

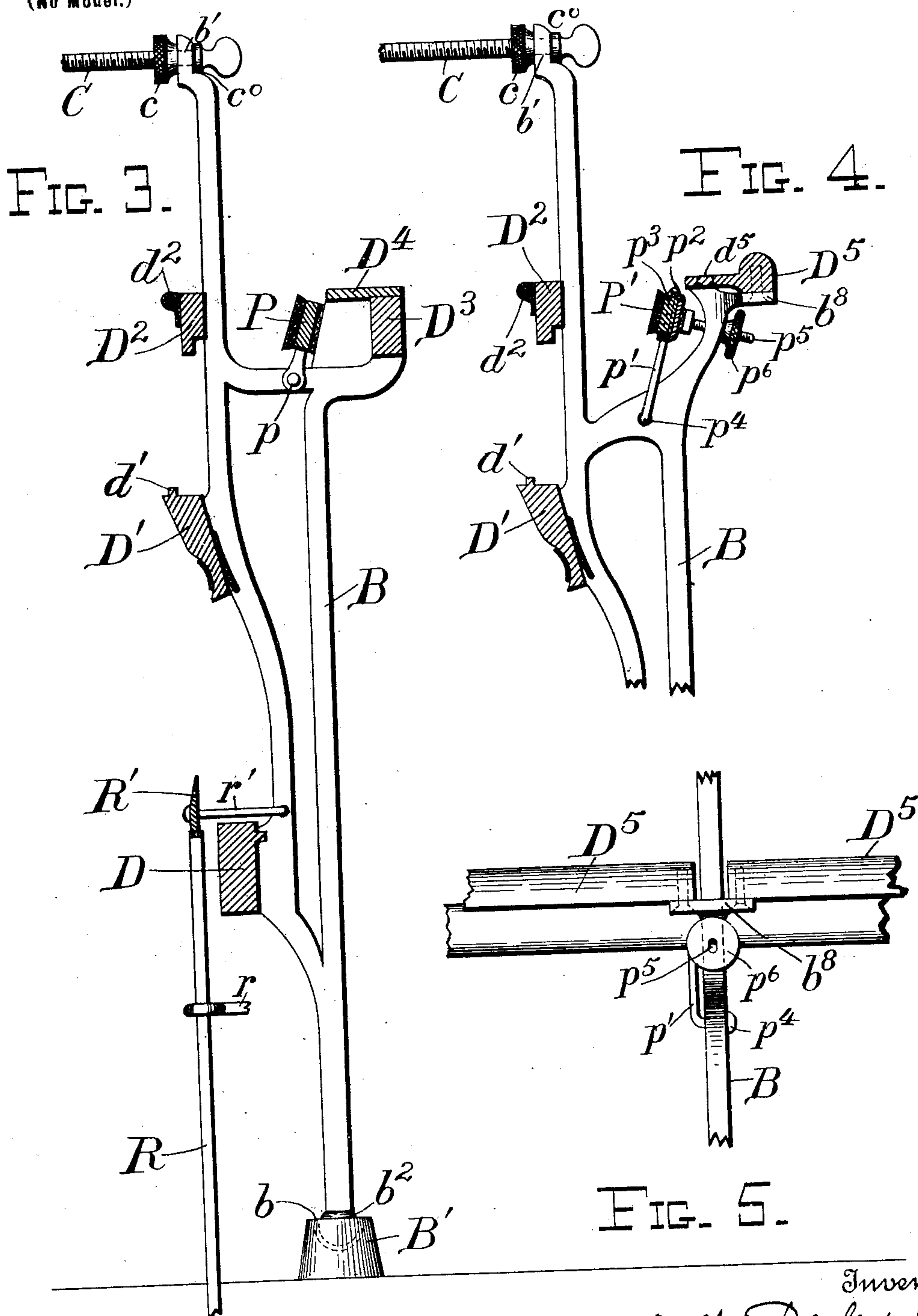
J. W. DARLEY, JR.

REPETITION PIANO ACTION.

(Application filed Oct. 5, 1894. Renewed Oct. 29, 1900.)

3 Sheets—Sheet 2.

(No Model.)



Witnesses

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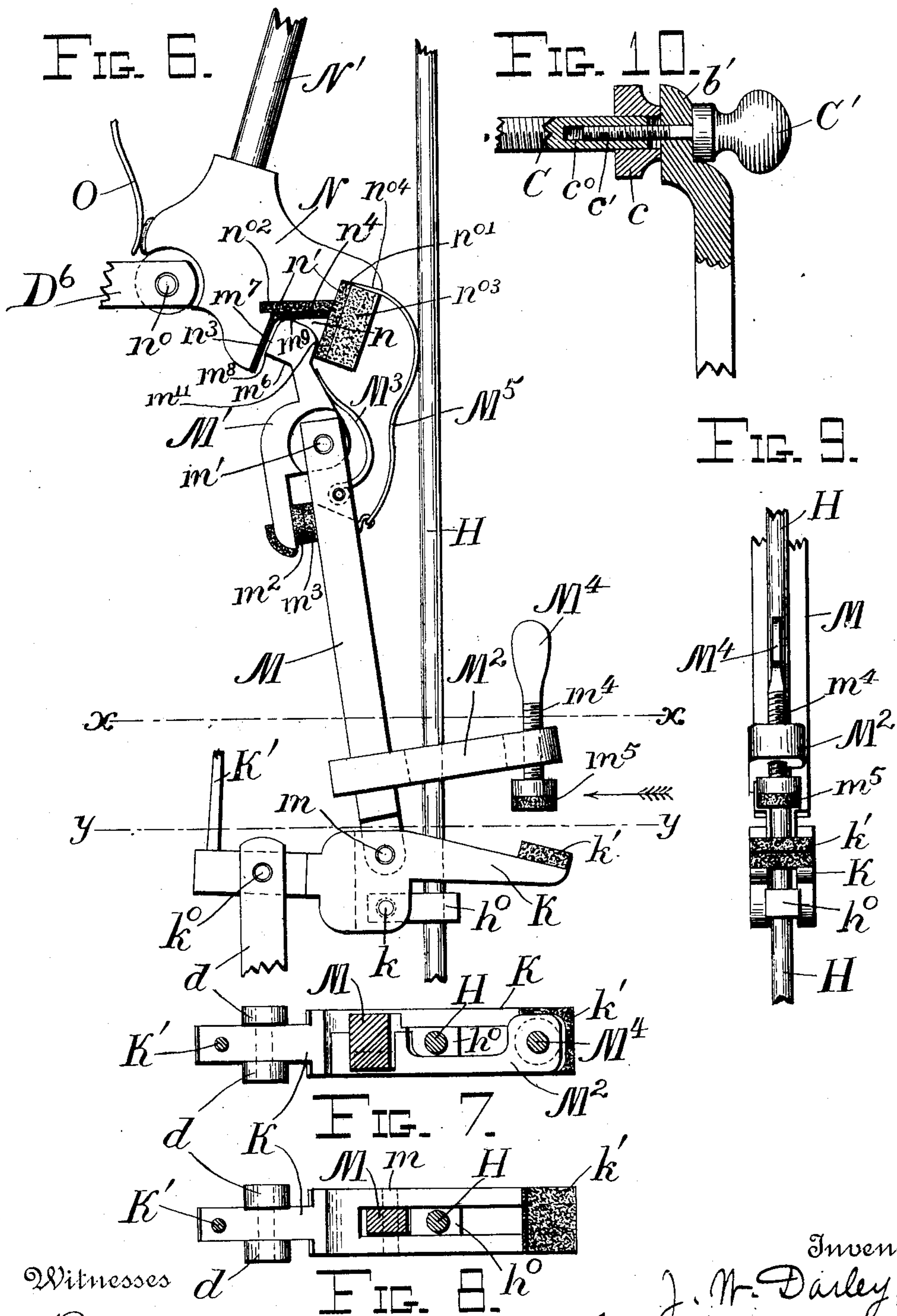
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UNITED STATES PATENT OFFICE.

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

REPETITION PIANO-ACTION.

SPECIFICATION forming part of Letters Patent No. 663,734, dated December 11, 1900.

Application filed October 5, 1894. Renewed October 29, 1900. Serial No. 34,845. (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 city, in the 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 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.

The present invention is especially intended to cover certain improvements upon the device described in my application, Serial No. 489,558, filed October 30, 1893.

Heretofore in repetition actions for upright pianos on account of the approximately vertical position of the hammer and the consequent elimination of the retractive effect of its weight great difficulty has existed in causing the hammer to rebound against the retarding effect of the recovery-spring sufficiently to enable the back-check to perform its functions. In the case of those actions in which there was a considerable space between the part of the checking device attached to the hammer and the part attached to the action when the latter is in the striking position the space between these parts was generally necessary to prevent the momentum of the back-check and action parts connected thereto from causing the back-check to strike the hammer-butt-checking portion, and thus dissipate its rebounding tendency, when the action parts settling back left the hammer unchecked. If in the attempt to enable the checking parts to work in a shorter hammer-rebounding space the said parts were arranged to come close together in the striking position, the force and effect of the momentum of the moving action parts were greatly enhanced, so much so that in case of light hammers no checking effect existed. In the present invention a satisfactory checking effect is obtained by allowing the checking parts

to come close together in the striking position and arranging an adjustable stop on a part of the action, whereby the momentum of the moving action parts and consequent tendency of the same to move through a greater distance than they are positively driven is eliminated. A secondary and by no means unimportant effect of this stop is the greater rapidity of repetition obtained thereby on account of the motion of the various parts being constrained to the proper limit. It will be noticed that this stop limits the motion of the back-check toward the coöperating parts attached to the hammer when they are in close relation to each other. A stop which controls the back-check when a considerable space exists between these parts does not fulfil the above functions.

In general, jointed-jack actions have had two defects, the one a corollary of the other—the first that it was necessary to allow the jack to commence to break when the hammer was at a great distance from the string, resulting in a large loss of power, and the second that by reason of the long bending of the jack a long heavy release existed in the downward motion of the keys, which was objectionable. To obliterate these effects in the present invention, the top of the upper part of the jointed jack and the abutting portion of the hammer-butt are peculiarly shaped, as will be hereinafter pointed out.

While the drawings represent details of an upright piano, many of the devices herein shown will be serviceable in pianos of other forms.

Jointed-jack actions have heretofore been constructed with the jack either having a positive relation as regards the abutting portion of the hammer-butt or have been made so that the contact of the hammer-butt on the jack-head changed from a point back of a line drawn through the jack-centers to a point on or near said line. In both of these constructions the danger that the jack would break before the full blow had been given existed. In the present invention the contact of the hammer-butt on the jack-head changes from a point near a line drawn through the

jack-centers to a point farther back from said line, the effect being to hold the two parts of the jack together, and thus is obtained a practically solid jack with the advantages of the joint.

My invention will be better understood after reference to the accompanying drawings, wherein the same parts are indicated by the same letters.

Figure 1 represents a side elevation of one of the improved piano-actions as it is mounted in the piano. Fig. 2 represents a similar view of the piano-action just after it has completed its stroke and is checked ready to strike a second time. Fig. 3 represents the frame and several parts connected thereto on which the action is mounted. Fig. 4 represents a slight modification of the device shown in Fig. 3. Fig. 5 represents a front view of the device shown in Fig. 4. Fig. 6 represents an enlarged detail view of the jointed jack and the various parts connected thereto. Fig. 7 represents a section along the line xx of Fig. 6 and looking down. Fig. 8 represents a section along the line yy of Fig. 6 and looking down. Fig. 9 represents a front view of the lower portion of the device shown in Fig. 6 looking in the direction of the arrow, and Fig. 10 represents a detail view of the head of the action-frame and connected parts.

A represents a portion of the framework of the piano, on which the frames B, one of which only is shown, are mounted by means of a socket-plate B', hollowed, as at b , to receive the ball b^2 at the base of the frame B. The top of the frame is held by a screw C, provided with a milled-headed nut c and engaging in the back of the piano. (Not shown.) The nut c is made adjustable to permit of changing the relation of the frame B and parts connected thereto to the strings E. Thus the frame B has a hole in its upper portion b' , through which passes the small screw c' , engaging in the female screw-threads c^0 , cut in the interior of the screw C, as shown in Fig. 10. By means of the adjusting-nuts each of the frames B may be given a solid bearing thereon independent of all the other frames, and thus variations in the framework of the piano may be compensated for.

D represents a rail stretching across the piano and secured to the various frames B. It is provided with tenons d^0 to engage in mortises in the upright pieces D⁷. D' represents a second rail also stretching across the piano above the first and provided with a tenon d' , adapted to engage in a mortise in the transverse strip D⁶. D² represents still another rail stretching across the piano and faced with a pad d^2 , of felt. D³ represents still another rail on the front portion of the frame B and provided with an upper rail or stop-piece D⁴, which is made in three sections.

In the device shown in Figs. 4 and 5 the rails D³ are omitted. The rails D⁴ are replaced by the rails D⁵, provided with stiffening enlargements on their exterior sides, and the

soft-pedal rail P is replaced by an equivalent device which will be hereinafter more fully described.

By having the rails D⁴ and D⁵ made in a plurality of pieces the adjustment of each piece is capable of being separately regulated, for since the hammer-shanks N', upon which are mounted the hammers N² and checks N³, are glued in place after the action proper is adjusted in position it follows that any variation which might be occasioned by adjusting the hammers to their respective strings would throw the back-checks out of alinement with their respective check-buttons h^7 were the rails D⁴ and D⁵ solid. Now since the strings are generally mounted upon the string-frames in three sets, which may be designated the "treble" side, the "center," and the "base" side, adjacent strings of each set being at the correct distance apart relative to the distance apart of the hammer-butt, and since any variation that occurs will be between the adjacent strings and hammer-butt of the treble and center set or center and base set, above referred to, it follows that if the rails D⁴ and D⁵ are made in three lengths, one length for each of the portions of the frame above referred to, this variation may be compensated for and the buttons h^7 brought into alinement with the back-checks. The rails D⁴ and D⁵ are not to be fastened in place until after the hammers are glued in, when each section of the said rails may be shifted laterally to effect the alinement of the back-check and checking-buttons. If the strings are mounted upon the frame in more or less than three sections, the rails D⁴ and D⁵ would be made in a corresponding number of sections.

The various rails and other parts of the piano-action are faced with felt or similar material whenever they are likely to be struck by any of the moving parts, and all centers are bouched with cloth in the well-known way, the effect of the whole being to prevent rattling and to deaden all sounds except of the strings which have been struck.

E represents one of the many strings of the piano.

F represents the key, which is pivoted at f and is provided at f' with a felt pad on which rests the adjustable head h' , which is screwed onto the screw-threads h of the vertical rod H. This head h' is provided with one or more holes h^2 for the insertion of a capstan-bar for adjusting the position of the head on the rod.

The rod H has fast thereto the arm h^0 , which is pivoted to the jack-lever K, as at k . The upper end of the rod H carries an adjustable cap h^1 , screwed onto the screw-threads h^6 and provided with a buckskin tip h^8 . There are bouched holes in the rails D⁴ and D⁵ for guiding the rods H. Near the said upper end a sleeve h^3 is screwed over the screw-threads h^5 and is adjusted by means of the holes h^4 . The top of this sleeve is faced

with felt, which engages under the rail D^4 , as shown in Figs. 1 to 3, or the wing d^5 of the rail D^5 , as shown in Fig. 4. The function of this sleeve h^3 is to limit the upward travel of the rod H, the inertia of which when the key F is pressed down quickly might carry it up too high.

The jack-lever K is operated by the arm h^0 and is slotted to allow the free passage of the rod H. The said lever is pivoted at k^0 to the vertical piece d and carries at its forward end a felt pad k' , which brings up against the pad m^5 , and at its opposite end the spoon K' , which engages the damper-lever Q at the pad q^5 .

The jack consists of the two members M and M' , pivoted together at m' , and the lower end of which is pivoted to the jack-lever K at m . The felt pads m^2 and m^3 , secured to the two members of the jack, respectively, prevent rattling when the jack is straightened out.

M^2 represents a tripping-arm which is attached to the lower member of the jack and carries an adjustable button m^5 , attached to the bolt M^4 , which is screw-threaded, as at m^4 .

The jack is normally kept straight by means of the spring M^3 , connected to one of the members and bearing against the other.

M^5 represents a piece of tape or similar material to prevent the hammer-butt and the jack from becoming too far disengaged from each other.

It will be seen from an inspection of Fig. 6 that an upward motion of the rod H would swing the jack-lever K about its pivot k^0 and would cause the jack to move almost vertically upward without being bent against the action of the spring M^3 , during which motion the contact of the side n^4 of the hammer-butt recess changes from a point nearly over a line drawn through m and m' to a point somewhat farther in, thus preventing any tendency of the jack portions to bend before the pads k' and m^5 strike, as the slight twisting force occasioned by said change of contact is in the proper direction to hold the jack parts together. When the pad k' strikes the button m^5 , the tripping-arm M^2 will cause the lower portion M of the jointed jack and the jack-lever K to revolve as one piece upon the center k^0 , and thus break the joint of the jack, causing the upper member M' to bend back about its pivot, as shown in Fig. 2, whatever momentum it may have acquired being stopped by its felt pad x coming into contact with the felt strip x^7 , the upper edge of which is glued to the rail D' . The groove n in the hammer-butt N and the shape of the head of the jack are so arranged that the most advantageous results are obtained upon the breaking of the joint of the jack, as will be hereinafter more fully described.

The hammer-butt N, pivoted at the end n^0 to the cross-piece D^6 , carries the hammer-shank N' and the hammer N^2 , to which latter the checking-piece is attached by means

of the wire n^6 , which is lance-shaped where it is driven into the check N^3 and screw-threaded on the other end, as at n^7 . This checking-piece is faced with buckskin n^5 , and any change that may be necessary to bring adjacent checks into line is effected by simply bending the wire n^6 as may be required. (See construction of check.) This adjustment may be made experimentally for each separate piano-action; but in general the bending is only required to bring the pieces N^3 in line after the hammers are glued in place, thus providing for any inaccuracy that may occur in said operation.

The hammer-butt N is recessed, as at n , having the sloping sides n^3 and n^4 , of which n^3 is faced with buckskin n^{02} , while the top of said recess is cushioned with felt n' , across which the said buckskin n^{02} extends, leaving a sharp corner between the sloping sides n^3 and n^4 , as shown most clearly in Fig. 6. The buckskin n^{02} is glued to the side n^3 along its whole length, but is only glued to the felt n' and cloth $n^{0'}$ at the juncture of the same. The felt n' is glued to the side n^4 at the recess n and again where it joins the cloth $n^{0'}$, and thus it will be seen there exists no glued surface in the line of action of the jack, whereby a greater cushioning effect is obtained. The cloth $n^{0'}$ is glued to the hammer-butt N in the recess n^{04} , as also to the ends of the felt n' and buckskin n^{02} in the recess n^{04} of the hammer-butt N, and the cloth $n^{0'}$ is glued to the felt n^{03} , the bridle M^5 being interposed between the cloth $n^{0'}$, felt n^{03} , and top of the recess n^{04} of the hammer-butt N. The cloth $n^{0'}$ is glued to the felt n^{03} in order to obtain the stiffening effect of the layer of glue and also to provide a better wearing-face to the felt by the use of the cloth. The head of the jack is flat, as at m^9 , has its face pointed, as at m^8 , plain, as at m^6 and m^7 , and its back rounded, as at m^{11} , being cam-shaped or somewhat of the shape of a monkey-wrench when its jaws are closed. The flat portion m^9 is formed at such an angle that when the hammer is in its outward position the said flat portion will be parallel to the side n^4 of the hammer-butt recess n , thus permitting the buckskin n^{02} to form a contact thereon of comparatively large surface, whereby the packing down of the buckskin n^{02} and pad n' and consequent settling of the parts is largely prevented, since the greatest pressure of the jack upon these parts exists when the key is first struck and the hammer started. Toward the end of the stroke or when the upper part of the jack commences to bend upon the lower part it is obvious that the locus of the center m' will be a portion of a circle whose center is k^0 and whose radius is the distance between k^0 and m' . Hence there is a slight upward motion of the top portion of the jointed jack occasioned thereby, which effect is slightly increased by the bending of the upper portion on the lower portion of the said jointed jack, said upper portion being

normally a little back of a right line drawn through m and m' . Now the sum total of these effects would be to urge the hammer toward the string after the cushions m^5 and k' had
 5 come together, and were it not for the provision about to be explained the said cushions would have to come together when the hammer was at a greater distance from the string, and since the driving effect of the
 10 jointed jack is greatly decreased after it commences to bend a great loss of power would result. To obviate this, the upper portion of the jack is formed with the parts m^7 cut away at an angle with the part m^9 , and when the
 15 jack commences to bend, which takes place when the hammer is close to the string, in which case the side n^4 of the hammer-butt recess n is at an angle with the horizontal, the nose m^8 , bearing against the side n^3 , forces
 20 the part m^9 rapidly up the inclined side n^4 , and thus compensates for the upper advance of the jack occasioned by its motion of revolution and also its bending and permits of the hammer being driven almost to the string
 25 before the release takes place, and thus a maximum of power is obtained. The part m^6 is cut away, as shown, to permit of clearance around the depending abutting portion of the hammer-butt N . The curved portion m^{11} is
 30 formed of such a shape as to prevent excessive lost motion of the jack in the hammer-butt recess in the numerous positions the various parts assume.

It will be seen from an inspection of Figs.
 35 1 and 2 that the first motion of the rod upward will cause the hammer to swing over into the striking position, that is a short distance back from contact with the string, as shown in dotted lines in Fig. 2; but before the
 40 rod H has quite reached its uppermost position, as limited by the adjustable sleeve h^3 , the pad m^5 strikes the pad k' . The further motion of the rod H bends the jointed jack, making it flexible with reference to the ham-
 45 mer, so that it may rebound after striking the blow against the retarding effect of the spring M^3 and check-button h^7 . When the key is released a short distance, the button h^7 releases the hammer-check, and then the
 50 spring M^3 straightens the jack and the action is ready for another blow.

It will be noted that when the hammer is in the striking position the checking-piece N^3 will extend over the felt cap h^8 , but out of
 55 contact therewith. After the blow has been struck and the hammer has rebounded through a short distance in accordance with the joint effect of the elasticity of the string E and the force of the spring O the buckskin
 60 face n^5 will strike against the said button h^8 , checking the rearward travel of the hammer so long as the key F is held down. When the hammer is in the striking position, the back-check is just clear of the checking-but-
 65 ton, and if no provision were made for counteracting the momentum of the rod H and

parts connected thereto the checking-button might pass over this short distance and striking the back-check would destroy the rebounding tendency of the hammer, especially
 70 in the case of light blows and treble hammers, and then when the rod and parts had settled back the hammer would not be checked, but would be free to rattle around. To obviate this, the rod H is provided with the button
 75 h^3 , abutting in its upward position against the under surface of the rails D^4 or D^5 . The button is to be adjusted against this rail while the key is depressed, thus limiting its motion to the proper amount. I find by the
 80 use of this device that with the lightest blows and lightest hammers excellence of checking is assured.

P represents a hinged rail faced with felt and pivoted at p to the frame B for the pur-
 85 pose of limiting the travel of the hammer-shank N' and of the hammer carried thereby. This pivoted rail is adjusted from the outside of the piano in the ordinary way, and I do not claim this specific construction as
 90 new; but I prefer to use the improved construction illustrated in Fig. 4, in which the rail P' consists of a wooden strip p^3 , faced with felt and held in a channeled metallic strip p^2 by the rods p' being passed through
 95 both and riveted at the top. The bottoms of said rods p' then pass through the pivot-holes p^4 . At the back of this metallic strip p^2 adjusting-screws p^5 are arranged, one of which screws into a portion of each of the frames B
 100 and is locked at the desired position by the thumb-nut p^6 .

The hammer-shifting rails P and the damper-lifting rod S are to be operated by the
 105 pedal in the usual manner.

The damper-lever Q is pivoted at q to the rear end of the cross-piece D^6 and is normally pressed forward by the spring Q' , which holds the damper Q^2 on the string. This damper
 110 is provided with the usual felt pad q^5 , against which the spoon K' presses whenever the jack is moved upward, as in striking a note.

Q^3 represents a pivoted tongue which is attached to the lower end of the damper-lever and is normally held in the vertical position
 115 by means of a weak spring q^4 . The back of this tongue is normally pressed against the projecting end q^6 of the damper-lever, and its backward travel about the pivot q^3 is limited thereby, while it may be pressed forward
 120 against the spring q^4 .

R represents the sostenuto rod, which abuts against a metal blade R' , which is pivotally connected by means of the rods r' to the frame
 125 B . The rod R passes through a suitable guide r , connected to the framework of the piano. Now if while any note is struck the sostenuto pedal be pressed down the blade R' will be forced up, so that it will be in the position indicated by the dotted lines in Fig. 2 and
 130 will hold the damper-lever so that the damper will be clear of the string. This will not

prevent the same note from being struck an indefinite number of times nor will it prevent any other note from being sounded, for the spoon K' of the actions of the other strings will press the lower end of the damper-lever forward when the key is struck, causing the pivoted tongue to strike the blade R', when it will simply relieve against the light tension of the spring q^4 , resuming its originally straight position when the key is released, thus allowing any number of dampers to be withheld from the strings and at the same time permitting ease of operation of the other keys. In this way it will be seen that not only can any note be struck while the sostenuto pedal is down, but the same note may be struck over and over again.

The herein-described mechanism enables the operator to strike the same note with great facility and frequency, and that irrespective of the position of the various pedals. These and the various other advantages of the herein-described constructions will readily suggest themselves to any one skilled in the art.

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

1. In a piano-action, the combination with mechanism for operating the hammer, of an adjustable stop located normal to the line of travel of the back-check and adapted to check the said back-check at the desired limit of its motion toward the cooperating part of the hammer, substantially as described.

2. In a piano-action the combination with a piano-key, of an operating-rod moved thereby and provided with a friction-cap; a jointed jack operated by said rod, a hammer operated by said jointed jack, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and means for adjustably connecting the hammer-check to the hammer, substantially as and for the purpose described.

3. In a piano-action, the combination with a piano-key, of an operating-rod moved thereby and provided with a friction-cap; a jointed jack operated by said rod, a hammer operated by said jointed jack, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and a wire screw-threaded at one end and adjustably connecting the hammer-check to the hammer.

4. In a piano-action, the combination with an action-frame and a stop carried thereby, of a piano-key, an operating-rod moved thereby and provided with a friction-cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jointed jack operated by said rod, a hammer operated by said jointed jack, and a hammer-check connected to said hammer and adapted to strike against said friction-cap, and to be checked thereby, substantially as described.

5. In a piano-action, the combination with an action-frame and a stop carried thereby, of a piano-key, an operating-rod moved thereby and provided with a friction-cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jointed jack operated by said rod, a hammer operated by said jointed jack, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and means for adjustably connecting the hammer-check to the hammer, substantially as and for the purposes described.

6. In a piano-action, the combination with an action-frame and a stop carried thereby, of a piano-key, an operating-rod moved thereby and provided with a friction-cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jointed jack operated by said rod, a hammer operated by said jointed jack, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and a wire screw-threaded at one end and adjustably connecting the hammer-check to the hammer.

7. In a piano-action, the combination with a piano-key and an operating-rod moved thereby, of a pivoted jack-lever operated by said rod and provided with a projecting arm; a jointed jack pivoted to said jack-lever, an arm projecting from one member of the said jointed jack in the line of travel of the projecting arm of the jointed jack, an adjustable button secured to one of said arms and adapted to strike the other, whereby said jointed jack may be bent at the desired instant and a hammer-butt and hammer operated by said jointed jack, substantially as described.

8. In a piano-action, the combination with a piano-key and an operating-rod moved thereby, of an arm rigidly attached to said rod, a pivoted jack-lever pivotally connected to said arm, and itself provided with a projecting arm, a jointed jack mounted above said jack-lever and operated thereby, an arm projecting from the lower member of said jointed jack, an adjustable button mounted therein and adapted to strike said projecting arm on the jack-lever at the desired instant and thus to bend said jack, and a hammer-butt and hammer operated by said jointed jack, substantially as described.

9. In a piano-action, the combination with an action-frame and a stop carried thereby, of a piano-key, an operating-rod moved thereby and provided with a friction-cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jointed jack operated by said rod and provided with a cam-shaped head; a hammer-butt operated by said jointed jack, and provided with a recess with sides sloping and faced as shown, to receive said head; a hammer connected to said hammer-butt and a hammer-check connected to

said hammer and adapted to strike against said friction-cap, and to be checked thereby, substantially as described.

10. In a piano-action, the combination with
5 an action-frame and a stop carried thereby, of a piano-key, an operating-rod moved thereby and provided with a friction-cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jointed jack operated by
10 said rod, and provided with a cam-shaped head; a hammer-butt operated by said jointed jack, and provided with a recess n with sides sloping and faced, as shown, to receive
15 said head, a hammer connected to said hammer-butt, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and means for adjustably connecting the hammer-
20 check to the hammer, substantially as and for the purposes described.

11. In a piano-action, the combination with an action-frame and a stop carried thereby, of a piano-key, an operating-rod moved thereby
25 and provided with a friction-cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jointed jack operated by said rod, and provided with a cam-shaped
30 head, as shown, a hammer-butt operated by said jointed jack, and provided with a recess n with sides sloping and faced, as shown, to receive said head; a hammer connected to said hammer-butt, a hammer-check provided
35 with a covering on one face of soft yielding material and adapted to strike said friction-cap, and a wire screw-threaded at one end and adjustably connecting the hammer-check to the hammer.

40 12. In a piano-action, the combination with a jointed jack provided with a cam-shaped head and means for bending the said jack, of a hammer-butt provided with a recess adapted to engage the cam-faces of said jack-head,
45 substantially as and for the purposes described.

13. In a piano-action, the combination with a jointed jack provided with a cam-shaped head pointed at m^8 , flat at m^9 , and rounded at m^{11} , of a hammer-butt provided with a recess n , having sides n^8 and n^4 sloping as shown,
50 and adapted to engage the faces of said jack-head, substantially as and for the purposes described.

14. In a piano-action, the combination with
55 a jointed jack and a rod for operating the same, of an adjustable sleeve mounted on said rod and adapted to strike a fixed stop and thus to check the action at the desired limit of its upward travel, substantially as and for the
60 purposes described.

15. In a piano-action, the combination with a jointed jack of a pivoted jack-lever and mechanism for operating the same, means for causing said jack-lever to push said jack forward during the early part of the stroke and to cause the member of the jack pivoted to

the jack-lever to rotate in unison with the jack-lever toward the end of the stroke, substantially as and for the purposes described.

16. In a piano-action, the combination with
70 a jointed jack of a pivoted jack-lever and mechanism for operating the same, an arm projecting from the said lever, and a similar arm projecting from the adjacent member of the jack and adapted to be struck by the first
75 arm toward the end of the stroke, substantially as and for the purposes described.

17. In a piano-action the combination with a key, of an operating-rod moved thereby and provided with a friction-cap; a jack-lever operated by said rod and a jack operated by said
80 lever, a hammer operated by said jack and a hammer-check connected to said hammer and adapted to strike against said friction-cap, and be checked thereby, substantially as and
85 for the purpose described.

18. In a piano-action the combination with a piano-key of an operating-rod moved thereby and provided with a friction-cap; a jack operated by said rod, a hammer operated by
90 said jack, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and means for adjustably connecting the hammer-check to the hammer, substantially as and
95 for the purpose described.

19. In a piano-action, the combination with a piano-key of an operating-rod moved thereby and provided with a friction-cap; a jack operated by said rod, a hammer operated by
100 said jack, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and a wire screw-threaded at one end and adjustably connecting the hammer-check to the
105 hammer, substantially as described.

20. In a piano-action, the combination with a fixed stop of a piano-key, an operating-rod moved thereby and provided with a friction-cap, a sleeve adjustably mounted on said rod
110 and adapted to strike against said stop and so limit the motion of said rod, a jack operated by said rod, a hammer operated by said jack, and a hammer-check connected to said hammer and adapted to strike against said
115 friction-cap, and to be checked thereby, substantially as described.

21. In a piano-action the combination with a fixed stop of a piano-key, an operating-rod moved thereby and provided with a friction-
120 cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jack operated by said rod, a hammer operated by said jack, a hammer-check provided with a covering on
125 one face of soft yielding material and adapted to strike said friction-cap, and means for adjustably connecting the hammer-check to the hammer, substantially as and for the purpose described.

22. In a piano-action, the combination with a fixed stop of a piano-key, an operating-rod

5 moved thereby and provided with a friction-cap, a sleeve adjustably mounted on said rod and adapted to strike against said stop and so limit the motion of said rod, a jack operated by said rod, a hammer operated by said jack, a hammer-check provided with a covering on one face of soft yielding material and adapted to strike said friction-cap, and a wire screw-threaded at one end and adjustably connect-

ing the hammer-check to the hammer, substantially as described.

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

J. W. DARLEY, JR.

Witnesses:

WM. E. MESSERSMITH,
A. WAGNER.