

No. 640,892.

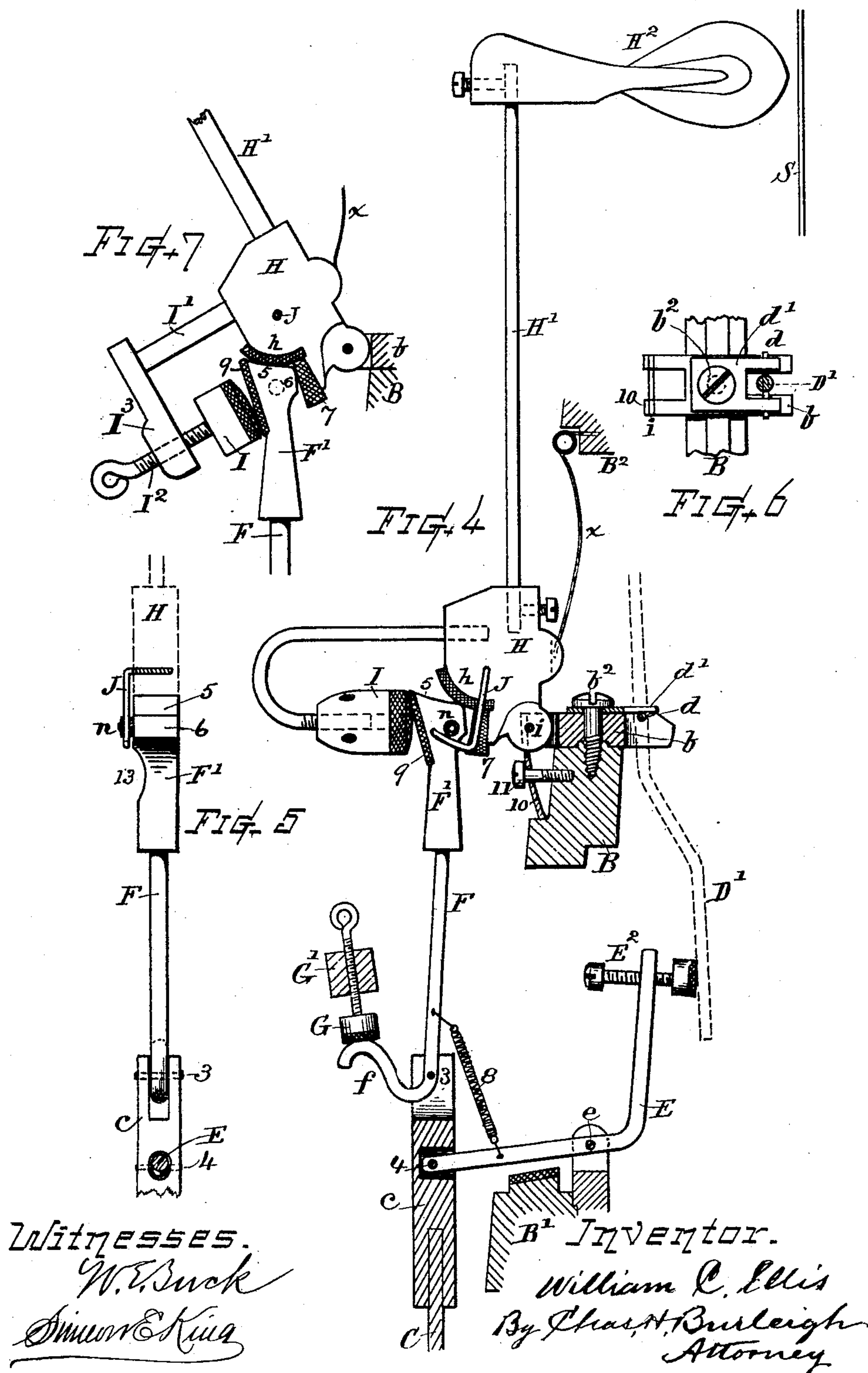
Patented Jan. 9, 1900.

W. C. ELLIS.
UPRIGHT PIANO ACTION.

(Application filed Jan. 21, 1899.)

(No Model.)

2 Sheets—Sheet 2.



UNITED STATES PATENT OFFICE.

WILLIAM C. ELLIS, OF WORCESTER, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO SAMUEL MAWHINNEY, OF SAME PLACE.

UPRIGHT-PIANO ACTION.

SPECIFICATION forming part of Letters Patent No. 640,892, dated January 9, 1900.

Application filed January 21, 1899. Serial No. 702,878. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. ELLIS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Upright-Piano Action, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The objects of my invention are, first, to provide an upright-piano action that can be adjusted with convenience and facility and in highly-efficient capacity for rendering the relative movements accurate and easy in practice; second, to enhance the repeating capacity of the piano-action and to render the touch free, delicate, and uniform; third, to obviate lost motion or backlash between the parts of the action from the key to the hammer, and, fourth, to afford in a piano-action means for reducing the throw of the manual-key and other moving parts in relatively uniform proportions and according to the requirements of the striking movement of the hammers when the soft-pedal expression is applied.

Minor objects and features of my invention will be understood from the explanations set forth in the following detailed description, the particular subject-matter claimed being hereinafter definitely specified.

The preferred construction of a piano-action embodying my present invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a front view of certain parts of my improved piano-action. Fig. 2 is a side view of the action mechanism and manual-key at normal position of rest, the key-table and laterally-extending parts being shown in cross-section. Fig. 3 is a vertical section of two keys to show the lifter-connecting devices. Fig. 4 is a side view, on a larger scale showing the hammer, its actuating-jack, and adjacent mechanism as at elevated position. Fig. 5 is a separate rear view of the jack. Fig. 6 is a top view of one of the joint-pieces for the hammer-hinge and damper fulcrum-pivots, and Fig. 7 shows a modification in the construction of the hammer-stop devices.

Referring to the drawings, the part marked A thereon represents the usual table or frame for supporting the manual-keys K, arranged thereon in well-known manner to tilt on the fulcrum-bar *a* when playing.

B, B', and B² indicate the stationary rails or frame-bars that extend entirely across the action and upon which the bearing-pieces, flanges, or ears that carry the hinging-pivots and support the movable parts are attached.

C indicates the lifter, which in accordance with my invention consists of a rod preferably of metal wire having a wooden head *c* fixed on its top end and a screw-thread C' cut on its lower end, and upon which there is threaded an adjusting-hub or foot-piece C², that stands upon and is secured to a tab of felt or suitable fabric C³, which in turn rests upon and is secured to the top of the manual-key K. In the present instance the tab C³ is detachably secured by the downwardly-pointed rear end of a spring or wire fastener *k*, the fore end of which is driven into the key. (See Figs. 1 and 3.) The connection of the adjusting-hub C² and felt C³ is made by a centrally-disposed screw C⁵, which permits rotation of the hub without interfering with its connection to the key.

D indicates the damper, having its lever D' fulcrumed at *d* for movement in well-known manner, and E indicates a damper-actuator consisting of an angle-lever fulcrumed at *e* in the flange or bearing attached to the frame-bar B' and having the end of its fore arm pivoted in the lifter-head at 4, while its upwardly-extending rear arm is provided with a threaded opening and has arranged there-through an adjusting-screw E², that carries a padded button which impinges against and actuates the damper-lever when the lifter is raised.

F indicates the jack, G the usual trip or knock-off device adjustably supported in the stationary bar G', and H the hammer-butt or center block pivoted on the flange *b*, fixed on the frame B and carrying the stem H' and hammer-head H², the latter being of the usual structure with, felt-covered end for contact with the strings S. The jack F consists of a rod or stem, preferably of wire, pivoted in the bifurcated top end of the lifter-head at 3

and having a tail f properly bent upward and forward for contact with the knock-off G . This jack-rod is provided with a head F' , of wood or suitable material, the tip or upper end of which is widened at the top or wedge-shaped, presenting an inclined or curved end surface 5, that acts against the packing-covered shoulder h of the hammer-butt, a rear surface 6 for contact with the back cushion 7, and a forwardly-inclined front surface 9, which latter is best covered with a cushion of felt or soft material. (See Figs. 1, 4, and 7.) A spring 8 connects the damper-actuator E and jack F for normally swinging the latter in backward direction and preventing undue vibration of the parts.

The hammer-stop, which is combined with the hammer-butt for acting in conjunction with the head of the jack, I arrange in peculiar operative relation, said hammer-stop comprising an arm or wire I' , fixed in and projecting forward from the hammer-butt H , said arm returned at its lower part and having the stop-knob or cushioned button I supported thereby opposite the face 9 of the jack-tip. The hammer-stop is best made adjustable inward and outward in relation to the jack-tip, in the present instance by a screw-thread on the returned end of the arm, upon which the knob I is threaded, regulation being effected by rotating the knob thereon. If desired in any instance, the stop-knob may be non-adjustably fixed on the arm, or, again, the adjustability can be attained as illustrated in Fig. 7, wherein the lower portion of the arm is made as a screw I^2 , threaded into the outer rigid portion I^3 of the arm I' . This modification is adapted to a construction in which the arm is made of wood.

Fixed in the side of the hammer-butt there is a link or hook J , the lower part of which extends beneath a felt-covered pin n , projecting laterally from the jack-head and serving as a coupling to confine the jack-head and hammer-butt in adjacent relation, but with a sufficient degree of looseness or clearance-space to afford ample freedom of action for the recoil and recovery of the jack in its actuation of the hammer, while at the same time preventing any great degree of lost motion or backlash between the end of the jack and the shoulder h of the hammer-butt. The hook J can be swung back out of engagement when it is desired to take the action apart or reassemble the parts. The hammer H and damper D are provided with the usual springs x and x' .

When the hammer is at its normal position of rest, (see Figs. 1 and 7,) it is stopped and supported by the hammer-stop I making contact with the front of the jack-head at the lower part of the inclined face 9, the heel or rear face 6 of the jack-head resting against the cushion 7 and its end surface 5 abutting against the shoulder h , substantially as indicated.

When the hammer is thrown up for sounding the string, it is stopped and may be held at the limit of its rebound (see Fig. 4) by the hammer-stop I making contact with the upper forwardly-protruding part of the face 9 of the jack-tip, the jack-head being then held forward by the contact of the tail f with the knock-off G and the heel or angle between the surfaces 5 and 6 resting against the curve of the shoulder h .

It will be observed that in my invention the usually-employed hammer-rest rail, back-check finger, bridle, and rocker or jack-bed are dispensed with, although, if desired, a hammer-rest rail might be used without detriment; but such rail is not essential to the proper working of this action.

The hammer and the damper levers are preferably pivoted on the same flange-piece b , secured to the frame-bar B , the pivot-joints being disposed as shown.

The hammer-axis pivot i is best firmly fixed in the hinging-ear of the hammer-butt and the projecting ends of the pivot laid into recesses formed in the end of the flange-piece b with suitable packing and there retained by an adjustable bifurcated slightly-yielding plate 10, secured to the frame-bar by a binding-screw 11 (see Figs. 4 and 6) in such manner that the pressure upon the pivot can be adjusted to prevent looseness or to obviate any stiff working of the joint. The side of the jack-head may be recessed, as at 13, to afford convenient access of a screw-driver to the screws 11 when desired.

The damper-pivot d is arranged on the rear end of the flange-piece b and is retained in its seat by the bifurcated metal plate d' , the latter serving as a holder for the pivot d and a washer for the attaching-screw b^2 , as indicated.

In the provision of means for graduating or varying the throw or movement of the keys under the control of the soft-pedaling action and for keeping the actuating parts in close proximity of contact while executing their functions I arrange, in combination with the manual-keys, a lifting-bar L , extending transversely across the manual and adapted to be operated by or in conjunction with the usual soft pedal, the end of the pedal-connecting pitman being shown at P , Fig. 1. Said bar L can be movably mounted in a suitable manner, as by swing-brackets L' , pivoted to the frame at O to rise and fall by the pedal action. A cushioned stop M is arranged beneath the bar L to limit its downward movement, and an adjustable cushioned stop N is arranged to engage the bar or its supporter L' for limiting the upward movement of said bar.

The ends of the manual-keys K when dropped or idle have support upon the bar L , preferably by means of adjusting-buttons m , the shanks m' of which are threaded through the respective key-levers and accessible from above, as illustrated. When the bar L is lifted, the rear part of the manual is raised,

thereby shortening the stroke or dip movement of the keys in a degree approximately corresponding to the reduced movement of the hammer under soft expression.

5 The pedal and levers for moving the pitman P may be the same as commonly used, and being well known it is deemed unnecessary to illustrate and describe them more fully herein.

10 In the operation of the piano-action mechanism constructed and arranged as hereinbefore described the parts are maintained without backlash or lost motion between their impinging surfaces and the dip of the key under varying conditions is reduced or varied so that
15 the key position and movement correspond to the requirement of the hammer position and movement. The bar L by following up beneath the key-stop *m* as the soft pedal is applied prevents a too long key stroke and
20 violent throw of the hammer, and the acting parts being linked together, as illustrated, affords such control of the hammer from the end of the key that the force of impact of the hammer against the string is completely under
25 the management of the player.

To the ordinary retractor-bar R, which is hinged to the frame-bar B and worked by the arm and loud-pedal pitman P', I attach an auxiliary bar or reinforce *r*, and horizontally
30 through the latter there is arranged a series of threaded screws *t*, accessible at the front and each carrying at its rear end a presser-button that is disposed for impinging against and moving a damper-lever when the bar R
35 is swung backward. This construction provides for a ready adjustment between the retractor-bar R and the individual dampers, whereby accurate and simultaneous contact or relief of the damping action upon the
40 strings is attained throughout the entire series of dampers.

The stationary lower frame-bar B', which carries the fulcrum-supports of the damper-actuating levers E, is best arranged below said
45 levers, and I provide thereon a cushion or felt-covered rib *u*, disposed adjacent beneath the lever-arms between their fulcrum *e* and the lifter C. Said rib or cushion serves to prevent the action mechanism from dropping
50 down or out of regular alinement when the action is disconnected and removed from the manual and instrument-case.

I claim as my invention and desire to secure by Letters Patent—

55 1. In a piano-action, the lifter-rod provided with the threaded end, and the threaded adjusting-hub or foot-piece rotatable thereon, in combination with the key, and a fabric tab connecting said foot-piece and key, for the
60 purpose set forth.

2. In a piano-action, the lifter composed of a wire screw-threaded at one end, and having a bifurcated wooden head with the pivot-bearings therein, arranged upon its upper end,
65 and an adjusting-hub or foot-piece arranged on its lower end and adapted for varying the length of the lifter by rotation of the same;

in combination with the manual-key and hammer-actuating appliances, substantially as set forth.

3. In a piano-action, a damper-actuator consisting of an angularly-bent wire lever fulcrumed at or near its angle-bend, the end of its fore arm pivoted in the upright lifter-head by a transverse pivot-pin, and its rear arm
75 extending upward in front of the damper-lever, an adjusting-screw threaded through the upper end of said wire, and a non-metallic button carried by said screw and adapted for contact with said damper-lever, in combina-
80 tion with the lifter and damper mechanism, substantially as and for the purposes set forth.

4. The combination with the piano-action mechanism comprising the hammers, ham-
85 mer-controlling devices, and lifters, and the damper-actuator levers; of the frame-bar carrying the damper-actuator fulcrums, said frame-bar being provided with a top rib or cushion adjacent beneath said actuator-le-
90 vers, for the purpose set forth.

5. A hammer-actuating jack composed of wire, provided with a head formed of wood or similar material, said wire having its lower part pivoted in the bifurcated end of the
95 lifter-rod head and its extremity bent upward and forward forming a tail for engagement with the knock-off stop; in combination with the lifter, the hammer, and the knock-off device, as set forth.

6. In a piano-action, the upright lifter-rod extending up from the key and having the pivot-supporting head thereon, the jack-rod pivoted directly in the bifurcated top end of
105 said lifter-head, and having the forwardly and upwardly bent tail projecting therefrom, and the damper-actuator lever, fulcrumed upon a frame-bar in rear of said lifter, and having the end of its fore arm pivoted within said
110 lifter-head adjacent below the jack-pivot, said fore arm of the damper-actuator serving as a stay to keep the lifter relatively upright; in combination with the action mechanism, substantially as set forth.

7. In an upright-piano action the combina-
115 tion with the pivoted hammer-butt carrying the hammer, and having the engaging shoulder and back cushion formed thereon as shown; of the hammer-actuating jack, its lower end bent, as at *f*, and its upper end pro-
120 vided with the head F' having the inclined end surface 5, the heel 6, and the forwardly-inclined front surface 9, disposed in relation as specified, the hammer-stop consisting of a projecting rod or arm fixed in and carried
125 by said hammer-butt, the lower part of said arm rearwardly returned and provided with a screw-thread, the adjusting-knob I arranged on the end of said arm, the face of said knob disposed opposite to the inclined
130 jack-head surface 9, and adapted for stop contact therewith at an upper position on said surface when the hammer is advanced, and at a lower position on said surface when

the hammer recedes, a knock-off for arresting the tail of the jack, and the lifter operating from the key and having said jack pivoted in its top end, all substantially as described.

8. The combination of the hammer having the hinging-butt, the hammer-stop carried by an arm fixed to said hammer-butt, the jack having an end surface that acts against the hammer-butt shoulder, and a forwardly-projecting face for engaging with said hammer-stop, a lug or pin on the jack-head, a hook or coupling secured to the hammer-butt and engaging beneath said lug for loosely connecting the jack and hammer-butt, the lifter-rod working said jack, and the knock-off for tripping said jack, substantially as set forth.

9. The combination with the manual-keys and a piano-action mechanism, of a transversely-disposed vertically-movable key-stop bar underlying the rear ends of the keys, a bed-cushion limiting the downward movement of said bar, an adjustable stop limiting its upward movement, adjusting-buttons arranged in the respective keys and stopping the same against said bar, and means under control of the player for raising and depressing said bar within the limit of its motion, for the purpose set forth.

10. The combination of the hammer and pivoted hammer-butt, the jack pivoted in the

lifter-rod head, and having its top end acting against the shoulder on said hammer-butt, the hammer-stop opposite to said jack, coupling devices loosely connecting the jack and hammer-butt, the jack-tripping knock-off, the lifter-rod having the upright head and foot piece, the manual-key, means connecting said lifter-foot with the key, a movable key-stop bar, adjusting devices fitted in the keys and stopping against said bar, and means for operating said key-stop bar to vary the dip of the key and carry the lifter and jack devices higher or lower in relation to the hammer-axis, for the purpose set forth.

11. The combination with the damper retractor-rod R and damper-levers, of an auxiliary bar *r* attached to said retractor-rod, and provided with a series of horizontally-disposed screws, threaded into and adjustable through said auxiliary bar, their heads accessible at the front, and carrying at their rear ends contact-buttons for impingement against the respective damper-levers, and means for operating said retractor mechanism, substantially as set forth.

Witness my hand this 18th day of January, 1899.

WILLIAM C. ELLIS.

Witnesses:

CHAS. H. BURLEIGH,
ELLA P. BLENUS.