

(No Model.)

4 Sheets—Sheet 1.

C. L. WESER.
TONE REGULATOR FOR PIANO FORTES.

No. 465,505.

Patented Dec. 22, 1891.

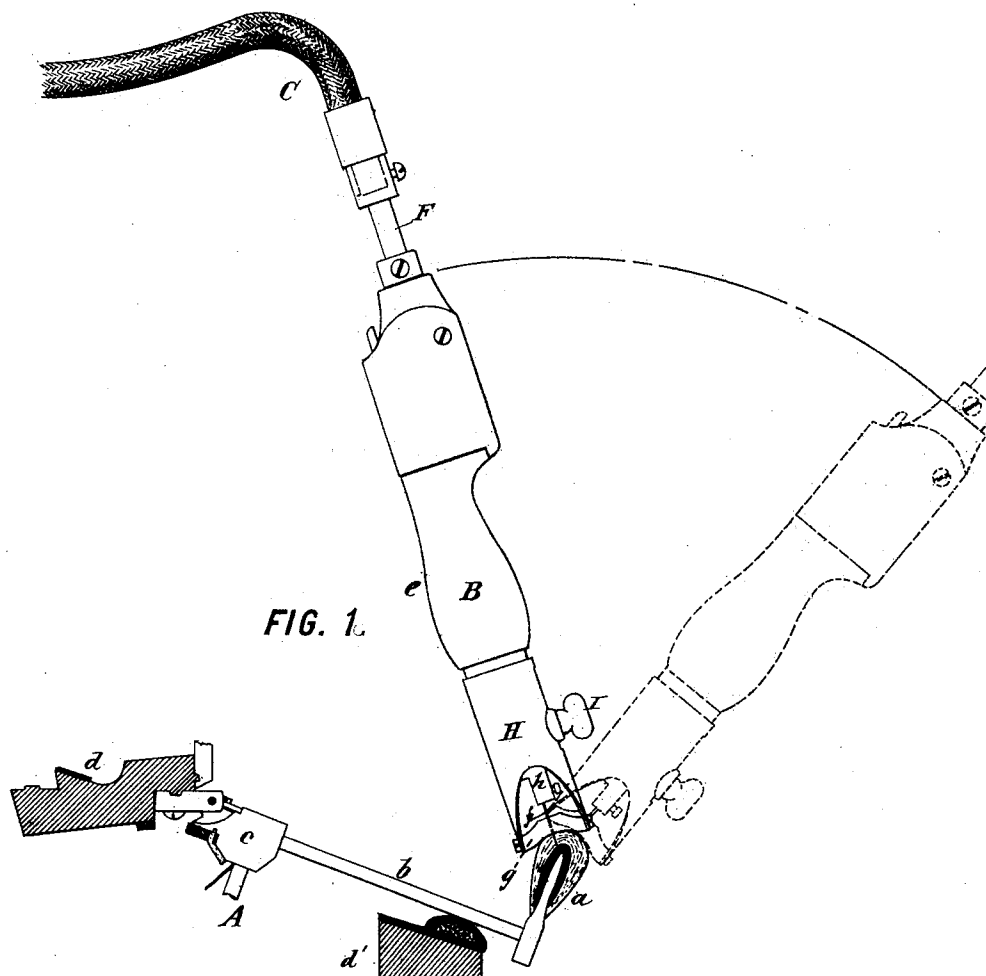


FIG. 1.

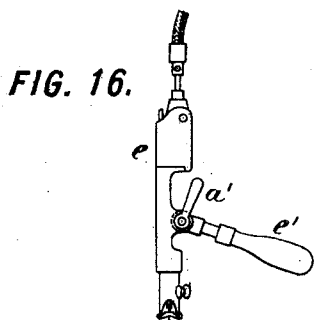


FIG. 16.

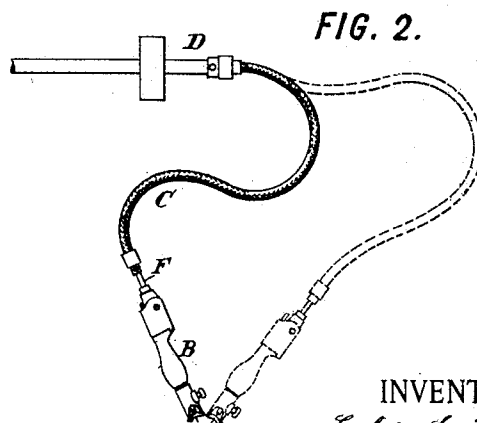


FIG. 2.

WITNESSES:

John Becker
Fred White

INVENTOR:

Calvin L. Weser

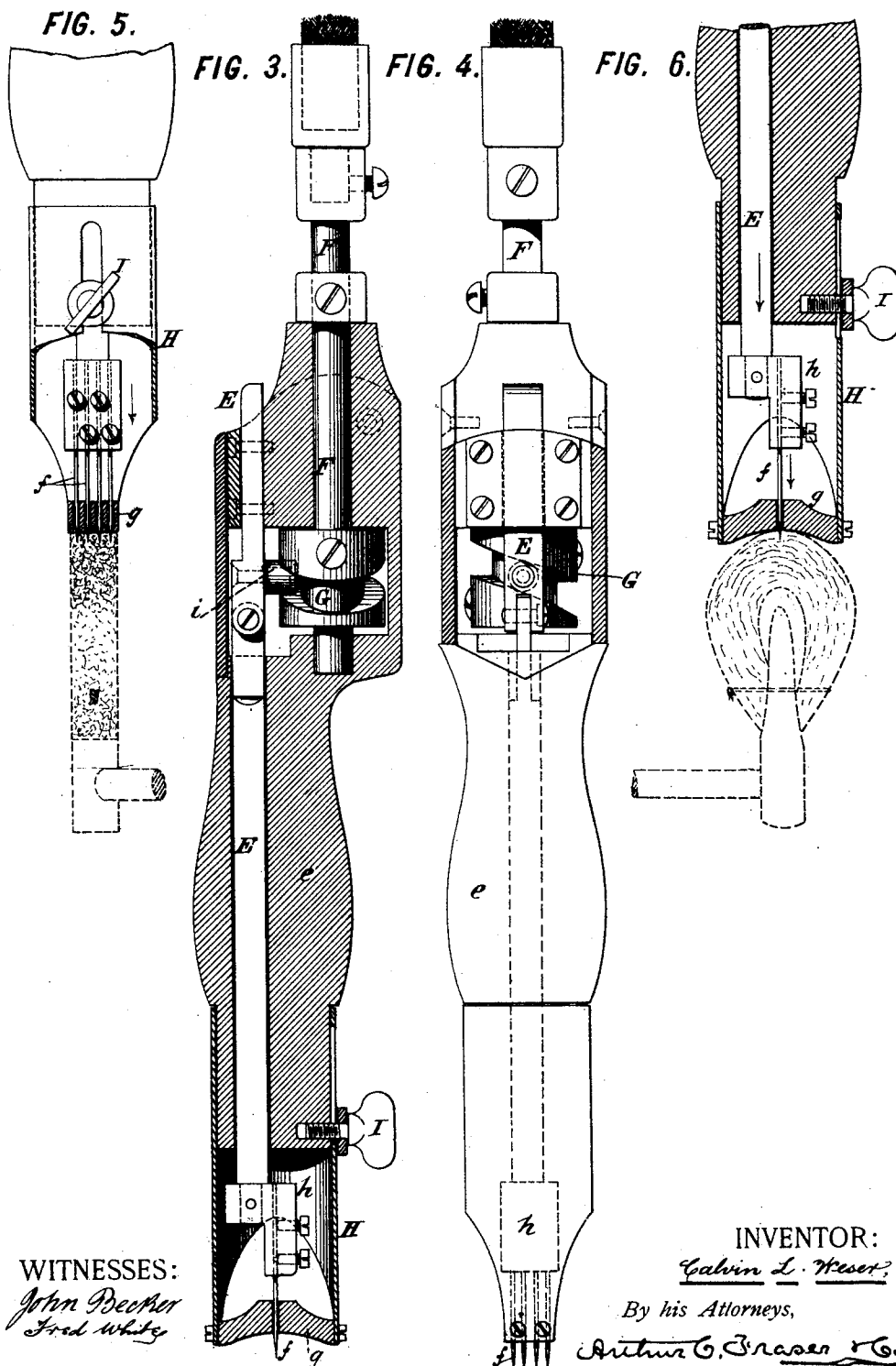
By his Attorneys,

Arthur C. Fraser & Co.

4 Sheets—Sheet 2.

No. 465,505.

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FIG. 7.

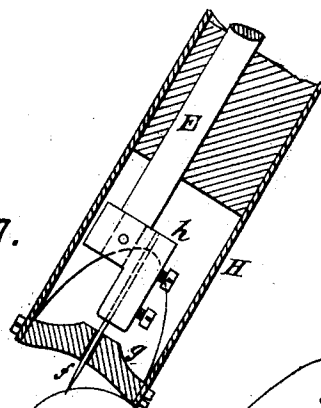


FIG. 15.

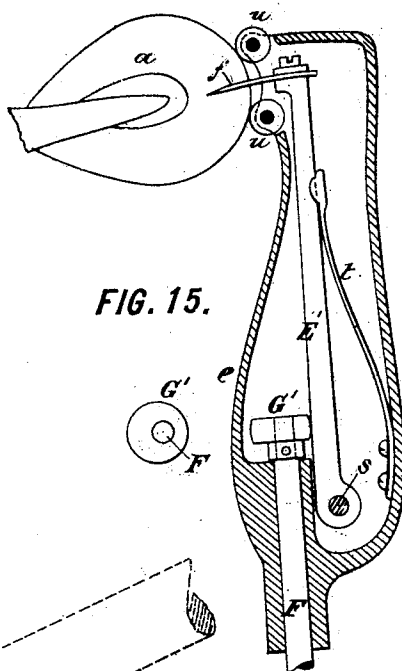


FIG. 8.

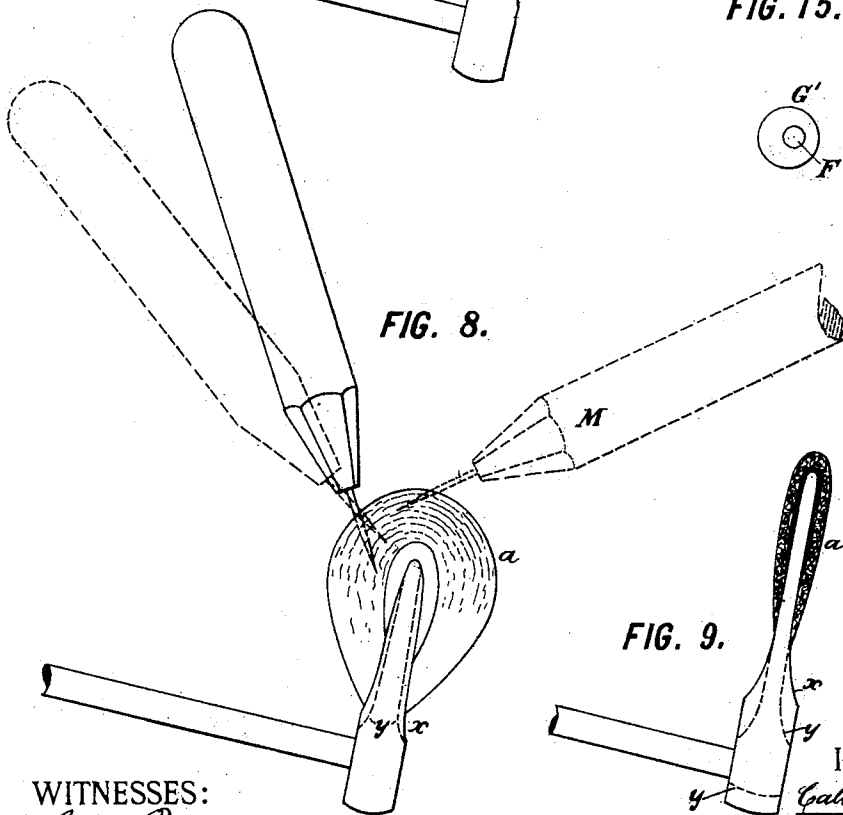
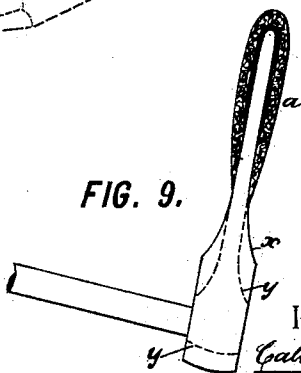


FIG. 9.



WITNESSES:

John Becker
Fred White

INVENTOR:

Calvin L. Weser

By his Attorneys,

Arthur C. Innes & Co.

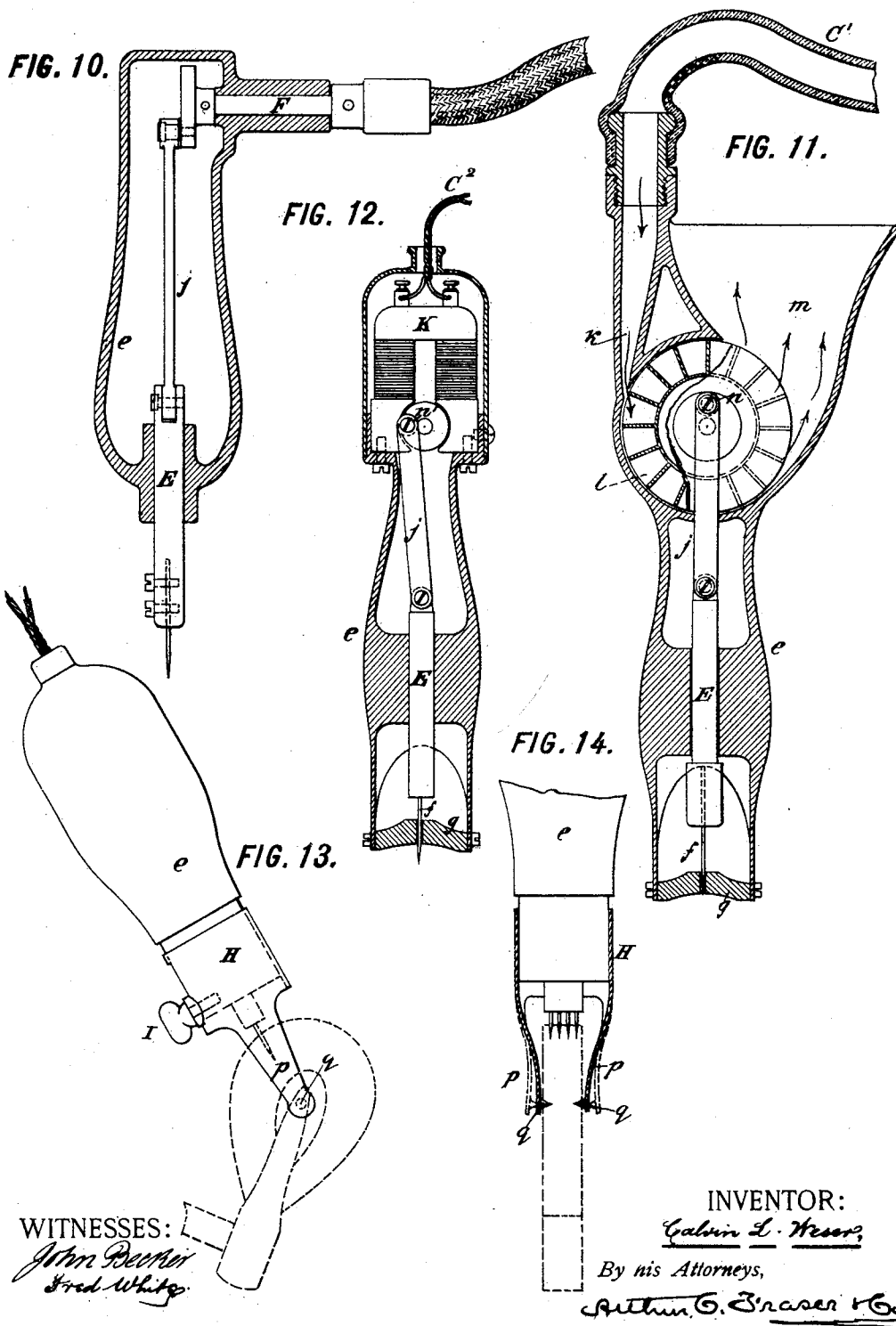
(No Model.)

4 Sheets—Sheet 4.

C. L. WESER.
TONE REGULATOR FOR PIANO FORTES.

No. 465,505.

Patented Dec. 22, 1891.



UNITED STATES PATENT OFFICE.

CALVIN L. WESER, OF NEW YORK, N. Y.

TONE-REGULATOR FOR PIANO-FORTES.

SPECIFICATION forming part of Letters Patent No. 465,505, dated December 22, 1891.

Application filed February 26, 1890. Serial No. 341,878. (No model.)

To all whom it may concern:

Be it known that I, CALVIN L. WESER, a citizen of the United States, residing in New York city, in the county and State of New York, have invented certain new and useful Improvements in Tone-Regulators for Piano-Fortes, of which the following is a specification.

This invention provides improved means for the tone-regulation of piano-fortes designed to supersede the method of regulation by hand manipulation now employed.

The operation, which is technically known as "tone-regulating," consists in softening the felts on the hammer, the softening being carried to greater or less extent in the different hammers in order thereby to modify the tone and to compensate for variations of tone due to other causes. The felts on all the hammers are originally dense and hard, and before the operation of tone-regulating the sounds emitted as they strike the strings are harsh, hard, or wiry, and lack mellowness or musical quality. The felts on all the hammers require softening in order to reduce this harshness of tone and render the notes sufficiently soft and mellow; but some hammers require to be softened to greater extent than the neighboring ones in order to compensate for or conceal irregularities of tone in the successive notes which are due to various accidental causes, such as varying densities of wood in the sounding-board, variations in the quality and weight of the strings, &c. As such accidental variations of tone are practically impossible of correction otherwise, piano-makers customarily rely upon the operation of tone-regulating, which is one of the final operations in the construction of the piano, to compensate for and thereby conceal these inequalities of tone. The softening of the felts is accomplished by pricking them with needles, the needles being carried in a wooden handle which the workman holds in one hand and strikes repeatedly against the hammer, so that the needles enter the felt and force the fibers thereof apart, so as to loosen up and thereby soften the cushion of felt upon the hammer. This hand tool is shown in side view in Fig. 7 of the accompanying drawings. The operation of tone-regulating by the use of said hand tool is one requiring consider-

able manual dexterity, and is a slow and tedious piece of work, requiring, if properly done and by an experienced workman, usually about one day's time. An expert workman can tone-regulate from six to eight pianos a week. In the manufacture of cheap pianos less attention is paid to the niceties of tone-regulation and the workman can do from fifteen to twenty a week.

My present invention provides an instrument for facilitating the operation of tone-regulating, and which is designed to be used in place of regulation by hand, as has heretofore been practiced.

To this end my invention provides a tone-regulating tool consisting of a handle to be grasped by the operator and one or more needles projecting sufficiently from its end, with mechanism for reciprocating the needles relatively to the handle, so that they are rapidly and alternately protruded and retracted. The handle being held firmly in the hand and being carried around the hammer without being itself moved toward and from the latter, as has heretofore been necessary, the needles automatically penetrate the felt in rapid succession. The operator determines the extent to which the felt shall be loosened or softened by the time during which he holds the tool against the hammer, so that its needles can penetrate it. The work is thus performed more rapidly and with less fatigue on the part of the operator, and requires less manual dexterity than the former means for accomplishing this purpose. Preferably the handle is provided with a guide or guard, through which the needles work, and which in use is brought against the surface of the hammer to determine the extent and direction of penetration of the needles. Preferably the reciprocation of the needles is effected by power derived from a flexible shaft entering the handle at one end and communicating, through any suitable mechanical movement, alternate longitudinal reciprocation to a sliding bar or frame within the handle, to which bar or frame the needles are fastened and from which they project in line with its direction of motion. The power for reciprocating the needles, however, may be communicated to the tool in many different ways—as by electric, pneumatic, or other means—and

any one of numerous mechanical movements may be adopted for imparting the essential reciprocatory motion.

In the accompanying drawings, Figure 1 is a fragmentary cross-section of an upright piano-forte action, which has been turned down into position for tone-regulating. This view contains in elevation the preferred form of my improved tool, which is shown in full lines in one position and in dotted lines swung over to another position. Fig. 2 is a similar view on a smaller scale, showing the means for connecting the regulating-tool to a power-shaft through the medium of a flexible shaft. Fig. 3 is a vertical mid-section of the tool viewed from the side. Fig. 4 is a front elevation of the tool, partly in vertical section. Fig. 5 is a fragmentary front elevation of the lower part of the tool, showing it at work upon the hammer, which latter is indicated in dotted lines. Fig. 6 is a fragmentary side view of the lower part of the tool, showing the hammer in dotted lines. Fig. 7 is a similar view showing the action of the guard in limiting the extent of penetration of the needles. Figs. 8 and 9 are elevations, respectively, of a base and treble hammer, Fig. 8 showing, also, the ordinary hand-tool in two positions in full and dotted lines. The remaining views illustrate modifications of my invention, whereof Fig. 10 is a vertical section showing a different method of driving the needles from a flexible shaft. Fig. 11 is a similar view showing a means for driving the needles by compressed air. Fig. 12 is a similar section showing the driving of the needles by an electromotor. Figs. 13 and 14 are respectively a side and front elevation showing a tool having a modified means for guiding the needles. Fig. 15 is a longitudinal mid-section of a further modification of the tool. Fig. 16 is a side elevation on a small scale of another modification.

Referring to Fig. 1, let A designate the piano-action, which is shown only in part, *a* being the hammer; *b*, the hammer-stem; *c*, the pivotal butt of the hammer-stem; *d*, the hammer-rail to which the hammers are pivoted, and *d'* the action-rail, which carries the cushion against which the hammers fall back after striking. The particular action here shown is an upright action, but is shown turned down horizontally in the position in which such actions are placed while performing the operation of tone-regulating.

B is the tone-regulating tool provided by my invention, which is connected by a flexible shaft C to the power-shaft D, as shown in Fig. 2.

The tool B consists, essentially, of a handle *e*, to be grasped by the hand of the operator, one or more needles *f* at the lower end of the handle, mounted so as to be movable in and out, and any suitable or convenient mechanism for imparting to the needle or needles a rapid reciprocating movement in the direction of their length. In addition preferably a guard or guide *g* is provided at the lower

end of the handle, through which the needle or needles may work and which shall limit the extent of their penetration and also to some extent its direction.

In the preferred construction of my improved tool, which is shown in Figs. 1 to 6, inclusive, there are four needles *f*, arranged in a row and extending longitudinally of the handle. They are clamped or otherwise fastened to a head *h*, fixed to the lower end of a slide E, which extends longitudinally through the handle *e*, or for any desired portion of the length thereof, and is guided therein, so that it is free to slide longitudinally. The flexible shaft C (shown in Figs. 1 and 2) is connected at its end by any suitable coupling to a shaft F, mounted to turn in bearings within the upper portion of the handle. On this shaft F is fixed a cam-cylinder G, in which is formed a cam-groove, and into this groove projects a roller *i* on the slide E. As the shaft F is revolved from the shaft D through the flexible shaft C, the roller *i* is caused by the sinuous contour of the cam-groove to move rapidly up and down, and it imparts thus a longitudinal movement to the slide E, and consequently to the needles *f*. The head *h* and needles *f* are housed in a sleeve H, which is adjustable up or down on the handle by means of a set-screw I. The lower end of the sleeve H carries a guide-plate *g*, formed with holes through which the needles may freely play. By setting the sleeve H to a higher or lower position the needles may be caused to protrude more or less beyond the guide-plate *g*.

The tool is used by grasping its handle *e* in the hand, placing its lower end with the guide-plate *g* against the exterior of the felt on the hammer, and carrying the tool partially around the end of the hammer, keeping it approximately radial thereto, as clearly shown in Fig. 1. The rapid protruding and retracting movement of the needles causes them to penetrate or prick into the felt and thereby to wedge its fibers apart and soften it. If it is desired to make the hammer softer in one place than another, the tool will be held longer in contact with that portion of the hammer, so that the needles will make a greater number of penetrations than at the other portions thereof. The degree of softness of the felt will depend entirely upon the number of penetrations, and hence the hammer may be reduced to any degree of softness desired by graduating the duration of time that the tool is caused to act upon it. But little skill is required on the part of the operator to hold the handle *e* radially of the center of the hammer, and this skill may readily be acquired without constructing the tool to aid in holding itself thus radial; but to contribute as far as possible to the accuracy of the work and render its quality as little dependent upon manual dexterity as possible I so construct the tool that it tends to retain always a position with the needles radial of the hammer

and withdraws the needles out of reach of the hammer before their angle therewith can be changed to any considerable degree of divergence from a radial position. This purpose is effected by the guide-plate *g*, the lower face of which is rendered concave with a curve approximating the curve of the largest of the hammer-heads—that is, those of the bass-hammers. When the tool is placed against the hammer, the latter partially enters the hollow or concave in the guide-plate, and this plate serves thus to keep the lower end of the tool in proper relative position to the hammer. Should the tool slip or be incorrectly placed by an unskillful operator, it will assume the position shown in Fig. 7, where the needle, even when fully projected, is lifted, so that it is out of contact with or but partly penetrates the felt, so that it is impossible to incline the tool so that the needles shall depart sufficiently from perpendicularity to the surface of the felt to do the latter any injury.

The extent of penetration of the needles should be graduated in proportion to the thickness of the felt. Thus, for treble-hammers, the felt of which is very thin, the needles should project very slightly, while for bass-hammers having thick felts the projection may be considerable. This is accomplished by setting the sleeve *H* in or out for operating on the different sets of hammers of the action, or by having specially-adjusted tools for the bass and treble hammers.

My improved tool possesses important advantages over the means of tone-regulation as heretofore practiced by hand. The movement of the needles is many times more rapid than it is possible to effect by moving them by hand, so that the work of tone-regulation, which by the old method takes about a day, can by my invention be done with equal care in about two hours. The workman, although requiring the same accurate ear and good judgment as in the hand manipulation, does not require so much manual dexterity to use my tool as to use the old hand-tool. The needles, being free from lateral strain, may also be much finer with my tool than is practicable with the hand-tool, thereby pricking numerous fine holes in the felt, instead of comparatively few coarse holes. The result is that the felt is softened more uniformly and its texture is less weakened than when its fibers are drawn so widely apart as by the forcing of a thick needle between them. The softening effect is also more uniform, since more of the fibers are separated by pricking numerous fine holes than by forming comparatively few coarse holes. By the use of my tool there is little if any liability of injuring the hammer, whereas with the old tools the hammers are continually liable to be injured by some accidental movement or slip of the tool. With the old tool there is also more or less prying movement of the needles in the felt, due to inevitable irregularities in the movement of the hand. This is illustrated

at the left hand of Fig. 8, where it is somewhat exaggerated. The hand-tool is shown in full lines in the position in which it is driven into the felt, and in dotted lines in the position in which it is drawn out, the needles thus being tilted within the felt, exerting a leverage therein which tends to displace and tear the fibers. Since in my improved tool the movement of the needles is in a right line, they are bound to retreat in exactly the same line as that in which they entered the felt. It will be impossible to tilt the handle *e* between the entering and retreating of the needles, since the movement of the latter is so rapid. Another and important advantage of my invention is that the needles are caused to penetrate the felt in a direction always perpendicular, or very nearly so, to the external outline of the hammer.

In the use of the old hand-tool an unskillful workman will frequently insert the tool somewhat in the manner indicated in dotted lines at *M* in Fig. 8, so that the needles enter nearly parallel with the exterior outline of the hammer. This tends to separate the fibers into layers parallel with the exterior outline, which impairs the hammer, imparting to it at the outset an apparent softness which is soon lost in use, since the direction of the blow against the strings is such as to mat the fibers together again and render the felt hard, whereas if the fibers are separated by pricking the felt in the direction of the blow the fibers are separated laterally, and the felt retains its softness for a much longer period, since the blow against the strings has no direct tendency to mat together fibers thus laterally separated. It is to accomplish this result of the separation of the fibers laterally that a skillful workman drives the needles into the felt in radial direction, or approximately so, the direction being always radial at the tip of the hammer where it strikes the strings. The same result is accomplished in my invention by the use of the guard-plate *g*, by which even an unskillful workman is compelled to insert the needles in the same direction or so closely approximate thereto as to produce the same effect.

Another advantage of my invention is that the tone-regulating process involves less strain to the hammers and their stems, and they consequently require less strength. By the old hand process the hammer receives at each penetration of the needles the full blow of the tool and the hand and the arm of the operator. In using my invention, however, no blow whatever is struck, the tool being simply carried around the hammer while its weight is sustained by the operator's hand, and the penetration of the needles subjects the hammer to no appreciable strain. For this reason the hammer may be lighter than heretofore, which is of considerable advantage, especially in the case of treble-hammers.

In Figs. 8 and 9, which show, respectively, a bass and treble hammer, the full lines *x* in-

dicating the outline at present given to the wooden head of the hammer, while the dotted lines *g* indicate the extent to which the material of this head may be cut away in making hammers for an action which is to be tone-regulated by the use of my invention. The stems also may be lightened to a relative extent. To sum up, therefore, my invention not only cheapens the tone-regulating process and consequently reduces the cost of the piano, but it improves the construction and tone of the piano, so that a piano regulated by the use of my instrument can be readily distinguished by its superiority of tone over another like instrument regulated by hand in the old way, and the original tone quality is more permanent in use.

The construction of tool which I have shown in Figs. 1 to 7 is one which I have had in practical use and which I know to be an effective embodiment of my invention. The construction of the tool may, however, be materially modified without departing from what is essential to my invention. For example, in place of the cam movement for imparting reciprocation to the slide *E*, carrying the needles, any other mechanical movement by which the rotation of a shaft such as *F* may be converted into reciprocatory motion can be adopted. One such construction is shown in Fig. 10, where the shaft *F*, instead of being arranged in line with the handle, projects perpendicularly therefrom and carries a crank on its end within the handle, which is connected by a pitman *j* with the slide *E*. This view also illustrates how the guide *g* may be omitted. The needles *f* are here clamped directly in the lower end of the slide *E*, and the tool is unprovided with any guide whatever. A skillful operator will not need any guide to determine either the extent of penetration or the angle of penetration of the needles. If necessary, he might steady his hand by resting it on a bar placed in front of the row of hammers in the action or on any other suitable rest or support.

Numerous other methods of communicating power from an external source to a movable or portable tool are well known in the art, and any one of these may be substituted for the flexible shaft, which I have shown as applied to my preferred construction. Instead of mechanical means for communicating the power, pneumatic, hydraulic, electrical, or any other suitable means may be employed. Fig. 11 illustrates how pneumatic means may be used, a flexible tube *C'* being employed to conduct compressed air from any suitable source to the tool into which it passes through a contracted nozzle *k* and is forced in a concentrated jet against the wings or vanes of a wheel *l*, escaping finally at *m*. The wheel *l* has a crank *n*, which connects through a pitman *j* with the slide *E*, carrying the needles. A similar construction could be employed for hydraulic transmission of power, except that some means would have to be

provided for carrying off the spent water. Fig. 12 illustrates how the tool can be driven by power communicated electrically, the circuit-wires entering through a flexible cable *C''* and connecting with the binding-posts of an electro-motor *K*, the armature-shaft of which has a crank *n'*, connecting by a pitman *j* with the slide *E*, which carries the needles.

Figs. 13 and 14 show a modification by means of which the tool may be guided to determine the direction and extent of penetration without using the guide-plate *g*. The needles are unprovided with any guide, the construction being thus the same as in Fig. 10. The handle *e* is provided with two spring-fingers *p p* on its opposite sides, projecting beyond the points of the needles and armed with spurs *q q*, projecting toward each other. These fingers are adapted to extend on opposite sides of the hammer, and the spurs can be pressed by the fingers of the left hand into contact with the wooden head of the hammer, slightly penetrating the latter, as shown in full lines in Fig. 14. The springs *p* are of such length and the spurs *q* so placed in line with the needles that the spurs may enter at the center of the approximately circular portion of the head. The tool may then be carried around this center, being thus held at all times with the needles radially thereof. The spring-arms *p* are fastened to a sleeve *r*, which may be adjusted out or in relatively to the handle *e* to regulate the depth of penetration of the needles.

Although, preferably, the needles are arranged longitudinally of the handle *e*, yet this is not essential. In Fig. 15 they are shown as arranged transversely thereof, being mounted on the end of a pivoted arm *E'*, pivoted within the handle at *s* and acted on by a cam or eccentric *G'* on a shaft *F* to press it in one direction and by a spring *t* to press it in the opposite direction. Rollers *u u* serve in place of the guide-plate *g*. This construction is shown only to illustrate a possible modification of my invention and not because it is deemed especially desirable.

Obviously my invention may be modified in many other respects in ways that any ingenious mechanic can readily suggest.

Although I have described the portion *e* of the tool as being a handle, and although, preferably, this portion of the tool is to be constructed to be grasped by the hand of the operator, yet this construction is not essential, since this portion of the tool may be a mere frame for supporting the working parts, and a separate handle may be provided, fixed or suitably connected to such frame. Such a construction is shown in Fig. 16, wherein the working parts of the tool are of the same construction as in Figs. 1 to 6, and the portion *e* is merely a frame inclosing them, a separate handle *e'* being provided, the stem of which is pivoted to the frame *e* by an adjustable joint *a'*, having a thumb-nut or clamping-pivot by which the handle may be turned to any desired

angle with the frame *e*. The handle might be united to the frame in many other ways.

I am well aware that tools have been made involving a handle and a stylus, punch, or cutting-blade mounted to reciprocate therein and alternately protrude from and recede into the handle. Many such tools may be mentioned—the duplicating-pen for pricking a succession of holes in a sheet of paper for duplicating writing, also dental pluggers, cloth-cutting tools, &c.; but no tools of this character heretofore made are applicable to the purpose of my invention, nor have they ever been applied thereto, and they are all essentially distinguished therefrom by reason of their inherent want of analogy in use or application to the pricking or opening of the felts of piano-forte hammers. I make no claim to any such known tools, nor to any tools not especially adapted for that purpose.

I claim as my invention the following defined novel features or combinations, substantially as hereinbefore specified, namely:

1. A tone-regulating tool consisting of a handle or frame, a needle carried thereby, and means for alternately protruding and retracting the needle in rapid succession, the whole adapted for use substantially in the manner specified.

2. A tone-regulating tool consisting of a handle or frame, a slide movable therein in the direction of its length, a needle or needles carried by said slide and protruding beyond the handle, and means for imparting a rapid reciprocatory movement to said slide, substantially as and for the purpose set forth.

3. A tone-regulating tool consisting of a handle or frame, a needle carried thereby, an external source of power, a flexible connector leading thence to said handle to communicate power thereto, and means carried by the handle and driven by said power for alternately protruding and retracting the needle relatively to the handle in rapid succession, substantially as set forth.

4. A tone-regulating tool consisting of a handle or frame, a slide movable therein in direction longitudinally thereof, a needle or needles carried by said slide and protruding beyond the end of the handle, and means for imparting a rapid reciprocatory movement to said slide, substantially as set forth.

5. A tone-regulating tool consisting of a handle or frame, a needle carried thereby, means for alternately protruding and retracting the needle relatively to the handle, and a guide or guard for limiting the extent of penetration of the needle, substantially as set forth.

6. A tone-regulating tool consisting of a

handle or frame, a needle carried thereby, means for alternately protruding and retracting the needle relatively to the handle, and a guide for determining the penetration of the needle in direction approximately perpendicular to the outline of the hammer, substantially as set forth.

7. A tone-regulating tool consisting of a handle or frame, a needle projecting therefrom, means for alternately protruding and retracting the needle relatively to the handle, and a guide-plate adjacent to the needle, adapted to determine the extent of penetration thereof and to limit the direction of penetration to approximate perpendicularity to the outline of the hammer, substantially as set forth.

8. A tone-regulating tool consisting of a handle or frame, a needle projecting therefrom, means for alternately protruding and retracting the needle relatively to the handle, a guide for determining the extent of penetration of the needle, and an adjustable connection between said guide and the handle, whereby the guide may be set higher or lower to adjust the depth of penetration, substantially as set forth.

9. The combination of a handle *e*, a slide *E*, working therein, needles *f*, fastened to said slide at the end of the handle, a rotary shaft *F*, entering the handle, and a mechanical connection intervening between said shaft and the slide, whereby the rotary movement of the shaft induces reciprocatory movements of the slide, substantially as set forth.

10. The combination of a handle *e*, a reciprocatory slide *E*, means for imparting reciprocatory movement to said slide, needles fastened to said slide beyond the end of the handle, and a guide-plate *g*, through which the needles work, formed with a concave lower face, substantially as and for the purpose specified.

11. The combination of a handle *e*, reciprocatory slide *E*, means for imparting reciprocatory movement to said slide, needles fastened to said slide and projecting beyond the handle, a guide-plate *g*, through which the needles pass, a sleeve *H*, carrying said guide-plate, and an adjustable connection fastening said sleeve to the handle.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

CALVIN L. WESER.

Witnesses:

W. TAZEWELL FOX,
FRANK L. WING.