiar with every element that enters into a piano-action, and I may state that I have paid particular attention to the causes which alter the tone of piano-strings. As is known to all those familiar with piano-actions the changes in the tone of the strings are due to two causes—contraction and expansion under varying atmospheric influences—and that both will take place so long as the full stretch is not taken out of the string. It is also well known that when the full stretch is taken out of the string and the latter held against contraction the tone thereof will not vary under varying atmospheric influences, though the string may break under too great a contraction, this being, however, seldom the case in pianos, which are, as a rule, not subjected to such extreme temperature variations as might cause the string to snap or break on contraction. It is obvious that when the stretch is taken out of a piano-string and the latter is held against contraction it will remain permanently in tune. The normal strain of the string on the tuning-pin is, however, very great—on an average one hundred and sixty pounds—the strain on the wrest-plank of a seven-and-one-third-octave piano being about eighteen tons, and it is this strain, which is increased very materially as the string contracts, which causes the tuning-pin to turn in its bearings in the wrest-plank, and the string will then be out of tune. This may, however, also result from the expansion of the string if the stretch is not taken out. It has been the endeavor of piano-manufacturers and others to devise a tuning-pin capable of resisting this strain—that is to say, a tuning-pin which shall have such a firm hold on the wrest-plank as not to yield to the increased strain due to the contraction of the string, and to this end various constructions of tuning-pins have been proposed, but, so far as these are known to me, none meet the requirements, in that they do not have the required hold on the wrest-plank. This is due to various causes, primarily to the great leverage of the string on the pin, the string-hole being invariably bored at right angles to the longitudinal axis of the pin and intersecting the same, and, secondly, to the insufficient holding or gripping surface of the pin. The tuning-pin now generally in use and which has been in use for years—in fact, as long as I can recollect—is one of moderate and uniform diameter (about nine thirty-seconds of an inch) throughout, except at the squared head to which the tuning-hammer is applied, the reduction in diameter being due to the flat faces formed thereon to afford the necessary hold for the hammer. The string-hole in these pins is bored squarely through the pin at a suitable distance from the milled or screw-threaded shank, and immediately below the head the leverage on this pin, due to the extensive bearing-surface of the end of the string in its hole and the abrupt bend of said string at the turn, together with the insufficient hold of its shank on the wrest-plank, cause the pin to yield under contraction of the string, and if the stretch is not taken out of the string there will be expansion, due in part to the blows of the hammer in playing and to atmospheric influences. It has been proposed to increase the diameter of the milled shank of the pin in order to afford it a better hold on the wrest-plank, the milled shank being made tapering from a reduced portion or throat, to which the string is secured to the outer end of the said shank, the string-hole being, as usual, bored transversely or squarely through said throat, the bore intersecting the longitudinal axis of the pin. It is obvious in a pin of the construction described that the strain exerted on the throat by the string is sustained chiefly by that portion of the shank having the greatest diameter, hence a mere circle about the shank, and as the leverage of the string on the throat is the same as in the tuning-pin first herein referred to the strain tends to revolve the pin on a circular fulcrum about the point of

greatest diameter of the shank, and such a pin will yield more readily to strain than the pin commonly used and of uniform diameter throughout, and for this reason tapering pins are not used in pianos. It has further been proposed to construct the tuning-pins in two sections, one revoluble on the other, the former having a squared head for the tuning-hammer and a longitudinally-slotted cylindrical tubular portion fitting on the fixed pin, the strain on the slotted portion holding the same to the pin. Such a pin has for obvious reasons never been employed in pianos because the revoluble portion cannot sustain the strain, having but frictional hold on the fixed pin. Finally, it has been proposed to attach the wire to a lever, the forked free end of which has bearing on a shoulder formed by the throat of the pin and its head. Evidently in such a construction the entire strain of the string is exerted in the direction of the longitudinal axis of the pin, tending to, and, in fact, drawing the pin out of the wrest-plank. Without taking the complicated arrangement of such a pin and its increased cost into consideration the incapacity thereof to resist the strain is obvious. The fact is that none of the so-called "improved" tuning-pins have, to my knowledge, superseded the tuning-pin now in common use and first herein referred to.

The object of my invention lies in the construction of a tuning-pin which is capable of resisting the increased strain exerted thereon over and above the normal strain and due to the contraction of the string, such construction being the result of years of study as to the mode of obviating the tendency of the pin to turn under said increased strain. In this I have succeeded, first, by making the milled shank of tuning-pins of greater diameter than that of the pin commonly used, and, like it, of uniform diameter throughout; secondly, by reducing the leverage of the string on the pin, I may say, to *nil*, and this I do by providing the pin with a winding-throat of slightly less diameter than that of the shank and having the usual tapering squared head for the tuning-hammer with this very important exception, that I provide between the said head and throat a cylindrical portion of substantially the same diameter as the shank, and instead of boring the string-hole squarely through the said throat or in a plane at right angles to and intersecting the longitudinal axis of the pin I bore said hole through the enlarged cylindrical portion above the throat and about midway of the length of said cylindrical portion and form a helical channel extending from one end of said hole to the point of junction of said cylindrical portion with the throat of the pin. It is evident that the shank of uniform but greater diameter than that of the shank of the tuning-pin generally used will afford a correspondingly greater hold on the wrest-plank. It is furthermore evident that by passing the string in a helical direction from its hole in the enlarged portion of the pin above its throat and commencing the winding of said string at the point of junction of the throat with the said enlarged portion the leverage of the string on the pin is reduced to practically nothing, and as the throat is of about the same diameter as that of the tuning-pin in common use danger of breakage is of course avoided, as the pin itself is in no manner weakened, while a considerable portion of the strain is sustained by the enlarged portion above the throat, and that strain may be said to be exerted in the direction of the longitudinal axis of the pin, but instead of outwardly or toward the head, as in the lever-pin hereinbefore referred to, it is exerted inwardly or toward the wrest-plank, tending to more firmly hold the pin therein.

To satisfy myself that the object of my invention has been attained by a pin of the construction described, I tested the same by having a piano-action equipped with these pins and subjected first to a freezing temperature and then immediately to the influence of a midsummer sun, and after reducing the temperature to normal by placing the action in a store-room and allowing it to cool I tested it and found that none of the strings were out of tune. This test if applied to an action equipped with the tuning-pins in general use would have left every string out of tune.

That my invention may be fully understood I will describe the same briefly, reference being had to the accompanying drawings, in which—

Figure 1 is a fragmentary sectional view of a piano wrest-plank, showing one of my improved pins in position and a string connected thereto; and Fig. 2 is an elevation of the pin approximately full size.

In Fig. 1, A indicates the wrest-plank, and C the iron frame usually employed and having, as usual, holes *c* for and of greater diameter than the shank or body of the tuning-pin, and which frame carries the usual bridges for the strings secured to said frame and wrest-plank by means of hitch-pins, as usual, while said wrest-plank A has formed therein the sockets *a* of suitable diameter for the body or shank of the tuning-pins.

The pin B has a milled or screw-threaded shank of considerably greater diameter (say about eleven thirty-seconds of an inch) than that of the shank of the tuning-pins now in common use, the diameter of which is about nine thirty-seconds of an inch. Above the body or shank *b* of pin B is formed the throat *b'*, whose diameter is about the same as that of the body or shank of the tuning-pin now in common use, or about nine thirty-seconds of an inch, and above said throat is formed the head of the pin, comprising a cylindrical portion b^2 of substantially the same diameter as the body or shank *a*, and a squared more or less tapering portion *f* for the application of the tuning-hammer, said portion *f* being

likewise of about the same dimensions as the corresponding portion of the tuning-pins now in common use.

The string-hole *d*, instead of being bored through the throat of the pin, as is the case in those pins which have an enlarged tapering milled body or shank, is in my improved pin bored through the enlarged cylindrical portion b^2 of the pin at a point some distance from the junction of said portion b^2 with the throat *b'*, and there is a helical groove or channel *d'* formed in said portion b^2 extending from one end of the hole to the point of junction of said portion b^2 with the throat *b'* for the reception and retention of the string and whereby the leverage of the latter on the pin is reduced to practically nothing, while the strain, or at least a portion of the strain, is exerted in the direction of the wrest-plank, as above set forth.

In my improved pin I have increased the diameter of the body or shank as much as is possible without unduly weakening the wrest-plank without reducing the diameter of the throat *b'*, about which the string is wound, and have provided in addition a point of attachment of the string—namely, the portion b^2—of greater diameter, hence greater strength, than the corresponding part of the ordinary or so-called "improved" tapered shank tuning-pin, and at the same time I have provided a means whereby the leverage of the pin on said reinforced portion b^2 is very materially reduced—in fact, as experience has shown, reduced to practically nothing. It will of course be readily understood that if that portion of a tuning-pin above its shank were made of the same diameter as that of the shank of my improved tuning-pin it would be necessary in order to afford a sufficient hold of the pin in the wrest-plank to correspondingly increase the diameter of the milled body or shank thereof. This would, however, be impossible, because of the corresponding weakening of the wrest-plank, which would then not be able to sustain the great strain thereon. Furthermore, if the portion of the pin B above its shank were reduced in diameter with a view to a reduction of the leverage of the string thereon and if said reduced portion were of uniform diameter throughout and the string-hole bored squarely through it it would not sustain the strain and would split, as has been found by experiment, so that such a construction is likewise impracticable. Obviously the increasing of the diameter of the milled body or shank *b* of the pin means a correspondingly-increased hold on the wrest-plank, and in order to relieve the throat *b'*, about which the string is wound, of excessive strain and prevent its splitting, as above stated, I have provided the enlarged cylindrical portion b^2, whereby this defect is not only effectually remedied, but the leverage of the string on the pin greatly reduced.

In view of the fact that the squared portion *f* of my improved tuning-pin is of the same diameter as the corresponding portion of the tuning-pins now in common use no alteration in the tuning-hammers is necessary.

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

1. A tuning-pin having a milled body or shank of uniform, but of greater diameter than that of the body or shank of the tuning-pins in common use, a cylindrical head of substantially the same diameter as the shank, said head terminating in a squared portion for the tuning-hammer, a throat of reduced diameter intermediate of said shank and head, the latter having a string-hole extending transversely therethrough at a point some distance from its point of junction with the throat, and a helical groove extending from one end of said hole to said point of junction, substantially as and for the purpose set forth.

2. A tuning-pin having a milled body or shank of substantially uniform diameter throughout its length but of greater diameter than that of the body or shank of the tuning-pins in common use, a throat of substantially the same diameter as that of the milled body or shank of said tuning-pins in common use, a cylindrical head of substantially the same diameter as that of the milled body or shank of the pin, said head terminating in a squared portion for the tuning-hammer, likewise of the same dimensions as those of the corresponding part of the tuning-pins in common use, said cylindrical head having a string-hole bored therethrough at a point some distance from its point of junction with the aforesaid throat and having a helical groove extending from one end of said hole to said point of junction of the cylindrical portion of the head with the said throat, substantially as and for the purpose set forth.

LEVI WALKER.

Witnesses:
J. A. WALKER,
T. J. RUTLEY.