

No. 670,150.

Patented Mar. 19, 1901.

W. C. ELLIS, Dec'd,

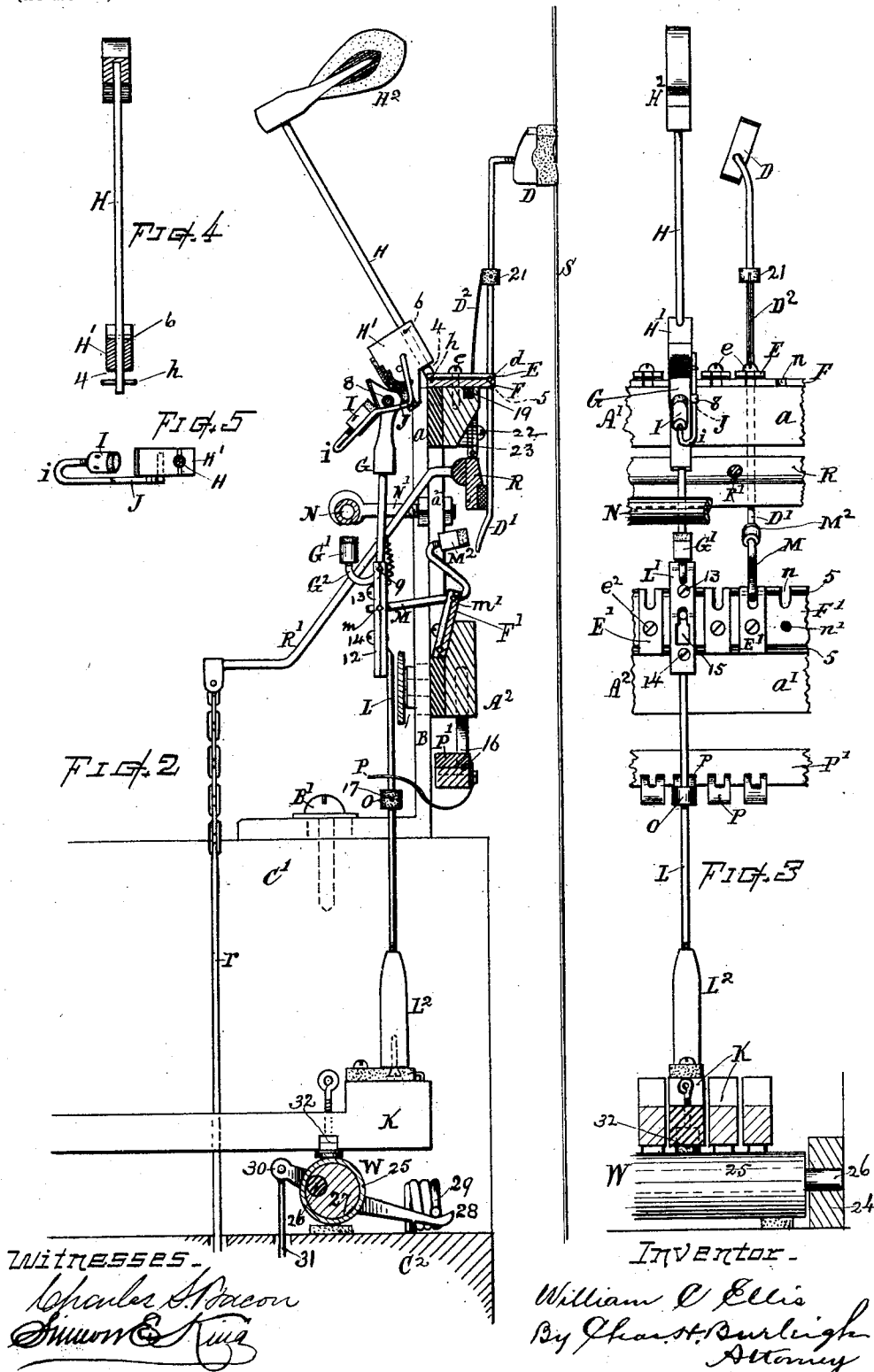
M. H. ELLIS, Executrix.

PIANO ACTION.

(Application filed Aug. 3, 1900.)

(No Model.)

4 Sheets—Sheet 2.



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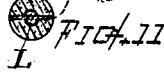
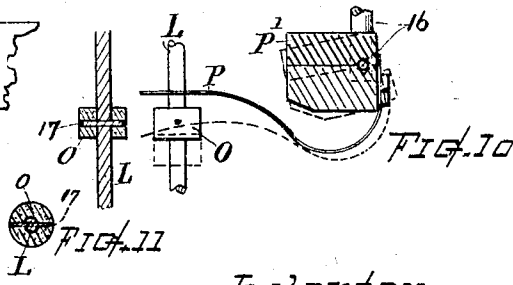
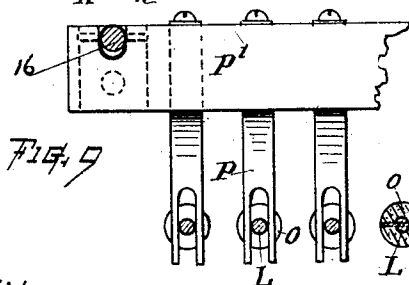
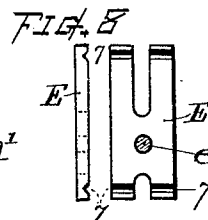
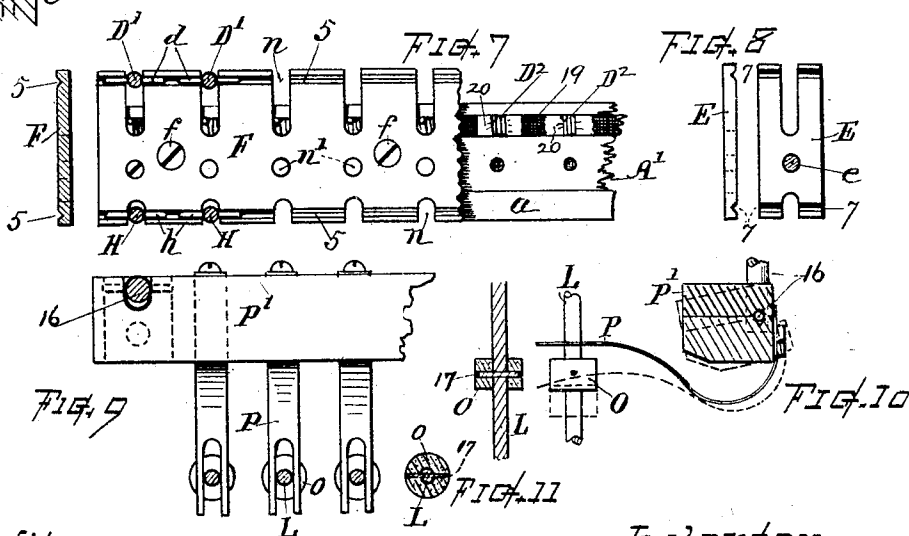
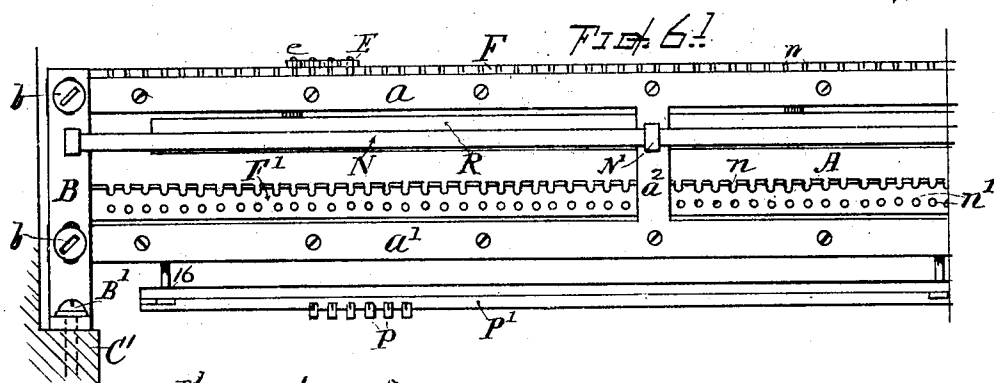
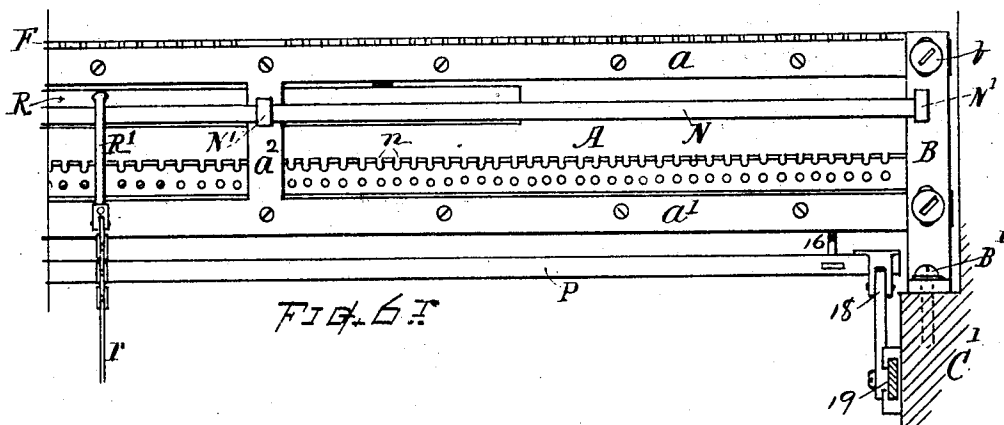
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PIANO ACTION.

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(No Model.)

4 Sheets—Sheet 3.



Latitresses.

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UNITED STATES PATENT OFFICE.

WILLIAM C. ELLIS, OF WORCESTER, MASSACHUSETTS; MARY H. ELLIS, EXECUTRIX OF SAID WILLIAM C. ELLIS, DECEASED, ASSIGNOR OF ONE-HALF TO SAMUEL MAWHINNEY, OF SAME PLACE.

PIANO-ACTION.

SPECIFICATION forming part of Letters Patent No. 670,150, dated March 19, 1901.

Application filed August 3, 1900. Serial No. 25,725. (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 certain new and useful Improvements in Piano-Actions, 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.

My present invention relates to an improved construction and combination of parts in upright-piano action mechanisms; also, to the peculiar structure of the action-supporting frame therefor and to the manner of mounting the operating parts thereon, the prime objects being to provide a strong, serviceable, and efficient action, afford means for simple and ready adjustment of the parts, and to obviate the liability of disadjustment and deterioration by warping, swelling, and shrinkages due climatic influences.

Another object is to provide a piano-action the parts of which can be manufactured and assembled economically and with convenient facility.

Minor objects and the features of my invention are particularly set forth in the following detailed description, and pointed out in the claims.

A practical embodiment of the invented means in an operative mechanism is illustrated in the accompanying drawings, wherein—

Figure 1 represents a vertical section of an upright piano embracing my improved action mechanism. Fig. 2 represents a side view of my improved action, the action-supporting frame being shown in vertical section. Fig. 3 represents a front view of certain portions of the mechanism. Fig. 4 is a sectional view showing the hammer-stem construction. Fig. 5 represents a separate plan view of the hammer-butt with its coupling-hook extended to form the back-stop. Fig. 6, in two parts 6^a and 6^b, represents the front elevation of the action-supporting frame, the operative mechanisms being omitted from this figure.

Fig. 7 represents in plan and section the structural details of the pivot-bearing plate. Fig. 8 shows a side and bottom view of the pivot-bearing cap or clamp plate. Fig. 9 shows a plan detail of the reaction-spring and spring carrier-bar. Fig. 10 represents a transverse section of the spring carrier-bar. Fig. 11 shows the construction of the spring bearing collar or lug upon the lifter-rod. Fig. 12 represents an end view of the action-supporting frame, the action members being omitted from this view for clearness of illustration. Fig. 13 shows front detail views of two of the jack lifter-heads, one shown with its cap-plate removed and the other with the cap-plate in position. Fig. 14 is a vertical section of said jack lifter-head. Fig. 15 represents a plan view in detail of the improved key lifter mechanism for soft-pedal expression. Fig. 16 is a view separately showing the construction of the hammer-throwing jack. Fig. 17 is a top plan view of the pedals and their fulcrum-hinge stand, and Fig. 18 is a vertical section showing the pedal fulcrum-hinge in detail.

Referring to the drawings, the part marked A represents the improved action-supporting frame, which is composed of the following-named parts disposed in the manner and relation indicated: The body of said frame consists of two strong flat-rolled metal bars or plates *a a'*, arranged edgewise parallel to each other in the same vertical plane and permanently united by upright intermediate tie-bars *a²*, as best shown in Figs. 6 and 12. The frame-bars *a a'* extend horizontally across the instrument and are supported at their ends upon upright angle-brackets B, that stand upon the end blocks C' of the piano case C. These brackets are preferably slotted for the attaching-screws B' and *b*, thus affording facility for upward and downward adjustment of the frame A on the brackets B and backward and forward adjustment thereof on the blocks C', such adjustment being accomplished by loosening the screws and sliding the movable part to the position desired and then retightening the screws. The metal frame-bars *a a'* are each supplemented by a backing-strip of the form indicated, made of wood

or similar material, firmly secured thereto by screws, the wood and metal bars together forming the supporting-rails $A' A^2$ for the action members. Combined with these supporting-rails I provide pivot seat-plates F and F', which consist of parallel-edged strips of brass, fiberoid, or other suitable hard material, formed about one-eighth of an inch in thickness by one and one-eighth inches in width, more or less, and in their longitudinal dimension to extend the length of the rails, or in suitable sections thereof as between the uprights a^2 . Said pivot seat-plates are rigidly secured, the one, F, in horizontal position upon the top of the top rail A' , and the other, F', at upright or somewhat inclined position upon the lower rail A^2 , in the manner illustrated. The plates F and F' are formed with a series of lateral indents, recesses, or notches n at their edge or edges, located at intervals corresponding to the spacing of the action-scale, and with holes or perforations n' for the cap-attaching screws. Near the edges in the face of said plates and extending from end to end I provide parallel longitudinal grooves 5, preferably of angular cross-section or V shape, for receiving and supporting the series of pivots of the hammers, dampers, and other respective operative parts of the action. The grooves 5 can be conveniently formed continuous on the length of the plates previous to cutting out the notches n .

D indicates the damper, provided with a wire stem D' , having a pivot-pin d , fixedly inserted therethrough, and a screw-threaded top end upon which the damper-head is screwed. The damper-pivot d is seated to rock in the rear groove 5 of the pivot-seat plate F.

In the construction of the hammer I provide a long wire stem H, which is inserted completely through the hammer-butt H' and projects from the lower part thereof. (See Figs. 2 and 4.) The pivot-pin h is fixed in a hole drilled through the stem at or near its lower end, said pivot projecting at the opposite sides of the stem, as shown, the pivot being separate from the hammer-butt and adapted for seating in the forward groove 5 of the plate F. The hammer-butt is shaped with the usual jack-engaging surface, but is cut away at the under part 4 about the downward-projecting end of the stem. The butt can be formed of fiberoid material and in smaller size than usual. It is vertically drilled and the stem driven tightly therethrough. The hammer-butt is best fixed upon the stem by a transverse pin 6, inserted through the parts, as indicated, or, if preferred, other means for fixedly attaching the hammer-butt upon the protruding stem-wire may be employed.

The wire stems H and D' of the hammers and dampers fit into the recesses n in the pivot-seating plate F, as indicated in Fig. 7, and their projecting pivot-pins lie within the groove 5 at either side of said recesses, the

pivot-pins being fixed in the stems and turning in said grooves. Said pivots h and d are retained and the joint stiffness regulated by means of the bifurcated cap-plate E, (see Figs. 2 and 8,) laid over the pivots and secured by the screw e , which passes through the hole n' into the wood portion of the rail. The cap E may be grooved across its ends, as 7 in Fig. 8, which grooves keep the cap from turning out of place, or, if desired, a similar but ungrooved cap may be employed.

The hammer-actuating jack G is made with a wire stem and a head of wood or fiberoid that engages with the hammer-butt surface and is arranged for operating similar to that described in my prior Letters Patent No. 640,892. The jack-head is loosely coupled with the hammer-butt by the stud 8, projecting from the side of the head, and a depending hook J, fixed at the side of the hammer-butt. The wire of the coupling-hook J is extended downwardly and forwardly beyond the coupling part, then bent backward upon itself at i , and its end threaded and provided with the adjustable button I, that acts as a back-stop for the hammer, both for its forward and rearward movement. The coupler J and back-stop I are thus simply made from a single wire blank.

The lower end of the wire jack G is provided with a fixed pivot-pin 9, inserted therethrough, and that portion beyond the pivot is turned up in the form of a hook G^2 , its end screw-threaded and provided with an adjusting button or head G' , cushioned on its top end, as best shown in Figs. 2 and 16, and adapted for knock-off contact. Above the tail ends of the jacks I arrange a plain rod, bar, or cylindrical tube N, supported in threaded arms N' , that project outward from the action-supporting frame and maintains said rod or tube firmly in position for effecting the knock-off of the jacks when the buttons G' are raised into contact therewith. The knock-off bar is adjustable by its supports in relation to the frame and can be moved bodily for regulating it to the position desired.

The jack G is pivoted in the head of the lifter L. This lifter preferably consists of a wire having an adjustable screw-threaded footpiece L^2 , that rests upon or is connected for operation to the manual-key K by a felt or cushion in the manner shown and as explained in my prior Letters Patent before mentioned. The lifter-head L' in the present instance is made with transverse pivot-seat grooves 10 of V shape and a removable cap-plate 12 for confining the jack-pivot and the damper-actuator pivot, which are seated therein and supported by the cap-plate, regulated, and secured by attaching-screws 13 and 14, as indicated.

The damper-actuating member M is best made of a single piece of wire bent with a forward and a backward bend into an S shape, its stem having transverse pivot-pins $m m'$ fixed therein, one of which is seated in the

groove of the pivot-seat plate F' and there confined and regulated by the furcated clamp-plate E', while the other is seated in the lifter-head L' for movement therewith. The member M comprises on its arm bent up from the stem a rearwardly-directed end having a screw-thread formed thereon and carrying the adjusting-button M², which is threaded upon said end and adapted for striking the end of the damper-stem wire. (See Figs. 2 and 3.)

The lifter-head L' is best provided with an opening 15, through which a screw-driver can be introduced for turning the screw e², that secures the cap-plate on the pivot-seat plate F' and for permitting convenient assembling and separation from the damper-actuating member M when desired without driving out the pivot-pin m from the wire arm.

In connection with the hammer and lifter action I provide a movable or rocking bar P', having arranged thereon the springs P for giving reactive impulse to the hammers or hammer-action after the hammer-head H² has approached the string S. Said bar or rocker P' is suspended by suitable hinging devices 16 upon and beneath the lower bar or rail of the action-supporting frame and in rear of the series of lifter-wires. The springs P are best formed as flat curved arms having their ends at the rear attached to said rockable bar P' and thence curving forward therefrom and fitted with divided or bifurcated forward ends for loosely embracing the lifter-wire between the forks. (See Figs. 9 and 10.) Upon the respective lifters L, below the springs, I arrange a small cylinder or body of felt O, secured to the lifter-wire by a wire pin 17, inserted transversely through the same, as best shown in Fig. 11, thus forming a non-slidable all-felt collar-lug upon the wire stem for giving bearing against the spring. Normally the springs P stand free and clear from contact with the bearing-lug O, except when the lifter is raised sufficient to carry the hammer nearly to the string S. Then the lug O is brought into contact with the spring P, which thus exerts its reactive effect at proper time without giving a constant drag or pressure upon the action. As a result, the key movement being chiefly accomplished before contact with the spring occurs, extremelightness of touch is thus attained. By rocking adjustment of the spring carrier-bar P' the relation and effect of the springs P can be greatly modified and regulated to suit the requirements or desires of any player. Any suitable means can be employed for effecting and retaining the adjustment of the spring carrier-bar—as, for instance, a lever-arm 18 and slide 19, as indicated in Fig. 6'. In the present instance I have shown flat plate forked springs P; but it is obvious that wire springs might be employed in similar relation and operation without departure from the spirit of my invention.

The damper-stem spring D² I arrange as a bow or finger of small wire having a coil at

its lower end. Within the wood portion of the top rail I provide a longitudinal groove 19, opening therein at the top surface. The fixed ends of the springs, each with a fiber packing 20 drawn through their coil, are set into the wood strip, with their coils embraced within the groove 19 and are there covered by the pivot-seating plate F, the arm of the spring projecting up through the recess n and its top end resting against a thimble of felt 21, that surrounds the wire damper-stem and is secured thereon by a pin inserted there-through.

R denotes the damper-retractor for loud-pedal device or means for simultaneously raising the series of dampers in the hinging of said retractor-bar. Depending transversely-grooved plates 23 are secured to the top rail, and hinging-studs having laterally-projecting pivots are fixed to the damper-retractor bar. The pivots are laid into the groove of the hinge-plate and confined by a cap-plate held by a screw 22.

The damper retractor-bar is provided near the center of the instrument with a forwardly-projecting arm R', the outer end of which is connected direct with the pedal T by a chain or rod r, one end of which is flexibly attached to the arms R and the other end secured to the pedal-iron T without intervening lever devices, as best shown on Figs. 1 and 2. The pedal T is preferably provided with a loop or eye t for the attachment and adjustment of the chain, rod, or connection r. The arm R' affords a long leverage and direct pull connection for moving the damper retractor-bar, and the pedal operation is thus rendered easy, simple, and quiet. Furthermore, this construction avoids or does away with the trap-levers of the ordinary pedal mechanism and the squeaky joints commonly incident thereto.

W indicates the key-lifting device beneath the rear ends of the keys K for varying the dip of the keys by pedal action. In my improved construction of this mechanism I provide a smooth-faced eccentrically-journaled roll extending across the instrument under the keys K. Said roll preferably consists of a cylindrical metal tube 25, through which extends a metal rod 26, arranged axially eccentric to the tube, and the interior space of the tube is fitted with a wood core 27 or equivalent packing that keeps the rod 26 in proper relative position. The rod projects at the ends of the tubular sections and forms journals for the roll eccentric to the cylindrical key-supporting surface, whereby the roll is mounted in suitable bearings 24 to the bed C² or end blocks C' of the piano-case C. The roll W is provided with a rearward projection or arm 28, upon which downward pressure is normally exerted by a suitable spring 29, and with a forward projection or arm 30, that is connected direct to the pedal T' by a chain, rod, or link 31, so that depression of the pedal pulls down on the arm 30 and par-

tially rotates the roll W in its eccentric bearings for raising the rear ends of the keys to diminish the key-play movement. The rod 26 can extend in one length for the full width of the key-bed; but the tube 25 and its filling 27 may be made in sections suited to the arrangement of the manual and intermediate bearings introduced between the ends of the tube or roll sections, thereby affording a firm support and a comparatively substantial lifting eccentric beneath the key ends. The intermediate bearing 42 can, if desired, be attained by cutting away the under side of the roller-tube 25 up to the rod 26 without cutting out the top surface of the tube. The keys are best provided with adjustable seat-buttons or stop devices 32, that rest upon the cylinder-surface, as shown.

I am aware that a key lifter-bar beneath the rear ends of the keys has heretofore been used in a piano, but in different construction from my present means. By constructing the key lifter mechanism in the manner set forth intermediate supports for said lifter are conveniently attained, thus rendering the lifter mechanism firm in its upholding of the keys and action mechanism and a central direct connection with the pedal is provided, in which the downward pull of the pedaling movement does not induce a sag or undue yielding of the lifter-roll between its supporting-bearings, caused by the weight or pressure of the action and the force of its operating means.

At their hinging the pedal-levers T and T' are respectively formed each with a transverse angular groove 35 near its rear end or at the fulcrum position, and a standard or bearing-piece having a transversely-disposed rod 36 fixed therein is seated in the piano-case bottom. The groove 35 of the pedal-lever is arranged to embrace said rod 36, and the pedal is secured thereto by a cap-plate 38, attached to the pedal-body by a screw 39, as indicated. The rod 36 forms the fulcrum-pivot for the pedal. A slight nick or circumferential groove formed in the rod and a slightly-protruding pin or lug 40, arranged on the cap-plate, serves to keep the pedal from lateral displacement, and the necessity for using felt bushings for the pedal-hinging is obviated.

What I claim, and desire to secure by Letters Patent, is—

1. In combination with a piano-action mechanism, the action-supporting frame comprising two straight, longitudinally parallel flat-rolled metal bars a a' , disposed in similar edgewise relation in the same vertical plane, and united by uprights a^2 , said bars extending across the action and having their ends secured to the upright supporting-brackets B seated on the end blocks of the case, the wood backing-strips, as shown, disposed adjacent to and secured to said bars, the upper pivot seat-plate F disposed horizontal along the top of the bar a , and secured to its backing-strip,

and the lower pivot seat-plate F' disposed in edgewise upright position along the lower bar a' and secured to the upward-projecting part of its backing-strip, all substantially as set forth.

2. In a piano-action, the pivot seat-plate formed of brass, fiberoid or equivalent rigid material, extending across the scale and having a corresponding series of perforations, and indented edge recesses at diametrically opposite positions on the front and rear edges of the plate and provided with parallel longitudinally-directed grooves near its opposite edges, and the series of independently-attached cap-plates having furcated ends and perforations to match said pivot seat-plate; in combination, with the pairs of oppositely-disposed hammer and damper members having wire stems that fit said recesses, and transversely-projecting pivot-pins centrally fixed in said stems and adapted to seat within said grooves, and single attaching-screws for holding and adjusting said cap-plates.

3. A piano-action hammer comprising the striking-head, a hammer-butt block cut away at its under part, and the hammer-stem inserted through said hammer-butt block and projecting at the under side thereof, and having the transversely-disposed pivot arranged through the downwardly-projecting portion of said stem.

4. In a piano-action, in combination substantially as described, the action-supporting frame comprising the edgewise vertical metal bars and wood back-strip, the longitudinally-grooved pivot seat-plate extending and secured along the top of said frame, and provided with interval recesses in the edges thereof, the dampers having wire stems with laterally-projecting pivot-pins fixed therein, the hammers having wire hammer-stems extending through and projecting at the lower side of their hammer-butt blocks, with transverse pivot-pins fixed in the projecting ends of said stems, said hammer and damper stems fitting laterally within the respective recesses at the opposite edges of said pivot seat-plate with their pivots seated in the respective grooves, the oppositely-furcated cap-plates each embracing a hammer and damper stem and confining the pivots thereof, and a fastening-screw for each of said cap-plates.

5. In an upright-piano action, in combination with the hammers, and the jack-head provided with a lateral stud; of the combined coupler and back-stop consisting of a single wire having one end attached to the hammer-butt, said wire bent to form a downward arm and hook that engages beneath said stud at the side of the jack-head; its fore end extending outward beyond the jack and then turned backward with a return-bend into alinement with the jack, and its backwardly-directed end screw-threaded and provided with the adjusting stop-button for contact with the front of the jack-head, substantially as set forth.

6. In a piano-action, in combination, the

hammer-actuating jack having a wire jack-stem, the tail end of said jack-stem turned upward and screw-threaded, the adjusting-button mounted on the threaded end of said jack-stem, and a knock-off rod consisting of a plain metal tube or bar disposed above said button, as shown and described.

7. The lifter device provided with a furcated head having transverse pivot-seat grooves for the jack and damper-actuator pivots, and a removable cap-plate therefor, means for securing and regulating said cap-plate, an opening or space 15 in said head through which access is afforded to the back-lying screws; in combination with the wire jack-stem having the pivot-pin therein, the damper-actuating member having fixed transverse pivots, and the pivot-seat plate F', its cap E' and cap-screw e², substantially as described.

8. In a piano-action and in combination as described, the action-supporting frame having the lower rail A² provided with depending hanger devices 16, the rockable spring-carrier bar hingedly suspended by said hangers beneath said frame-rail, means for adjusting said carrier-bar, a hammer-actuating mechanism comprising wire lifter-rods each provided with a surrounding felt collar-lug and a transverse pin fixed therein, the series of springs attached at their rear ends to said carrier-bar, and having bifurcated fore ends that loosely embrace the lifter-rod wire above said transverse pins, and are adapted for contact with said collar-lugs, in the manner set forth.

9. In a piano-action the action-supporting frame, its top rail having the longitudinal spring-seating groove formed therein, the overlying pivot seat-plate secured on said rail with its indented edge extending over said groove, the pivot-seating groove in said plate, the damper-stem having the fixed pivot supported in the groove of said seat-plate, and a soft thimble on said stem, the damper-spring secured in said rail with its coiled head inclosed within said groove by said overlying pivot-seat plate, a soft plug inserted through the coil, and the arm of said spring projecting up through the seat-plate recess and bearing on said soft thimble.

10. In an upright piano-action, the combi-

nation as described, with the forte-pedal iron, the series of dampers, and the damper-retractor bar rockably supported on the action-frame; of a forwardly-projecting arm rigidly fixed to said retractor-bar above said pedal-iron, and a chain or pull member disposed in a directly-connecting relation and having its respective ends attached to said arm and to the pedal-iron, substantially as shown and described for operation as set forth.

11. In a piano-action, in combination, with the hammers, hammer-actuating mechanism and manual-keys; the key lifter mechanism comprising a cylindrical roll eccentrically journaled in bearings upon the key bed or frame and provided with a forward projection or arm, and a backward projection or arm, a spring acting on said backward projection, the pedal-lever, and a connection, chain or rod linking said forward projection of the lifter-roll direct to said pedal-lever, substantially as set forth.

12. In a piano-action, the key lifter-roll composed of a cylindrical metal tube, a metal rod arranged longitudinally within said tube at axially eccentric position and having journal portions that project beyond the ends of the tube-sections, a wood packing between said tube and rod, journal-bearings for supporting said roll, and connections for oscillating the roll by pedal movement; in combination with the pedal and the manual-keys provided with cushioned adjusting devices that rest upon the surface of said lifter-roll, for the purpose set forth.

13. The damper-actuating member M, consisting of a single piece of wire bent up as shown, with a forward and a backward bend into an S shape, its rearward end screw-threaded and having an adjusting-button M² threaded thereon, the forwardly-directed part of said wire having the two transverse pivot-pins m and m' rigidly fixed therein; in combination with the damper-stem wire, the lifter-head and the grooved pivot seat-plates, all substantially as shown and described.

Witness my hand this 28th day of July, 1900.

WILLIAM C. ELLIS.

Witnesses:

CHAS. H. BURLEIGH,
ELLA P. BLENUS.