

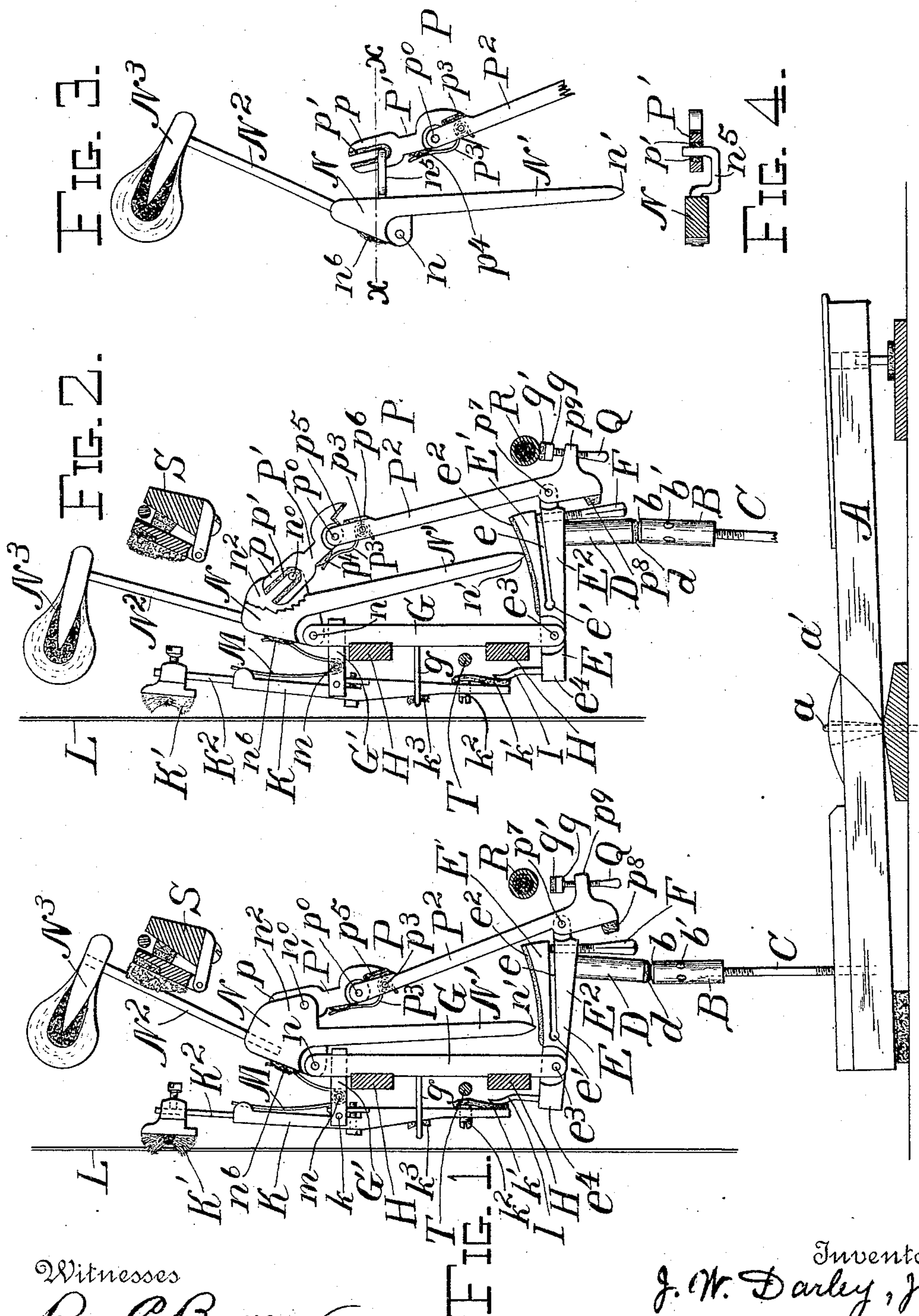
(No Model.)

2 Sheets—Sheet 1.

J. W. DARLEY, Jr.
PIANO ACTION.

No. 543,799.

Patented July 30, 1895.



Witnesses
Percy C. Bowen
John C. Wilson

Inventor
J. W. Darley, Jr.,
By Whitman & Wilkinson,
Attorneys.

(No Model.)

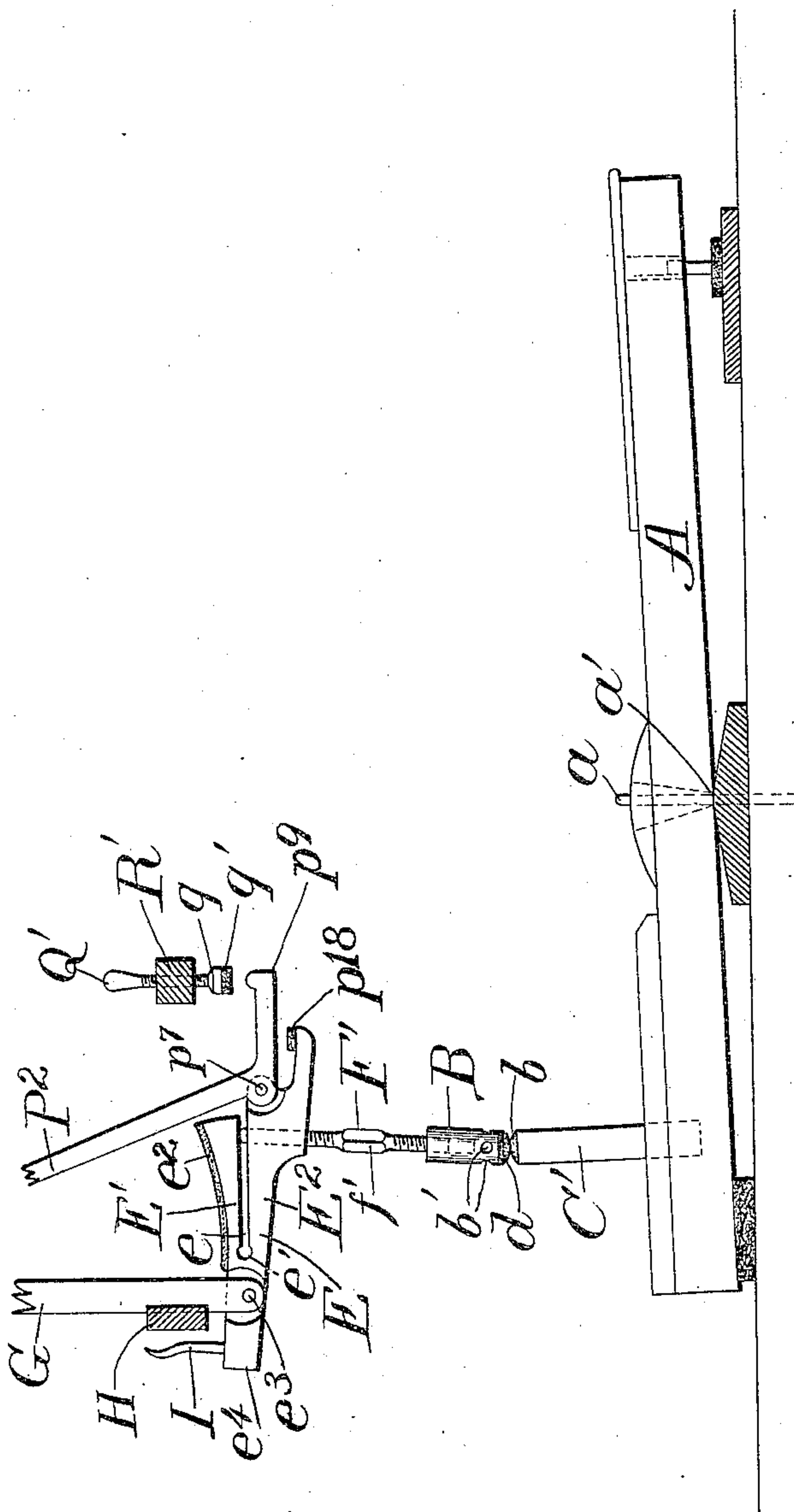
2 Sheets—Sheet 2.

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FIG. 5.



Witnesses

Rory C. Bowen
John E. Wilson

Inventor

John W. Darley, Jr.
By *Whitman & Wilkinson*
Attorneys

UNITED STATES PATENT OFFICE.

JOHN W. DARLEY, JR., OF BALTIMORE, MARYLAND, ASSIGNOR OF ONE-HALF
TO MICHAEL HOLZMAN, PHILLIP HAMBURGER, AND LEON HAMBURGER,
OF SAME PLACE.

PIANO-ACTION.

SPECIFICATION forming part of Letters Patent No. 543,799, dated July 30, 1895.

Application filed October 30, 1893. Renewed January 4, 1895. Serial No. 533,848. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. DARLEY, Jr., a citizen of the United States, residing at Baltimore, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Repetition Piano-Actions; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in piano-actions, and especially in those actions which are designed to enable the operator to strike the same note repeatedly and in rapid succession; and it consists in certain novel features hereinafter described and claimed.

Reference is had to the accompanying drawings, wherein the same parts are indicated by the same letters.

Figure 1 represents a sectional elevation of a piano-key and a single string in an upright piano and of the various parts connected to the key, the hammer being shown in its position farthest from the string. Fig. 2 represents a similar view to Fig. 1 with the key omitted and the hammer being in the midway position. Figs. 3 and 4 represent detail views of a convenient method of connecting the hammer-butt to the jointed jack, and Fig. 5 represents an improved method of adjusting the connection between the key and the parts operated thereby.

A represents the key pivoted at a' on the pin a and provided with the upwardly-extending rod C, threaded upon its upper end to permit of the vertical adjustment of the piece B. The upper end of this piece B is provided with holes b' for convenience in turning, and is curved, as at b , abutting upon the lower flat surface of the downwardly-projecting arm D of the lever E.

The juncture of the pieces B and D is cushioned by a punching of buckskin d glued to the under surface of the piece D. This juncture of the pieces B and D is so placed that the limits of its motion are equidistant from and on opposite sides of a line drawn from the pivotal point a' of the key A to the pivot e^3 .

The lever E is pivoted to the back piece G at e^3 and carries near its outer end e^4 the up-

wardly-projecting spoon I. The lever E has near the pivot e^3 the hole e' , into which the slot e is cut, thus forming two arms E' and E^2 . This permits of an upward adjustment, by means of the screw F, of the upper curved surface of the arm E' , which carries the buckskin piece e^2 . This upward adjustment permits of taking up any variation or wear, so that the buckskin piece e^2 may be brought into its correct relative position with reference to the lower arm N' of the hammer-butt N. The curved upper surface of the lever E, upon which the buckskin e^2 is glued, is a portion of the circumference of a circle whose center is either above or to the right side of the pivot n of the hammer-butt N.

The upper surface of the lever E is a portion of a true circle described, as above explained, from directly above the hole e' to the point directly under the lower arm N' of the hammer-butt N, when the hammer N^3 has been brought to within a very short distance of the string L, say, three-sixteenths of an inch. From this point out the upper surface of the lever E conforms to a tangent drawn to this circle. By this construction it is evident that when the hammer has reached its striking-point (the further motion of the key A having ceased and the adjustments being such that the extension N' of the hammer-butt N is just clear of the buckskin e^2) the further motion of the hammer, under the influence of its acquired velocity, will tend to carry the extension N' of the hammer-butt N farther away from the buckskin e^2 , thus precluding the possibility of any interference with the free motion of the hammer, which strikes the string L a quick sharp blow. After the hammer has struck its blow and is rebounding, after it has passed a short distance, say, three-sixteenths of an inch, as before, away from the string, the tip n' of the arm N' of the hammer-butt will begin to press on the buckskin on the upper surface of the lever E and meets with greater and greater frictional resistance upon the surface of the buckskin, since the arc described by the tip n' intersects the curve of the buckskin e^2 .

In the improved method of adjustment shown in Fig. 5 the upright piece c' is glued or otherwise permanently attached to the key

A, and the screw F' , having like screw-threads in the same direction at each end thereof, serves to adjust both the piece B and the arm E' , carrying the buckskin e^2 . Thus the piece B is first adjusted to give the hammer when at rest its proper distance from the string, and then the piece B is held firmly while the screw F' is so turned as to give the arm E' the requisite adjustment. Since the threads on both ends of the screw F' are similar, the relative positions of the arm E^2 and the piece B will not be changed. In this form of device the downward motion of the arm p^9 is arrested by the pad p^{18} and its upward motion by the screw Q' , passing through the rod R' , as will be hereinafter explained.

With either form of the device the back piece G is secured to the metallic rails H H by screws passing through the rails H H and carries upon its lower pivot e^3 the lever E. Upon the upper pivot n of the back piece G is mounted the hammer-butt N. The back piece G is provided with an arm G' , upon the pivot m of which the spring M is mounted, furnishing a tension for the damper-lever K and the hammer-butt N.

The extension of the spring M, which bears upon the hammer-butt N, may be dispensed with and a separate spring of the usual form provided. Upon the arm G' a damper-lever K, provided with rod K^2 and damper K' of the usual form, is mounted. This damper-rod is provided with a regulating-screw k^2 , which passes under the felt buffer k' , bearing against the lifting-rod T.

The damper-lever K is provided at k^3 with a felt buffer, which limits outward motion by abutting upon the under surface of the hook g , screwed into the back of the back piece G.

Upon the pivot n swings the hammer-butt N, carrying the downward extension N' , whose under surface is curved to a small radius, so that a comparatively small force will cause it to indent itself into the buckskin e^2 , and so cause the hammer-butt extension N' to lock itself under a lighter blow than if the end of the extension N' were made of larger surface. The yielding surface of the buckskin allows the sharp end n' to move along it like the trough of a wave.

The hammer-butt N is grooved upon its inner surface above the pivot n , and in this groove is glued the felt punching n^6 , upon which the extension of the spring M rests. The hammer-butt N is provided with the hammer-stem N^2 , which carries on its upper end the hammer N^3 . It is also provided with a slot in its outer side, bounded by side walls n^2 , through which passes the pin n^0 .

Upon the pivot p^7 in the lever E is mounted the lower lever P^2 of the jointed jack P. The lower arm of this lever P^2 is provided with the elastic cushion p^8 , adapted at the inner limit of the motion of this lower arm to strike the screw F , and so limit the motion of the jack. The lever P^2 also carries in its outwardly-projecting horn p^9 the adjusting-screw

Q, provided with the button q , faced with a felt punching q' . This button is adapted to strike the under side of the tube R, which extends the full width of the piano.

The tube R is preferably made of metal and filled with any compound which may be poured in in a state of solution or fusion, and which will harden thereafter—such as plaster-of-paris, rosin, wax, or similar substance. The object of this filling is to exclude air from the inside of the tube, which might vibrate sympathetically should the proper chord on the piano be struck, or the tube R may be replaced by a solid metallic or wooden rod, or it may be made of wood or other substance and the adjusting-screw Q and button q mounted therein, as shown in Fig. 5.

The lower lever P^2 of the jointed jack P carries at its upper end the pivots p^0 and p^3 , the pivot p^0 forming a joint for the upper portion P' of the jointed jack and the pivot p^3 supporting the spring P^3 , which bears upon the cushion p^4 , glued in a groove formed in the inside face of the upper lever P' of the jointed jack P and tending to press the cushion p^5 , fixed to the inside face of the downwardly-projecting horn of the part P' , against the cushion p^6 , fixed to the outer surface of the upper part of the lever P^2 , and so tends to keep the two parts of the jointed jack in their correct positions when at rest, and also to perform another function, hereinafter to be explained. The fact that this spring is secured to one part of the jointed jack and bears against the other prevents the said spring from exerting any material pressure upon any of the bearings, except the joint of the jack itself, and facilitates the requisite rapidity of motion of the various moving parts. The upper portion p of the part P' of the jack is formed into a slot, the sides and bottom of which are cushioned by the buckskin pieces p' , the bottom of which slot bears upon the under side of the pin n^0 in the hammer-butt N and transmits motion from the lever E to the hammer-butt N. The buckskin pieces p' project a little beyond the sides of the piece P' to prevent any rattling against the sides of the slot formed in the hammer-butt N; but since this construction may be attended with mechanical difficulties the construction shown in Figs. 3 and 4 may be adopted. In these figures the hammer-butt N is provided with a hook-shaped pivot n^5 , projecting from the front of the hammer-butt and engaging in the slotted end of the upper part P' of the jointed jack P.

By making the pivots p^0 and p^7 and e^3 free from lateral play the end p of the part P' will not be liable to strike against the hook n^5 , and hence cause any rattling.

The device S, connected to the soft pedal, (not shown,) and the rod T, connected to the loud-pedal, (not shown,) are well known in the art, and are merely indicated in the drawings.

The operation of the device is as follows:

If the key be struck the parts B and D will lift up the outer end of the lever E, pushing up with it the jack P, which will occupy the initial position. (Shown in Fig. 1.) This jack
 5 P will cause the hammer-butt to rotate about the pivot n , moving the hammer N^3 toward the string L. As soon as the arm E^2 of the lever E has been lifted high enough to cause the pad q' on the screw Q to strike the rod R the vertical
 10 motion of the jack is arrested and changed into a rotary motion about the pivot p^7 , which will cause the jack to bend, as shown in Fig. 2, against the straightening action of the spring P^3 . At the time that this occurs the tip n'
 15 passes clear of the buckskin e^2 and the hammer swings through its acquired velocity against the string L. It rebounds, due to the resiliency of the string and also to the effect of the spring M, which spring also presses the
 20 damper against the string, the said damper having in the meantime withdrawn by the action of the spoon I against the pad k' , the spoon swinging outward as the arm E^2 of the lever E is lifted. In the part of the stroke
 25 in which the hammer is in the act of striking and of rebounding from the string the pin n^0 slides freely in the slot in the upper end of the part P' of the jack. The slot in the upper end of the part P' is made of such a
 30 length that when the key is in the position shown in Fig. 1, should the hammer be moved into contact with the string L, leaving the key at rest, the pin n^0 would not pass out of the slot. This precludes the possibility of these
 35 parts ever becoming disconnected. Now if the key be held down, the pointed tip n' will swing back to the position shown in Fig. 2, and will lock itself in the buckskin e^2 and the slightest upward motion of the key A will
 40 release the tip n' , and the spring p^3 , acting to straighten the jointed jack P, will cause the hammer to move forward close to the string and thus put the apparatus in condition for rapidly repeating the note. Thus it will be
 45 seen that the same key, if struck several times in rapid succession, will each time sound the note distinctly, thus avoiding the necessity for waiting until the key A has regained its normal condition before repeating the note.
 50 The relative proportions of the jointed jack are as shown, for the reason that after the pad q' has struck the tube R the piece P^2 virtually has a motion of partial revolution on the point of contact of the pad q' and the
 55 tube R as a center. It is evident that when this occurs the piece P' will have a motion of partial revolution on the pin n^0 as a center, the piece P^2 meanwhile moving, as above described. It follows that by making the piece
 60 P' short between centers compared with the distance between centers of the piece P^2 the circumference of the circle drawn with the pin n^0 as a center and distance between n^0 and p^0 as a radius will practically not intersect the
 65 circumference of the circle drawn with the point of contact of the pad q' and the tube R as a center and having a radius equal to the dis-

tance from this center to the pivot p^0 . Hence it follows that after the pad q' has struck the tube R all further motion of the hammer toward the string ceases, no matter how much
 70 more the key may be depressed. This construction permits of the hammer being positively driven up to the striking-point by the jointed jack and gives the combination the
 75 greatest possible power, for if the part P' were long, compared to the part P^2 , the arcs of the two circles described, as above explained, would intersect to a greater or less degree, and instead of allowing the pad q' to strike the tube
 80 R when the hammer has reached its striking-point the pad q' would have to strike the tube R before the hammer had reached its striking-point, in order to allow for the additional motion of the hammer, produced by reason of
 85 the intersection of the arcs of the two circles, as explained above, and thus a reduction of the hammer velocity would result, as the hammer velocity, produced by reason of the intersection of the arcs of the two circles, would be
 90 much slower than that produced by the jointed jack driving direct.

By having the further direct motion of the hammer stopped after the pad q' has struck the tube R the hammer is allowed to strike
 95 the string by its own inertia. The spring M assists the resiliency of the string L in causing the hammer to rebound, after striking the blow, against the friction of the hammer extension n' with the buckskin e^2 and the
 100 tension of the spring P^3 . The tension of the spring P^3 is made sufficiently strong to straighten the jointed jack and bring the hammer close to the string in position for repetition against the tension of the spring
 105 M when the key is sufficiently released.

The various parts are adjusted by means of the adjusting-screws F, k^2 , and Q, and the tension on the springs M and P^3 may be adjusted in any well-known way.
 110

It will be noticed that all the adjustments are effected by means of screws and that nothing depends upon the fixity of wires, as is usually the case, and thus facility and permanence of regulation are assured.
 115

In order to avoid difficulties as to effecting alignment in manufacturing, it may be preferable to make the back piece G in two parts.

The rods H or bars are preferably cast of some compound metal, which will expand
 120 upon cooling, it being preferable to make these as castings for economy in manufacture, all screw-holes being cast in place, thus saving the operation of drilling.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—
 125

1. In a piano action, the combination with a piano key, of a pivoted lever provided with a curved pad e^2 of buckskin or similar material, and adjustable mechanism connecting
 130 said pivoted lever with the said piano key; of a pivoted hammer butt having a projecting arm adapted to engage in said curved pad

during part of its return stroke; and a jack slotted at its upper end connecting said pivoted lever with said hammer butt, substantially as and for the purposes described.

5 2. In a piano action, the combination with a piano key, of a pivoted lever provided with a curved pad e^2 of buckskin or similar material, and adjustable mechanism connecting
10 said pivoted lever with the said piano key; of a pivoted hammer butt having a projecting arm adapted to engage in said curved pad during part of its return stroke; and a jack
15 made in two portions pivoted together the upper portion of said jack being slotted as shown and connected to the hammer butt; and the lower portion of said jack being pivoted to
20 said pivoted lever, and a spring normally tending to straighten said jack, substantially as and for the purposes described.

2. In a piano action, the combination with a piano key, of a pivoted lever provided with a curved pad e^2 of buckskin or similar material, and adjustable mechanism connecting
25 said pivoted lever with the said piano key; of a pivoted hammer butt having a projecting arm adapted to engage in said curved pad during part of its return stroke; and a jack
30 made in two parts pivoted together, the upper part being slotted and engaging a pin on said hammer butt; and the lower part being pivoted to said pivoted lever and provided with a projecting arm adapted to bring up
35 against a fixed part of the piano near the end of the stroke of the hammer butt, and a spring normally tending to straighten said jack, substantially as and for the purposes described.

4. In a piano action the combination with a piano key A of a pivoted lever split horizontally into two tongues as shown and provided
40 on its upper edge with a curved pad of buckskin or similar material, a screw passing through the lower tongue of said lever and adapted to raise or lower said upper tongue and the buckskin thereon, means for adjust-
45 ably connecting said lower tongue with said piano key; a hammer butt pivoted above said lever and having a downwardly projecting arm adapted to engage in said curved pad during part of its return stroke; and a jack
50 connecting said pivoted lever with said hammer butt, substantially as described.

5. In a piano action, the combination with a piano key A of a pivoted lever split horizontally into two tongues as shown, and provided
55 on its upper edge with a curved pad of buckskin or similar material, a screw passing through the lower tongue of said lever and adapted to raise or lower said upper tongue and the buckskin thereon, means for adjust-
60 ably connecting said lower tongue with said piano key; a hammer butt pivoted above said lever and having a downwardly projecting arm adapted to engage in said curved pad during part of its return stroke, the said ham-
65 mer butt being provided with a pin in front of said pivot; a jack made in two portions pivoted together, and having its upper end

slotted and engaging said pin, and its lower portion pivoted to said pivoted lever; and a spring normally tending to straighten said jack, substantially as and for the purposes described. 70

6. In a piano action the combination with a piano key A of a pivoted lever split horizontally into two tongues as shown and provided
75 on its upper edge with a curved pad of buckskin or similar material, a screw passing through the lower tongue of said lever and adapted to raise or lower said upper tongue and the buckskin thereon, means for adjust-
80 ably connecting said lower tongue with said piano key; a hammer butt pivoted above said lever and having a downwardly projecting arm adapted to engage in said curved pad during part of its return stroke; the said ham-
85 mer butt being provided with a pin in front of said pivot; a jack P made of two parts P' and P² of unequal length and pivoted together; the upper and shorter part being slotted and engaging said pin, and the lower part being
90 pivoted to said pivoted lever; and a spring normally tending to straighten said jack; and a piano key, substantially as and for the purposes described.

7. In a piano action the combination with a piano key A of a pivoted lever split horizontally into two tongues as shown and provided
95 on its upper edge with a curved pad of buckskin or similar material, a screw passing through the lower tongue of said lever and adapted to raise or lower said upper tongue and the buckskin thereon, means for adjust-
100 ably connecting said lower tongue with said piano key; a hammer butt pivoted above said lever and having a downwardly projecting arm adapted to engage in said curved pad during part of the return stroke; the said ham-
105 mer butt being provided with a pin in front of said pivot; a jack made in two parts pivoted together, the upper part being slotted and engaging said pin; the lower part being pivoted to said pivoted lever and having a
110 projecting arm adapted to bring up against a fixed part of the piano near the end of the stroke of the hammer butt; and means for straightening said jointed jack, substantially
115 as and for the purposes described.

8. In a piano action, the combination with a pivoted damper lever and pivoted hammer butt, with a spring interposed between the
120 two, and a pin secured to said hammer butt in front of its pivot, of a jack made in two portions pivoted together, and having its upper end slotted and engaging said pin, a spring normally tending to straighten said
125 jack; a piano key, and mechanism connecting said piano key with the lower parts of said jointed jack, and of said damper lever, substantially as and for the purposes described. 130

9. In a piano action, the combination with the key A and lever E split as at e and operating the various parts connected thereto, of the upright C' secured to the said key, the

nut B adapted to bear on said piece C', and the double ended screw F', engaging in said lever and in said nut, substantially as and for the purposes described.

5 10. In a piano action, the combination with a pivoted hammer butt provided with a pin in front of said pivot, of a jack made in two portions pivoted together, and having its upper end slotted and engaging said pin, a spring
10 secured to one of said portions and bearing on the other and normally tending to straighten said jack; a piano key, and mechanism connecting said piano key with the lower part of said jointed jack, substantially as and for the
15 purposes described.

11. In a piano action, the combination with a pivoted hammer butt provided with a pin

in front of said pivot, of a jack P made of two parts P' and P² of unequal length and pivoted together; the upper and shorter part 20 being slotted and engaging said pin; a spring P³ secured to one of said portions and bearing on the other and normally tending to straighten said jack, a piano key; and mechanism connecting said piano key and the 25 lower part of said jointed jack, substantially as and for the purposes described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN W. DARLEY, JR.

Witnesses:

PERCY C. BOWEN,
JOHN C. WILSON.