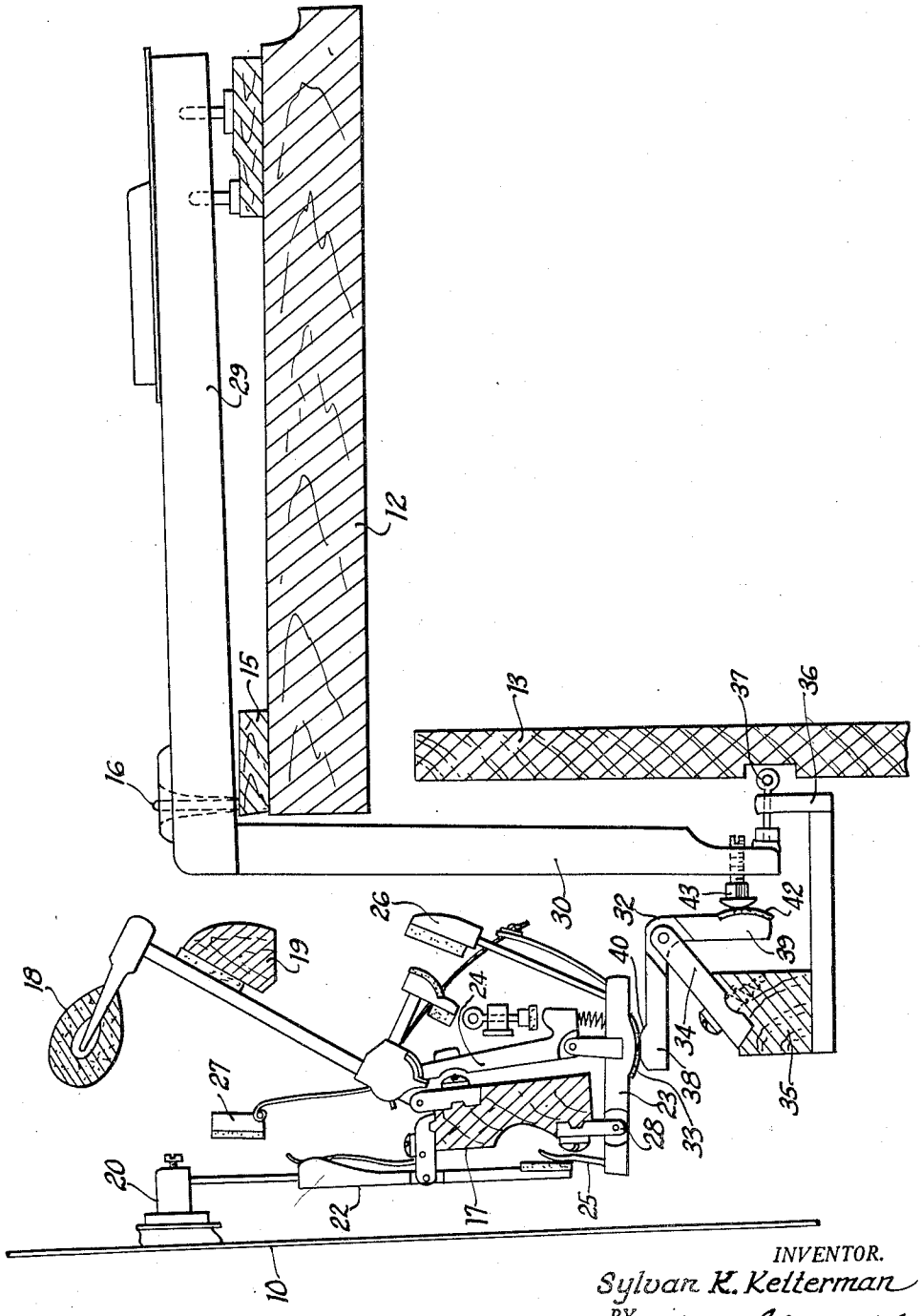
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PIANO ACTION

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PIANO ACTION

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1 Claim. (Cl. 84—240)

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This invention relates to piano actions, and more particularly to an actuating mechanism and key structure for such actions which is applicable particularly to upright pianos of the smaller sizes.

One object of my invention is to provide a piano action and key structure which, although applicable to pianos of smaller sizes, provides playing leverage and "touch" comparable to those generally found on the large pianos.

My invention has for another object the provision of an action for use in small size upright pianos and which minimizes frictional resistance to operation.

As another object, the invention comprehends the provision of an action including an actuating key and mechanism constructed and arranged so that both the hammer and key levels may be selected for a particular piano size.

It is a further object of this invention to provide a piano action including a key and actuating parts and wherein the structure and arrangement is such that the keys are removable separately or as a group without disturbing the rest of the action and the action parts are removable without disturbing the keys.

This invention also comprehends the provision of a piano action and key combination wherein the relationship of parts is such that access is convenient for tuning and adjusting.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings in which similar characters of reference indicate similar parts throughout the several views.

Referring to the one sheet of drawings, the single figure of the drawing is a fragmentary vertical end sectional view illustrative of the action and playing key portions of a piano embodying a preferred form of my invention.

Referring to the exemplary embodiment of my invention which is depicted in the accompanying drawing for illustrative purposes, a hammer actuating mechanism, which is of a structure and size recognized as practically standard in the art for many years, is disposed in aligned relationship between a string 10 at the rear of the piano and a key bed 12 at the front of the piano, below which key bed is a bottom frame 13 comprising the front panel of the piano case. Substantial space is provided between the key bed 12 and the string 10 for the accommodation of the piano action which includes the hammer actuating mechanism. There being an action, such as that illustrated, for each string of the piano, each

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such string and action are accompanied by a key 14 pivotally supported for rocking movement in a vertical plane and relative to a balance rail 15 and a balance rail pin 16, in a manner well understood in the art.

Although quite well known and understood, certain parts of the hammer actuating mechanism will be specifically referred to herein for identification and reference purposes. As is usual, the hammer actuating mechanism is carried by a hammer rail 17 and includes a hammer 18 supported for swinging movement toward and from the string 10 by the hammer rail 17 and having a normal position of rest against a hammer support rail 19. In addition to the hammer 18, there is a damper 20 movably supported from the rail 17 by a damper lever 22. The parts through which the hammer and damper are operated include a whippen 23, jack 24, damper spring 25, back check 26, and spring rail 27; the actuation of both the hammer 18 and damper 20 being effected by limited swinging movement of the whippen 23 in a vertical plane and relative to a stationary support provided by a whippen pivot flange 28 secured to the rail 17.

The position of the hammer and its actuating mechanism are desirably selected in reference to the piano string acted upon by the hammer for optimum playing results; the level at which the hammer and its actuating mechanism are disposed being influenced and determined by the length of the strings. The desirable height of the key board, on the other hand, is selected for convenience in playing. The factors influencing the relative levels of the keys and their associated actions are consequentially unrelated. Also, while the desired key board level remains practically the same, regardless of the height and size of the piano, the most effective level for the action varies with the height of an upright piano and the resultant permissible length of its strings.

In the larger upright pianos, the relative levels of the keys and actions was such that the lever portions of the keys on the opposite sides of the pivotal supports for those keys were both permissibly quite long. The key leverage, and lever arm lengths, in any instance, control certain characteristics of the force required for actuating the hammer and the movement of a key which is necessary for producing the necessary travel of the hammer. These factors influence what the piano players refer to as "touch," as well as the ease of control exercised by the player over the force of the hammer against the string.

Since there are various factors which are

against the desirability or advisability of altering or completely revising the structure of the hammer actuating mechanism from the characteristics which have become quite standard and well known, the more modern desire for smaller pianos has brought about the need for effecting other changes to compensate for the altered position of the action in the smaller pianos, and yet preferably to provide in the smaller pianos a "touch" or key leverage characteristics and low friction losses comparable to those developed over a long period in the larger pianos. In addition to the foregoing, the adaptation of an action to the smaller pianos should be such that the keys are removable individually or as a complete set without disturbing the action, and the actions should be removable separately and without disturbing the keys. The latter considerations contribute to ease of service and tuning.

Having given consideration to factors such as those which have been discussed, I have provided a new and different key structure which, as depicted by the key **14**, has rigidly connected lever portions **29** and **30** disposed in substantially right angular relationship to one another and adapted for normal disposition with the lever portions movable in a vertical plane and with the lever portion **30** extending downwardly from the key bed to a level below that of the whippen **23** in the hammer actuating mechanism. With this key structure, the lever portion **29** is manually operated and has the usual and characteristic key movement. Upon such movement, however, lever portion **30** swings about the pivot provided by the balance rail **15** and balance rail pin **16**, so that the principal component of movement of the lower end thereof is horizontal.

The movement of the whippen **23** required for actuation of the hammer **18** being generally vertical, as contrasted with the mainly horizontal component of movement of the lower end of the key lever **30**, and in order to minimize friction in producing actuation of the hammer in response to movements of the key, as well as to maintain satisfactory leverage, I have provided a bell crank **32** which is interposed for rotational movement between the lower end of the lever portion **30** and a bearing **33** on the lower surface of the whippen to translate the horizontal movements of the key lever into vertical movements of the whippen. The bell crank **32** is supported for such rotational movement by a bell crank flange **34** secured to and carried by a bell crank support rail **35**. Also secured to the bell crank support rail is an arm **36** which acts as a support for a key leveling screw **37** against the end of which the lever portion **30** of the key normally rests, and upon the adjustment of which the normal level or position of the key is dependent.

The bell crank **32** has arms **38** and **39** disposed in substantially right angular relationship to one another; the arm **38** having a normal position substantially parallel to the lower surface of the whippen and the arm **39** having a normal position substantially parallel to the lever portion **30** of the key. At the projecting end, the arm **38** of the bell crank has a substantially arcuate bearing surface **40** which normally engages the bearing surface **33** on the lower surface of the whippen, and which latter bearing surface is desirably arcuate and padded. An arcuate and preferably padded bearing surface **42** is provided at the projecting end of the arm **39** facing toward the lower end of the key lever portion **30**. A capstan screw **43** is carried at the lower end of

the key lever portion **30** at a position aligned for engagement with the bearing surface **42** on the bell crank, and is adjustable toward and from the surface of the key lever portion to effect engagement between the bearing surfaces **33** and **40** on the whippen and bell crank when both the whippen and key are in their normal positions.

Since the principal component of movement of the lower end of the bell crank arm **39** from its normal position is horizontal, as is the principal component of movement of the lower end of the lever portion by which it is actuated, there is very little relative movement between the capstan screw **43** and bearing surface **42** to produce appreciable frictional resistance to such movement. Likewise, the principal component of movement of the extending portion of the whippen is vertical and in correspondence to the principal component of movement of the extending end of the bell crank arm **38**, so that there is only very slight relative movement between the whippen and bell crank bearings **33** and **40** to introduce frictional loss at that point in the mechanism. The substantially arcuate curvature of the engaging bearing surfaces on the capstan screw, bell crank and whippen provides for relatively free rolling movements between those surfaces.

In the disclosed embodiment of my invention, the lengths and relative proportions of the lever portions of the key **14** are such that the key movements and forces for actuating the hammer simulate those of a large piano in which the action is placed at a considerably higher level relative to the keys. Also, in the disclosed embodiment, the effective lengths of the arms **38** and **39** on the bell crank are such that they do not materially alter the characteristic movements and forces by virtue of their interposition between the key lever portion and the whippen. Furthermore, the bell crank **32** being disposed below the hammer actuating mechanism and to the rear of the key lever portion **30** and not attached to either the key lever portion or whippen, the bell crank does not interfere with the removal or adjustments of either the key or the hammer actuating mechanism. With the key in the form and position disclosed, it is also noteworthy that both the key and action are selectively removable without interference to one another.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

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

In an action for a piano, the combination comprising a substantially rigid key bed having a balance rail directly mounted thereon, a hammer actuating mechanism including a whippen having a bearing surface on the bottom thereof, a key supported on said balance rail at a level above that of the whippen for pivotal movement relative to the balance rail, said key including a lever arm portion which comprises a substantially rigid continuation of the key extending downwardly at substantially a right angle to the rest of the key at a position between the balance rail and the hammer actuating mechanism and terminating below the whippen,

the length and disposition of said lever arm portion being such that the principal components of movement of the end thereof below the whippen are horizontal when the key is moved, a capstan screw adjustably mounted at the lower end of the lever portion below the whippen, a bell crank support rail, a bell crank movably supported on said bell crank support rail for translating movements of the capstan screw to the bearing surface of the whippen to effect actuation of the hammer mechanism in response to movements of the key, an arm extending from the bell crank support rail to a position adjacent the lever portion of the key, and a leveling screw adjustably carried by said arm and having an end normally engaging said lever

arm portion on the side thereof opposite the capstan screw.

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