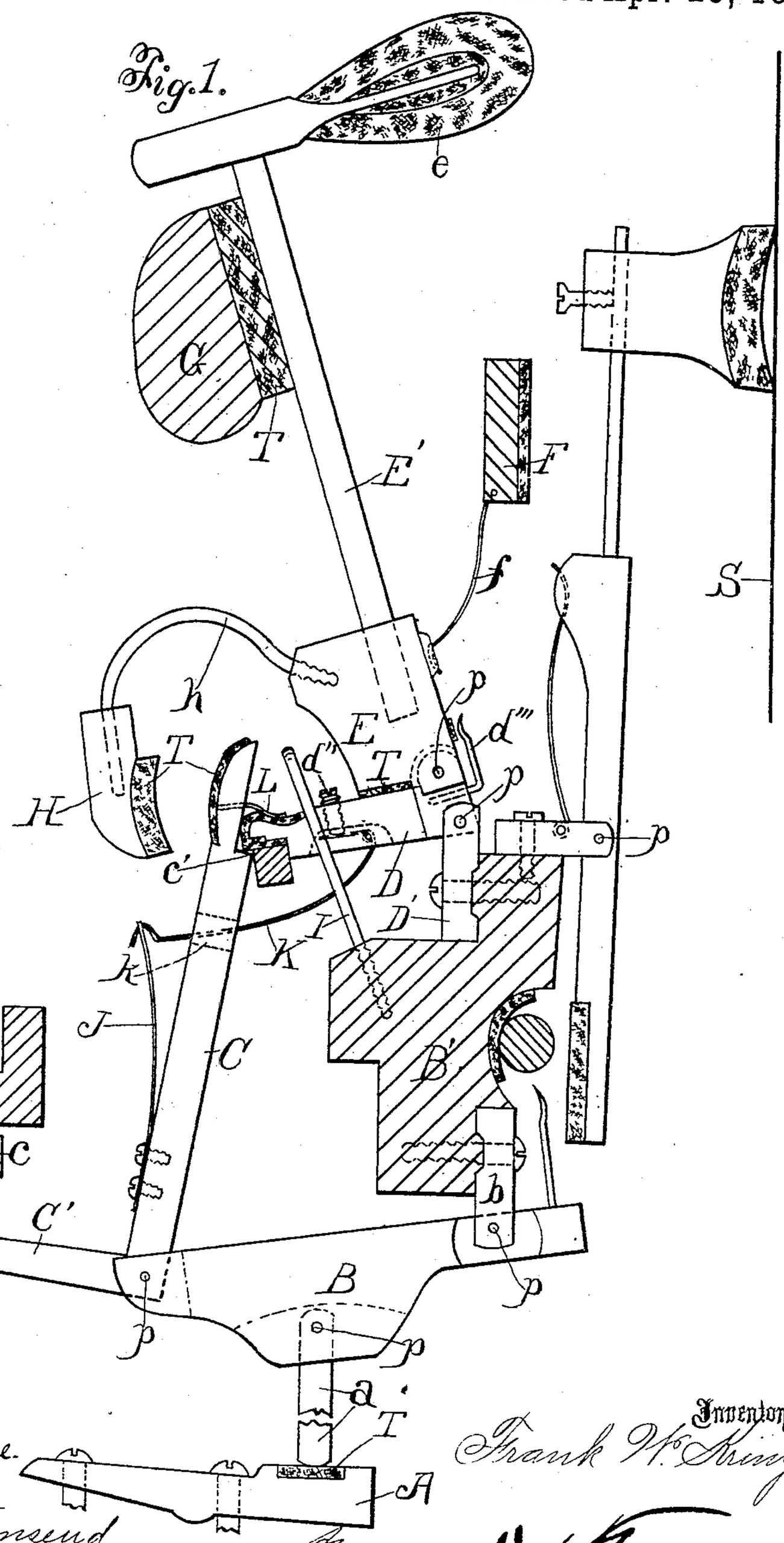
(No Model.) 2 Sheets—Sheet 1.

F. W. KRINGEL.

REPEATING ACTION FOR UPRIGHT PIANOFORTES.

No. 495,979. Patented Apr. 25, 1893.

Fig. 1.



Witnesses.
W. M. Lee.
F. W. Townsend

Inventor.
Frank W. Kringel.
by Wizard & Townsend.
his Attys

(No Model.) 2 Sheets—Sheet 2.

F. W. KRINGEL.

REPEATING ACTION FOR UPRIGHT PIANOFORTES.

No. 495,979. Patented Apr. 25, 1893.

Fig. 2.

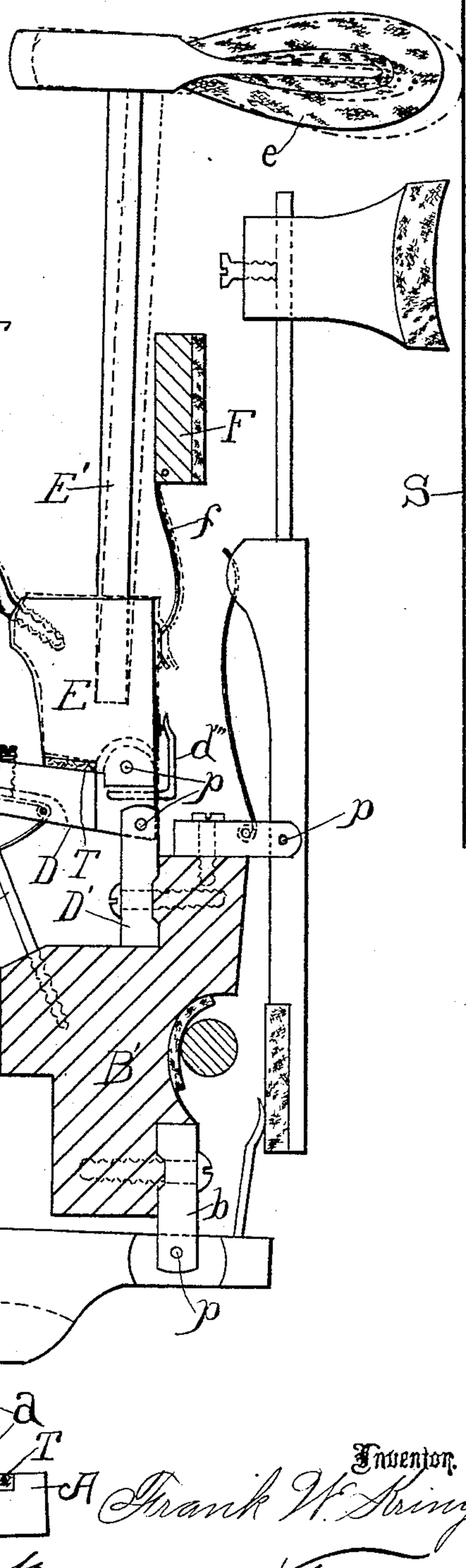


Fig. 3.

Fig. 4.

Witnesses.
M. M. Lee.
F. M. Townsend

Inventor.
Frank W. Kringel
by Edgerd F. Townsend
his Atty.

UNITED STATES PATENT OFFICE.

FRANK W. KRINGEL, OF LOS ANGELES, CALIFORNIA.

REPEATING ACTION FOR UPRIGHT PIANOFORTES.

SPECIFICATION forming part of Letters Patent No. 495,979, dated April 25, 1893.

Application filed July 5, 1892. Serial No. 439,069. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. KRINGEL, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Repeating Actions for Upright Pianofortes, of which the following is a specification.

The principal object of my invention is to produce an action for upright pianos by means of which the hammer can be operated by shorter strokes of the key, after the key has been once struck, and a single note may be repeated with greater rapidity, than heretofore possible with upright piano actions and without liability of the hammer failing to respond to each stroke of the finger upon the key.

Further objects are to secure these results by simple means and to lighten the touch; also to support the hammer independent of the hammer rail so that the action will be unaffected by any swelling or warping of the key bottom.

My invention consists essentially in pivoting the hammer butt to a pivoted hammer sustaining lever and providing and arranging suitable hammer operating means for operating the hammer through the medium of such lever.

My invention broadly stated comprises the combination in an action for upright piano fortes of a jack; a hammer supporting lever having one end arranged to normally engage such jack and having its other end pivoted to a suitable support; such support; a hammer provided with a suitable hammer butt and shank and having its butt pivoted to the hammer lever near its pivotal point; a stop arranged to limit the upward movement of the hammer lever; an intermediate spring medium arranged to connect the hammer lever and the jack, or other suitable yielding means arranged to force the hammer lever upward; suitable means for operating the jack and means for retracting the hammer.

My invention also comprises various other features and combinations hereinafter more fully set forth.

The accompanying drawings illustrate my invention. Figure 1 is a side elevation of an action embodying my invention, with the various rails in transverse section. In this view the action is shown in its fully lowered or normal position. Fig. 2 is a view of the same with the action fully elevated; the position of the hammer when striking the wire is shown in dotted lines in this view. Fig. 3 is a vertical mid-section of the hammer butt, with fragments of the hammer stop arm and hammer shank. Fig. 4 shows fragments of the jack spring with and without the end of the lever spring.

A represents a key rocker.

a is an abstract which is pivoted in the usual manner to the jack rocker B, which is pivoted to a jack rocker flange *b* which is secured to the action rail B′.

The jack C is pivoted to the free end of the jack rocker and is arranged to engage the hammer lever to force it upward and is also provided with the throw off arm C′ arranged to engage a button *c* in the usual manner. The upper end of the jack is provided with a hammer-lever engaging shoulder *c′* arranged to engage the under face of the hammer lever D, to force the lever upward. It is also provided with a lever engaging hook arm L or other suitable means arranged to engage the upper face of the lever D when the shoulder *c′* is in engagement with the lever D to cause the lever to descend with the jack. The hammer butt E is pivoted to the hammer lever D near the pivotal point of such lever, and is provided with the usual hammer shank E′ and a hammer *e* and has its front portion arranged to normally engage the hammer lever D.

F is the spring rail and *f* is a hammer spring. G is the hammer rail. The hammer back stop H is secured to the hammer butt E by means of a stop arm *h*, and is arranged to engage the jack when the jack is retracted from the hammer lever. A hammer lever stop I is screwed into or otherwise secured to the action rail and arranged to limit the upward movement of the hammer lever D.

The jack spring J is arranged to force the jack toward the hammer lever. In the drawings it is shown as a flat spring fixed by one end to the jack and having its other end pivotally connected with the free end of the ham-

mer sustaining spring K which is attached to the hammer lever D and projects forward therefrom to engage the jack spring.

The hammer or hammer lever sustaining spring serves to hold the lever D up against the stop I and thus to prevent the return of the hammer *e* until the jack C has been returned to its engagement with the hammer lever D. The springs J and K thus arranged serve as anti-friction fulcrums for each other and secure superior delicacy and accuracy of operation.

In the drawings I have shown the end of the hammer-sustaining spring passed through a suitable hole *k* provided through the jack, but other ways of arranging the springs may be devised without departing from my invention. A suitable recess *d'* is provided in the hammer lever to receive the spring K, and a tension screw *d''* is arranged to engage such spring to increase or diminish the tension of the spring as may be required.

In order to cause the hammer *e* to descend when the hammer lever is lowered after a stroke has been delivered, the lever is provided with an upwardly extending hammer returning arm *d'''* which is arranged to engage the hammer butt and force it to retract the hammer as the lever descends. The arm *d'''* is so arranged with relation to the butt E, hammer lever D and lever stop I that sufficient play is allowed between arm *d'''* and butt E to permit the hammer to swing against the wire to deliver its stroke when the lever is in engagement with the stop I.

In practice the operator strikes the key in the usual manner, and, the jack, actuated through the intermediate mechanism, forces the hammer lever upward, which in turn forces the hammer butt and the hammer upward, and the hammer toward the string.

When the throw-off C' strikes the button *c*, the jack is withdrawn from the lever D and engages the back-stop H to stop the hammer. When the key is released and begins to return to its normal position, the jack drops and is forced by the jack spring J toward the lever D which is sustained by the spring K until the shoulder *c'* of the jack is under the heel of the lever as shown in Fig. 1. At the same time the lever hook L engages the lever and upon the further descent of the jack will draw the lever down thus operating the butt returning arm *d'''* to retract the hammer so that the hammer is ready for another stroke at any point in the return movement of the key after the throw-off has cleared the button.

The lever stop I holds the lever D from too great upward movement as shown in Fig. 2, but the hammer *e*, by reason of its momentum, tilts its pivoted butt and flies back far enough to strike the string S, as indicated in dotted lines in Fig. 2.

As soon as the stroke has been delivered, the spring *f* throws the hammer into the position shown in full lines in Fig. 2, but the spring sustained lever D prevents it from returning further until the jack descends sufficiently to depress the lever as hereinbefore described.

In practice the return movement of the key necessary to place the parts in position to repeat the stroke is about one-fourth the depth of the touch. This movement should be no more than must of necessity be allowed in order to deliver a blow of sufficient force to give a clear tone. This is especially important as I am thereby enabled to secure greater rapidity of movement in the upright action than that heretofore secured even in the grand piano forte action. This movement can be regulated by regulating the stop I and button *c* with relation to each other and also by regulating the tension of the spring K by means of set screw *d''*. To lengthen the movement, raise stop I and button *c*. If the tension of the spring K is not then great enough to hold the lever against the stop when the jack is withdrawn from the lever, increase the tension of the spring.

The leverage upon the hammer through the medium of the hammer lever is very great so that the weight of the hammer to be lifted is practically one-third of that heretofore and the weight of the touch is correspondingly reduced. In case the movement is so rapid that the hammer would otherwise fail to return with the lever, the engagement of the arm *d'''* with the hammer butt forces the hammer down with the lever so that the delicacy of operation is not at the expense of its accuracy.

T T represent felt cushions to prevent rattling of the parts.

p p indicate pivots.

j indicates the spring retaining notch in the upper end of the jack spring.

Now having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An upright piano action comprising the combination of a pivoted hammer sustaining lever; a hammer pivoted to such lever; suitable hammer operating means arranged to engage such pivoted hammer sustaining lever to operate the hammer through the medium of such lever; the key, and means operatively connecting such hammer operating means with the key.

2. The upright piano action set forth comprising the combination of a jack; a hammer supporting lever having one end arranged to normally engage such jack and having its other end pivoted to a suitable support; such support; a hammer provided with a suitable hammer butt and shank and having its butt pivoted to the hammer lever near its pivotal point; a stop arranged to limit the upward movement of the hammer lever; suitable yielding means arranged to force the hammer lever upward; suitable means for operating the jack, and means for retracting the hammer.

3. The combination in an action for upright piano-fortes, of a jack provided at its upper

end with a hammer lever engaging shoulder arranged to engage the under face of such lever, and the arm arranged to engage the upper face of the hammer lever; such hammer lever having one end arranged to be normally in engagement with such jack and having its other end pivoted to a suitable support; such support; a hammer provided with a suitable hammer butt and shank such hammer butt being pivoted to the hammer lever near the pivotal point of such lever and having its front portion arranged to normally engage the hammer lever; the hammer butt returning arm fixed to the hammer lever and arranged to engage the hammer butt to cause it to descend with the hammer lever; a stop arranged to limit the upward movement of the hammer lever; yielding means arranged to force the lever upward against the lever stop, and suitable means for operating the jack.

4. In an action for upright pianos, the combination set forth of the hammer butt pivoted to a jack actuated hammer lever; such hammer lever; the jack; the jack spring secured to the jack and arranged to force the jack toward the lever; the hammer lever sustaining spring secured to the hammer lever at one end and pivotally connected with the jack spring at its other end, and suitable means for operating the jack.

5. The combination set forth of the pivoted hammer lever; the hammer having its butt pivoted to the hammer lever; the jack arranged to engage the hammer lever to force it upward; means for retracting the jack from the hammer lever when in its elevated position; the back stop fixed to the hammer and arranged to engage the jack when the jack is retracted from the hammer lever, and means for operating the jack.

6. The combination set forth of the pivoted hammer lever having a hammer pivoted thereto; a jack arranged to engage such hammer lever to force it upward and provided with means to depress the hammer lever; means arranged to force the jack into engagement with the hammer lever; means to force the jack out of engagement with the hammer lever when in its raised position; means arranged to prevent too great upward movement of the hammer lever; a hammer lever sustaining spring arranged to sustain the hammer lever and a tension device adapted to increase or decrease the tension of such spring.

F. W. KRINGEL.

Witnesses:
JAMES R. TOWNSEND,
F. M. TOWNSEND.