

**No. 638,798.**

**Patented Dec. 12, 1899.**

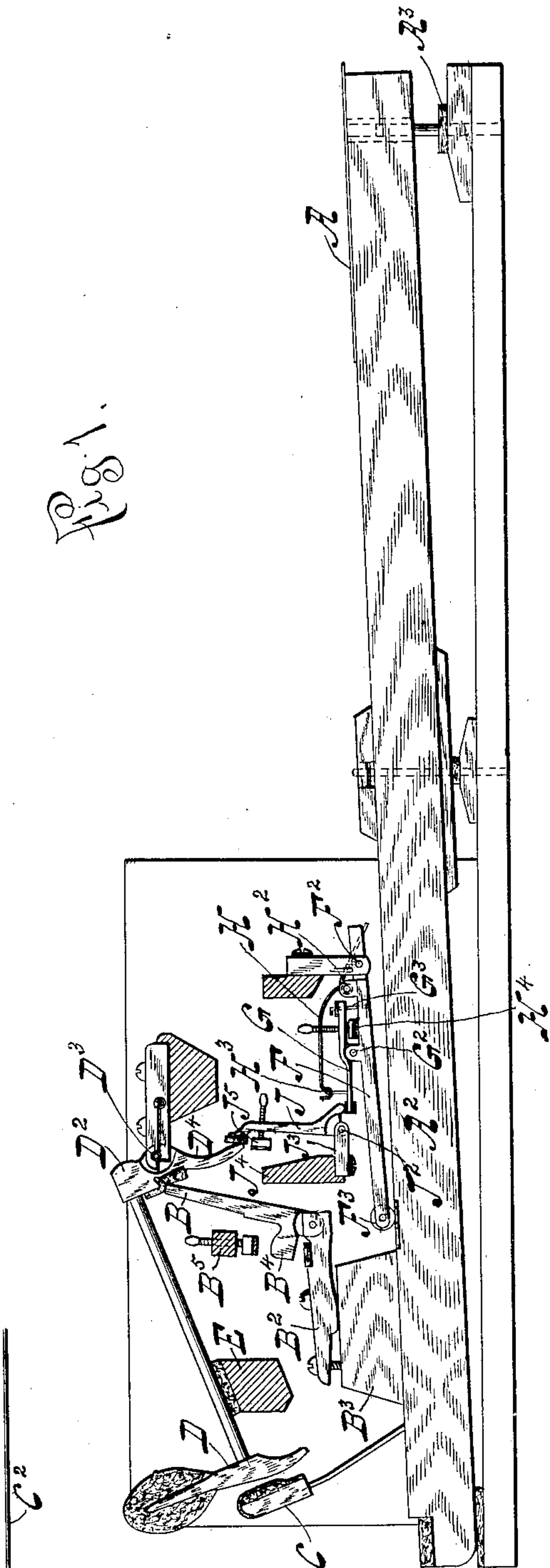
**J. F. CONOVER.**

**PIANO ACTION.**

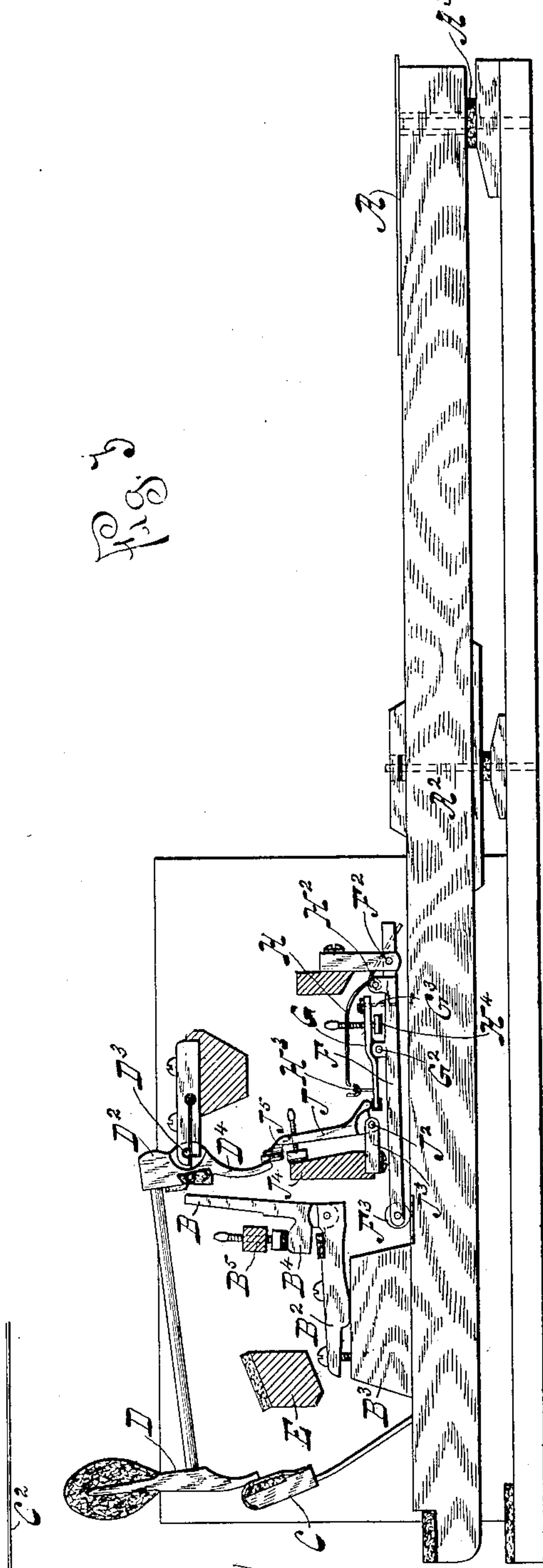
(Application filed Feb. 14, 1898.)

(No Model.)

3 Sheets—Sheet 1.



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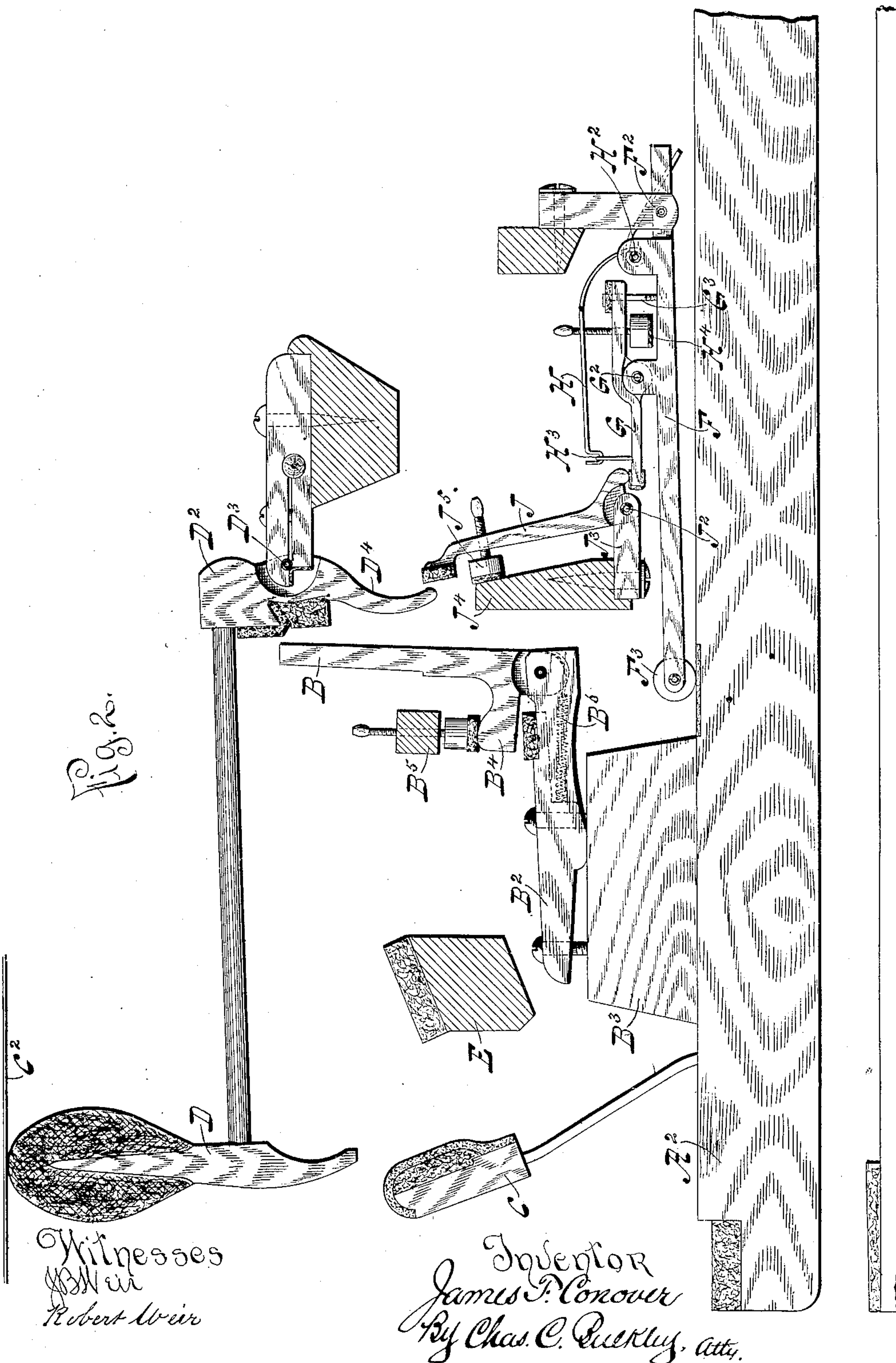
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3 Sheets—Sheet 2.









# UNITED STATES PATENT OFFICE.

JAMES F. CONOVER, OF CHICAGO, ILLINOIS.

## PIANO-ACTION.

SPECIFICATION forming part of Letters Patent No. 638,798, dated December 12, 1899.

Application filed February 14, 1898. Serial No. 670,327. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES F. CONOVER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Piano-Actions, of which the following is a specification.

My invention relates to a certain improved repeating device for use in conjunction with any form of piano-action.

A pianist frequently finds it necessary to produce the same tone or note in quick succession or reiteration, and accomplishes this result by rapidly-repeated blows with the several fingers of the hand upon the same key. As these movements of the fingers upon the same key to produce the reiterated tone are effected with extreme rapidity, it is frequently the case with the ordinary action that no tone is produced which may be estimated by the ear. This failure to obtain the desired reiterated tone or reiterated defined tone occurs because of the extreme celerity with which the pianist reverses his fingers and repeats the blows successively upon the same key, affording no opportunity for the readjustment or positioning of the parts of the action when the hammer is at a sufficient distance from the string. In order to produce strong, clear, and well-defined reiterated tones, it is essential that the maximum power of percussion shall be obtained, and to accomplish this result the hammer before the key is again struck should be permitted to assume and maintain a position remote from the string, whereby the hammer when the key is again struck applies the necessary power of percussion upon the string. It is also desirable to avoid any extra or unnecessary movements of the hammer, which interfere with the precision of the touch, and also afford means whereby to obtain these strong, clear, and well-defined reiterated tones with extreme rapidity.

Actions have been provided with interposed spring-controlled levers and arms mounted upon the key-lever, acting upon the hammer, these interposed devices rising and falling with the vertical movements of the key-lever and constituting the repeating mechanism. An arm termed a "jack" is normally engaged with the hammer and mounted upon the key-lever. When the key is struck, the

jack transmits the movement of the key-lever to the hammer and impels the latter to the string. Before the hammer reaches the string the jack is disengaged from the hammer, which then by its momentum reaches and strikes the string. The hammer on its descending movement away from the string first encounters and engages frictionally with a padded arm on the key-lever, termed the "back-catch," and is momentarily held in this position. As the key-lever moves still farther downward the back-catch releases the hammer.

The repeating mechanism is designed to act upon the hammer and permit reengagement of the jack with the hammer as the back-catch releases the hammer and before the key completes its upward movement to a final position of rest, whereby the key may be repeatedly struck when in an intermediate position to actuate the hammer and produce rapidly-reiterated or successive tones.

In the present form of repeating mechanism the recoil of the hammer compresses the spring thereof, and upon the release of the hammer by the back-catch upon the further descent of the key-lever this spring is then uncontrolled and by its accumulated force of compression imparts to the hammer an extra upward movement toward the string. The pianist now striking the key fails to produce a clear defined tone because of the close proximity of the hammer to the string, caused by this extra movement of the hammer, thus limiting the extent of throw or movement of the hammer. In order to obtain sufficient range of movement to produce the required tone, the hammer must descend farther, which consumes time and demands a greater finger movement. Because of this extra hammer movement a vibratory sensation is imparted to the finger on the key which interferes with the precision of touch.

The object of my invention is to provide an action capable of producing a more rapid succession of clear and well defined tones of great power which shall not interfere with the precision of touch.

A further object of my invention is to provide an action of simple construction, easily adjusted, and less liable to get out of order.

With these objects my invention consists



in the features, arrangement, and combination of parts and details of construction to be described, and pointed out in my claims, reference being now had to the accompanying drawings, in which—

Figure 1 is a section and side elevation of a piano-action embodying my improvements, the various parts being in the normal position of non-use. Fig. 2 is a like enlarged view showing the position of the parts as the hammer strikes the string and as the key reaches the limit of its downward travel. Fig. 3 is a like view showing the position of the parts when the hammer is engaged by the back-catch after striking the string, with the key at the extremity of its downward travel. Fig. 4 is a like view showing the position of the parts as the key is released and moves slightly on its upward travel. Figs. 5 and 6 are respectively side and plan detail views of the hammer pivot-block. Figs. 7 and 8 are like views of the lifting-lever and parts mounted thereon. Figs. 9 and 10 are like views of the pivot-arm for the jack. Figs. 11 and 12 are like views of the hammer actuating and holding arm.

A designates the key, and  $A^2$  the key-lever. The jack B is pivoted to the arm  $B^2$ , secured on the block  $B^3$ . This block is mounted upon the end portion of the key-lever  $A^2$ . The back-catch C is also carried on the end of the key-lever. The hammer D is connected with the butt  $D^2$ , which latter is pivoted in the usual manner at  $D^3$ . The jack B has a tang  $B^4$ , which engages against the stop  $B^5$  when the key-lever is raised or moved upward to lift the jack B. The rail upon which the hammer rests when not in use is designated at E. The upper free end of the jack B is adapted to engage a notch in the hammer-butt  $D^2$ . As the key A is struck the back end of the key-lever  $A^2$  is suddenly raised, which propels the hammer to the string  $C^2$  by means of the jack B, mounted on the key-lever and engaged with the hammer-butt  $D^2$ .

A lifting-lever F, pivoted at  $F^2$  to a fixed part of the action, has a friction-wheel  $F^3$  at its other end adapted to travel upon the inner end portion of the key-lever  $A^2$ . A presser-arm G is centrally pivoted at  $G^2$  to the lifting-lever F, and a spring H, secured to the lifting-lever F at  $H^2$ , is connected by a loop  $H^3$  to the presser arm or lever G at a point near one of its extremities. A stop-rod  $G^3$  checks the excessive movements of the presser arm or lever G. A stop  $H^4$  operates to check the spring H in a manner to be described.

J designates a holding-arm pivoted at  $J^2$  to the extension  $J^3$  from the stationary rail or cross-piece  $J^4$ . This holding-arm J touches and at times bears against the tang  $D^4$  of the hammer and also carries a button  $J^5$ , which impinges against the stationary rail  $J^4$ , the latter therefore serving as a stop for the holding-arm.

I shall first describe the usual operation of

the well-known parts of an action in impelling the hammer to the string.

When the parts are in their normal position of rest, the jack B is engaged with the butt  $D^2$  of the hammer D, which latter rests upon the rail E, as shown in Fig. 1. When the key is struck, the inner or back end portion of the key-lever  $A^2$  is suddenly and forcibly lifted or raised, thereby lifting the jack B and impelling the hammer D to the string. Just before the front end of the key A reaches its seat or cushion  $A^3$  the tang  $B^4$  of the jack B is engaged by the stop  $B^5$  and the end of the jack disengaged from the butt of the hammer. When the hammer has struck the string and returns, it is necessary that the jack shall re-engage the hammer, and this is accomplished by the spring  $B^6$ , which pulls the jack forward, as is usually the case after the hammer rests upon its rail, into engagement again with the hammer-butt as the key-lever descends at its inner end and disengages the jack from its stop  $B^5$ .

I will now describe the action of my improved repeating mechanism.

In a position of rest the hammer is engaged with the jack, as stated, the holding-arm J rests lightly upon the presser-arm G, its upper end touching the tang  $D^4$  of the hammer-butt  $D^2$ , and the free end of the lifting-lever F rests upon the key-lever  $A^2$ . The spring H exerts an upward pressure on the presser-arm G, which would turn the holding-arm on its pivot and lift the hammer were it not for the stop  $H^4$  on the presser-arm, which engages against the lifting-lever F and holds the spring H in check. As the key is struck the inner end of the key-lever is raised forcibly, lifting the jack and impelling the hammer to the string, as already described, and at the same time the lifting-lever F and presser-arm G are also raised, thereby turning the holding-arm J on its pivot  $J^2$ , the spring H being still held in check by the stop  $H^4$  and its tension un-increased. As the hammer is raised the lower end of its tang  $D^4$  moves horizontally through the arc of a circle, and the upper end of the vertically-extended holding-arm follows the said tang and also moves through the horizontal arc of a circle about a pivot on a fixed part of action. Thus as the jack moves upward in a vertical plane the hammer-tang and holding-arm move through a horizontal plane, the hammer-tang moving forward and in front of the holding-arm as the hammer is moved upward to the string. Just before the front end of the key reaches its seat the jack engages the stop, and the button  $J^5$  of the holding-arm J comes against the stop-rail  $J^4$ . When this occurs, the holding-arm is held in a stationary position, and as it engages one end of the presser-arm G in the continued descent of the key toward its cushion the continued upward movement of the inner end of the key-lever causes said presser-arm to turn upon its pivot  $G^2$  and, raising that



part of the presser-arm carrying the stop  $H^4$ , lifts said stop out of its engagement with the lifting-lever  $F$ , and thereby permits the spring  $H$  to exert its influence upon the presser-arm to hold and maintain the holding-arm engaged by the presser-arm firmly against the stationary stop-rail  $J^4$ , as clearly shown in Fig. 2. It will therefore be observed that the lifting-lever and presser-arm at the outset are lifted by the key-lever, the spring  $H$  being held in check by the stop  $H^4$  until the jack is disengaged from the hammer, when the holding-arm is stopped in its movement, the presser-arm turns on its pivot to withdraw the stop  $H^4$ , and then through the presser-arm the force of the spring is exerted to hold the holding-arm against the stop-rail. The stroke is now completed and the hammer thrown to the string, with the hammer-tang  $D^4$  slightly in front of the holding-arm  $J$ , and the back-catch  $C$  is in a position to receive the hammer as it recedes from the string. As the hammer recedes it is caught by the back-catch, and its tang comes in contact with the holding-arm  $J$ , Fig. 3.

I will now describe the readjustment of the parts for a repeated stroke before the key assumes its position of rest.

As the key rises the inner end of the key-lever falls and the back-catch recedes from the hammer, which would fall upon the rail  $E$  but for the holding-arm, which is now held stationary by the spring against the stop-rail. As the key-lever falls the jack is released from its stop, and the spring  $B^6$  (shown in dotted lines in Fig. 2) reengages the jack in the notch of the hammer-butt, the hammer being held against descent by the holding-arm bearing against the tang of the hammer. As the key still continues to move on into a position of rest the inner end of the key-lever still continues to descend, the presser-arm, held by the spring against the tang of the holding-arm, turns upon its pivot, and the stop  $H^4$  is brought into contact with the lifting-lever  $F$ , thus withdrawing the pressure of the spring from the presser-arm and the holding-arm, and the latter is permitted to move backward upon its pivot  $J^2$  without offering further resistance to the hammer. The jack is now in position to again impel the hammer to the string, but as the key has risen but for a comparatively short distance and within the time required to reverse the movement of the finger it is impossible to strike the key before the readjustment of jack and hammer has been effected.

By pivoting the holding-arm to a fixed piece and extending it vertically therefrom into the plane of horizontal movement of the hammer-tang said holding-arm only has a movement about a fixed pivot, which movement corresponds to that of the hammer-tang, and I thereby am enabled to stop the hammer at just the required point where the hammer shall in the recoil engage in the back-catch

and its tang bear preferably slightly against the holding-arm or stand in close proximity to the holding-arm.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a repeating action, a hammer, a key-lever, a back-catch carried thereby, a jack, a holding-arm pivoted upon a fixed part of the action and extended upwardly therefrom, to act upon the hammer, a yielding-pressure device acting upon the holding-arm, a stop for controlling the holding-arm and means for controlling the yielding-pressure device.

2. In a repeating action, a hammer, a downwardly - extended projection from the hammer, a key-lever, a back-catch carried thereby, a jack, a holding-arm pivoted upon a fixed part of the action and extended upward from said pivot into the plane of travel of the hammer projection whereby to move with and act upon said hammer, a yielding-pressure device acting upon the holding-arm, a stationary stop for controlling the holding-arm and means for controlling the yielding-pressure device.

3. In a repeating action, a hammer, a key-lever, a back-catch carried thereby, a jack, a holding-arm pivoted upon a fixed part of the action and extended upward therefrom in a position to engage the hammer, a pivoted presser arm or lever engaging the holding-arm, a stop for controlling the holding-arm, a yielding-pressure device acting directly on the presser-arm and a stop carried by the presser-arm to control the yielding-pressure device.

4. In an action, means for operating the hammer, a holding-arm pivoted to a fixed piece, a stationary stop for said holding-arm, a key-lever, a lifting-lever pivoted at one end to a fixed part of the action and riding at its other end on the key-lever, a presser arm or lever pivoted to the lifting-lever, bearing against the holding-arm, a stop for the presser-arm and a yielding-pressure device controlled by said stop.

5. In an action, the combination with means for operating the hammer, of a pivoted holding-arm, a stop therefor, a lifting-lever pivoted to a fixed piece at one end and riding on the key at its other end, and a yielding-pressure device acting upon the holding-arm.

6. In an action, the combination with means for operating the hammer, of a pivoted holding-arm, a stop therefor, a lifting-lever pivoted to a fixed piece at one end and riding on the key at its other end, a pivoted presser-arm and a yielding-pressure device acting directly upon the presser-arm.

7. In a repeating action the combination with the jack and the back-catch mounted on the key-lever of a holding-arm pivoted to the fixed part of the action and extending upward therefrom to engage the hammer, a pivoted presser-arm, a lifting-lever upon which the



presser-arm is pivotally mounted and which lifting-lever is operated by the key-lever and a yielding-pressure device acting on the presser-arm and means for controlling the yielding-pressure device.

8. In an action, a holding-arm, pivoted on a fixed piece independent of the movable parts of the action, adapted to bear against the hammer and hold it stationary momentarily and a pivoted presser arm or lever bearing against the holding-arm, together with a yielding-pressure device acting on the presser arm or lever and a stationary stop for the holding-arm.

9. In an action, a holding-arm pivoted on a fixed piece independent of the movable parts of the action, a presser arm or lever bearing against said arm, a yielding-pressure device acting on said pressure-arm, and a lifting-lever, to which the pressure-arm is pivoted, movable with the key-lever.

10. In an action, a holding-arm, a presser

lever or arm, a lifting-lever pivoted to a fixed part of the action to which the presser arm or lever is pivoted, a yielding-pressure device acting upon the pressure-arm and a stop for the holding-arm.

11. In an action, the combination with means for operating the hammer, of a holding-arm adapted to bear against the hammer, a stop therefor to hold the holding-arm in a stationary position, while the means for operating the hammer engages therewith, a pivoted presser arm or lever bearing against the holding-arm, a yielding-pressure device acting thereon and a lifting-lever pivoted to a fixed part of the action.

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

JAMES F. CONOVER.

Witnesses:

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J. B. WEIR.