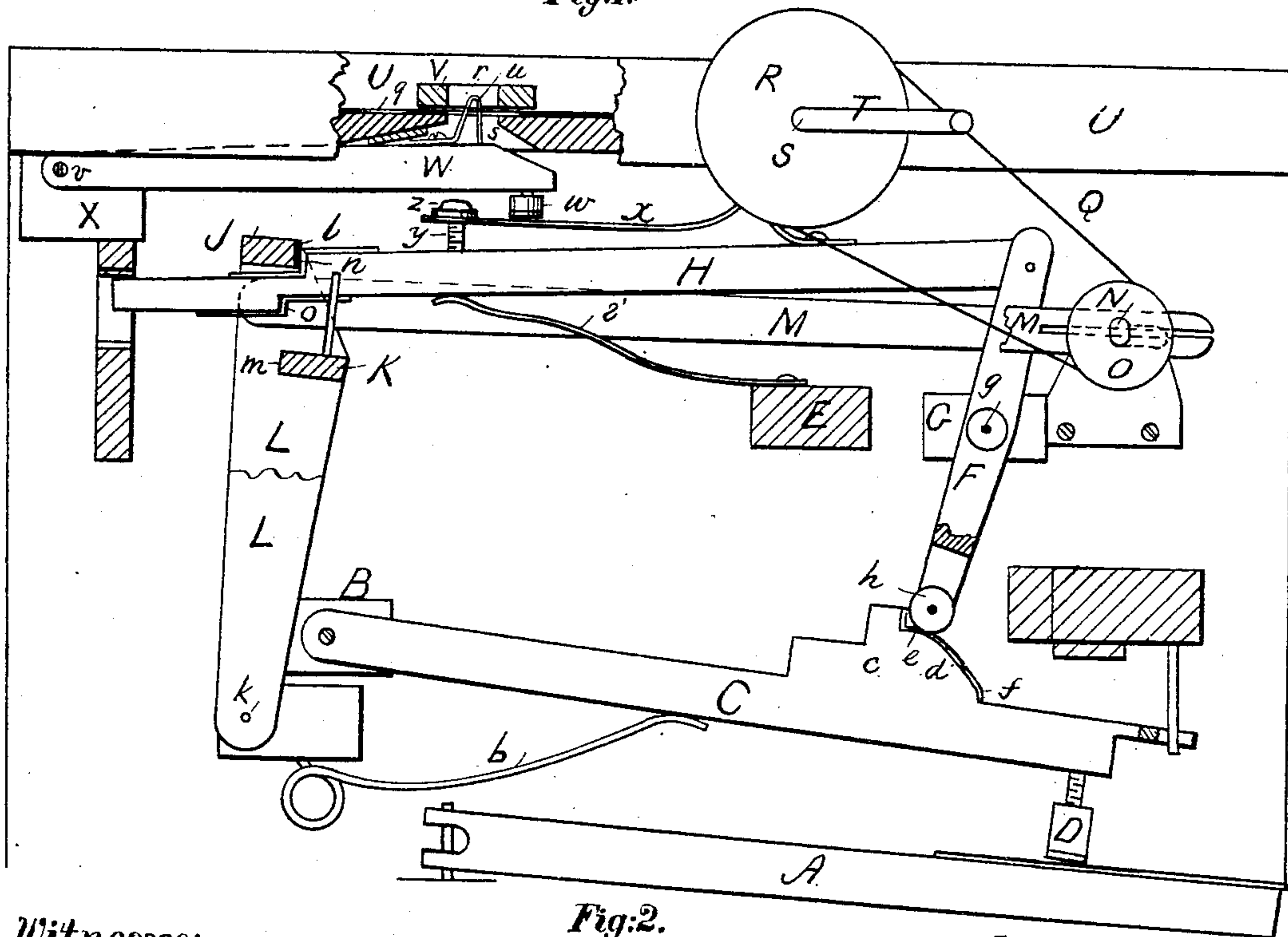
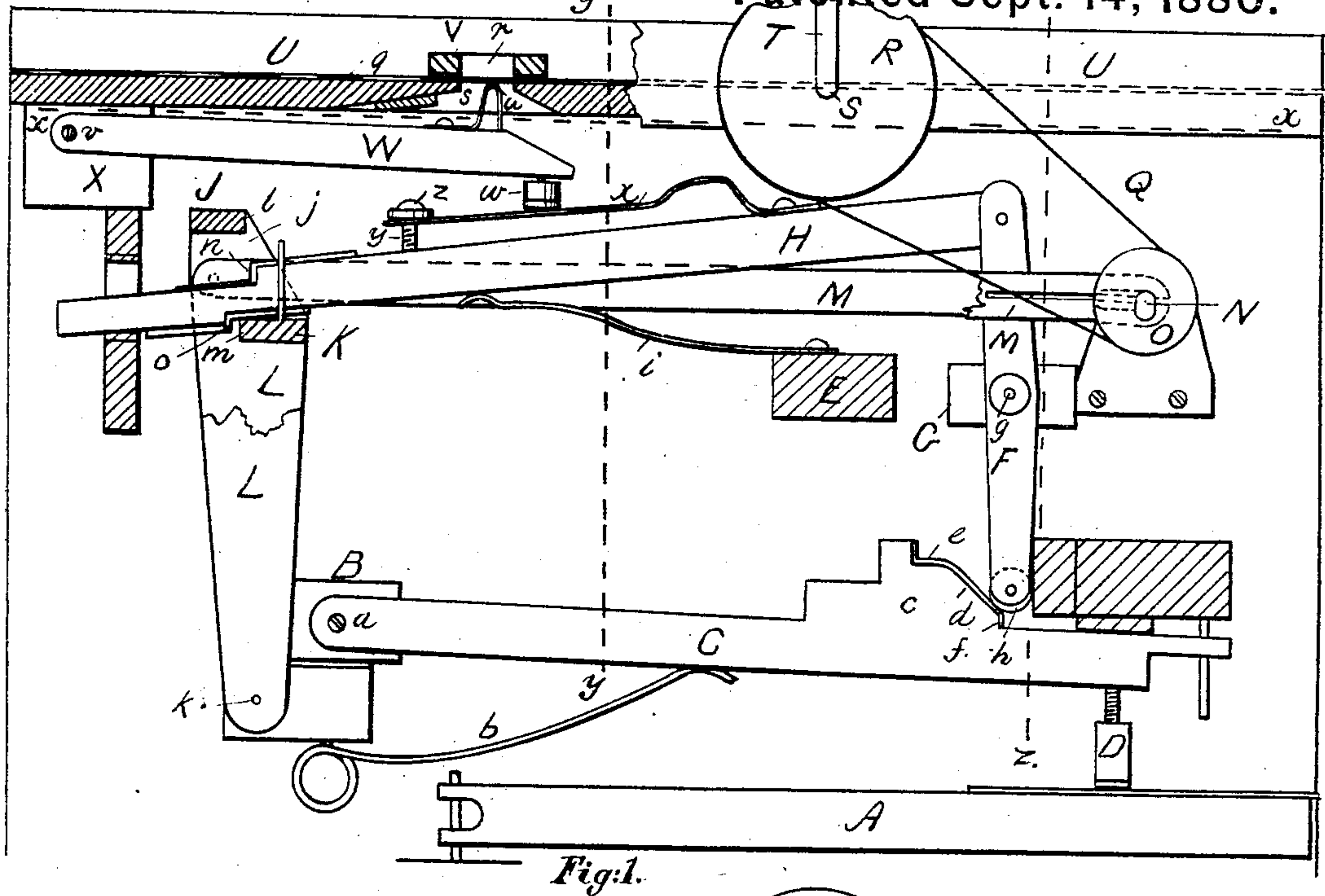


O. H. ARNO.
Mechanical Musical Instrument.

No. 232,165.

Patented Sept. 14, 1880.



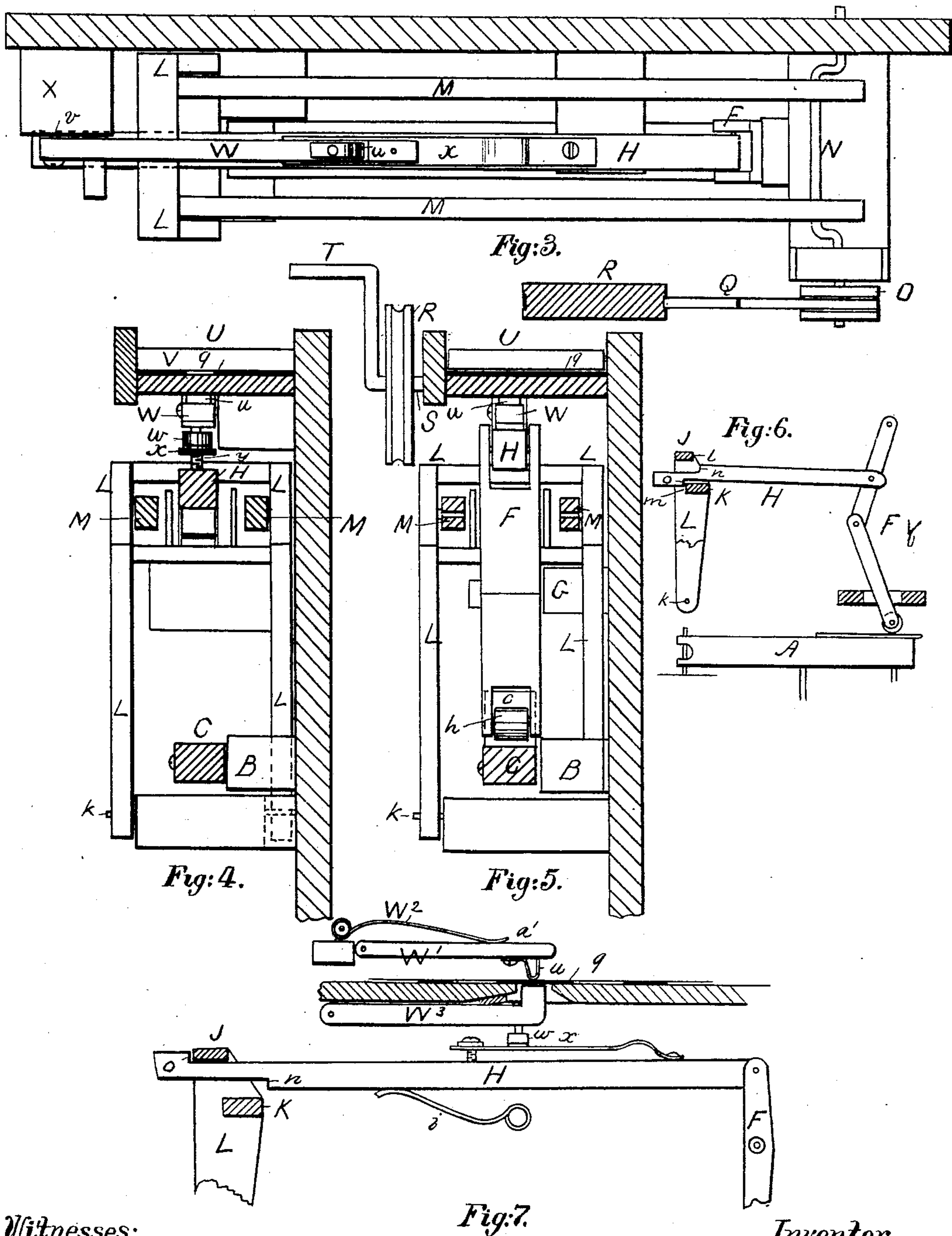
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Fig:7.

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UNITED STATES PATENT OFFICE.

OLIVER H. ARNO, OF WILMINGTON, MASSACHUSETTS, ASSIGNOR TO JAMES MORGAN, OF BROOKLYN, NEW YORK.

MECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 232,165, dated September 14, 1880.

Application filed January 24, 1880.

To all whom it may concern:

Be it known that I, OLIVER H. ARNO, of Wilmington, Middlesex county, and State of Massachusetts, have invented a new and useful Improvement in Reed-Organs, of which the following is a specification.

This improvement in reed-organs, &c., relates to mechanism for securing from the travel of a perforated strip of paper, or of other suitable material in proper relation thereto, an automatic opening and closing of the valve of the reed-organ in accordance with the arrangement of perforated and unperforated portions in said strip, and thereby, under a proper arrangement of such perforated and unperforated portions, the automatic playing of a tune by the organ to which such mechanism is applied.

The improved arrangement embraced herein consists of levers and other mechanical devices, which are applied together and in such relation to each other and to the plane of movement of a perforated strip of the character above described as to secure an automatic operation of the action to a reed-organ or other musical instrument, and thus the performance or playing of a musical composition, all substantially as hereinafter described.

In the accompanying plates of drawings, Figures 1 and 2 are side elevations of a key and mechanism applied thereto to secure an automatic operation thereof, in Fig. 1 showing the key and such mechanism in its normal position, and in Fig. 2 the key depressed and in the then position of said mechanism; Fig. 3, a horizontal section on line *xx*, Fig. 1; Figs. 4 and 5, cross-sections on lines *yy* and *zz*, Fig. 1; Figs. 6 and 7, views showing, in miniature, modifications in the arrangement of the mechanism embraced herein.

In the drawings, C represents a lever above an organ-key, which is shown at A in the drawings. This lever C extends along the length of the key, and at its rear end turns upon a fulcrum-pin, *a*, of a fixed horizontal rail, B, running across the key A and lever C, and near its front end it is provided with a vertically-adjustable block or button, D, which is to rest on the finger end of the key A, as shown. This lever, arranged as above, is more or less horizontal. In turning on its fulcrum

it moves in a vertical plane. Its downward movement is against a bent spring, *b*, which at one end bears against its under side, and at the other is fixed to the rail B, and its upward movement is in consequence of the reaction of such spring.

c is a raised edge on the upper side of lever C, which edge has an incline, *d*, terminating at its upper end with a horizontal face, *e*, and at its lower end with a vertical face, *f*.

F is a lever, which is arranged vertically and in the same vertical plane as the horizontal lever C and key A. This lever F, intermediate of its length, turns upon a fulcrum-pin, *g*, of a fixed transverse horizontal rail, G, and its lower end, through a frictional roller, *h*, is in contact with the raised edge *c* of lever C, while its upper end is hung to the front end of a horizontal bar, H, which is in the same vertical plane as the horizontal lever C, vertical lever F, and key A, and between its front end and rear end it rests upon the free end of a bent spring, *i*, secured to a transverse longitudinal rail, E. This bar H, near its rear end, passes through the opening *j* between two parallel transverse horizontal bars, J K, which are at the upper end of parallel vertical arms L, hung and swinging at their lower ends upon a suitable pivot or center, *k*, of the transverse horizontal rail B.

The front edge, *l*, of the upper cross-bar, J, and the rear edge, *m*, of the lower cross-bar, K, are in a radial line with the center of motion or swing of the vertical arms or frame L, and in relation to these edges of the cross-bars J K the horizontal bar H has a shoulder, *n*, on its upper edge and a shoulder, *o*, on its lower edge. The upper, *n*, of these shoulders *n o* is a little forward or to the front of the lower shoulder, *o*, and otherwise they are situated as follows: the upper, *n*, for the front edge of the upper cross-bar, J, by contact with it, to carry the horizontal bar forward, and the lower, *o*, for the rear edge of the lower cross-bar, K, by contact with it, to carry the horizontal bar backward, according as such shoulders, through the raising and lowering of their common bar H, are placed, either the one or the other, in position for such abutments of the cross-bars as will hereinafter fully appear.

M M are parallel horizontal rods connecting

upper ends of swinging frame L with similar crank-arms of a common transverse horizontal shaft, N, which turns in suitable fixed bearings.

5 O is a grooved pulley on horizontal shaft N, connected by belt Q with a larger grooved pulley, R, of a horizontal shaft, S, which turns in suitable fixed bearings, and is adapted, by a crank-handle, T, or otherwise, to be turned
10 or driven. This shaft S is the driving-shaft, and intermediate of its length it and a yielding horizontal roll, which is arranged above it and turns in suitable fixed bearings, make feed-rolls for feeding a perforated strip of paper (shown at *g*) through a horizontal guide-way or race, U, which is above the mechanism hereinbefore described and in the same vertical plane therewith.

V is a stationary plate arranged transversely
20 to the raceway U, and under this plate, between it and the upper surface of the raceway, the perforated paper strip travels when fed as aforesaid. This plate V has a hole, *r*, through it in the line of the perforations of the paper
25 strip as the paper strip passes under it, and corresponding with this hole *r* of plate V is a hole, *s*, through the bottom of the raceway U, and these two holes are in position for the projection into them of a vertical wedge-shaped
30 projection, *u*, on the upper side of a horizontal lever, W, which is below the race and between it and the horizontal bar H, hereinbefore referred to, and in the same vertical plane as said bar. This lever W, at its rear end, turns
35 upon a fulcrum, *v*, of a fixed transverse horizontal rail, X, and at its front end has an adjustable block or button, *w*, which rests upon a spring metallic strip, *x*, fixed at one end to the upper side of the horizontal bar H, and at
40 its other and free end arranged to play upon a vertical headed screw-pin, *y*, of the bar H, the head *z* to which pin *y* limits the upward movement of the said spring-strip.

The mechanism above described operates in
45 relation to the travel of the line of perforations in a perforated strip of paper through the raceway U as follows:

First, as each and every perforation in the strip is traveling over the wedge-shaped pro-
50 jection *u* of the lever W the projection first automatically rises and enters the perforation, because of the upward action of the bent spring *i*, on which the horizontal bar H rests, and there it remains in its lifted position for the
55 length of such perforation.

Second, as each and every unperforated portion of the strip is traveling over the wedge-shaped projection *u* of the lever W such projection and lever are maintained in their low-
60 ermost position.

Third, that in the passing from an unperforated portion to a perforated portion the wedge-shaped projection and its lever W rise by force of the spring *i* acting through the
65 horizontal bar H, and in the passing from a perforated portion to an unperforated portion the wedge-shaped projection and its lever lower

against the force of the spring *x*, acting through the horizontal bar as aforesaid, and that these
70 respective positions so established are maintained so long as a perforated portion is passing by the wedge-shaped projection *u* in the one instance, and so long as the unperforated portion is similarly passing in the other instance.

Fourth, that the passage aforesaid of the
75 perforated paper strip is continuous, because of the continuous rotation of the feed-rolls.

Fifth, that the vertical arms of frame L, through the connection between them and the
80 crank-arms of the shaft N, driven by the driving-shaft S, are constantly swinging forward and backward.

Sixth, that in this forward and backward swing of the frame L the horizontal bar H is
85 either carried forward with it by reason of the abutment of the upper cross-bar, J, to such frame with the upper shoulder, *n*, of said bar, or carried backward with them by reason of the abutment of the lower cross-bar of such
90 frame with the lower shoulder, *o*, of said bar H, as the case may be, and that the shoulder in either case is put into position for abutment from the movements of the horizontal lever having the wedge-shaped projection, herein-
95 before stated.

Seventh, that when the horizontal bar is once moved forward or once moved backward it remains in such position so long as the
100 cause—to wit, the movement of the horizontal lever having the wedged-shaped projection *u*—remains in the same position as that in which it was when such movement of the said horizontal bar was first occasioned, and while at the same time the vertical frame L is con-
105 stantly moving forward and backward.

Eighth, that the forward movement of the horizontal bar H causes, through the vertical lever F, the depression of the horizontal lever C against its spring *b*, thus the depression of
110 the key, and that such relation of parts continues so long as such horizontal bar remains forward, and that the backward movement of the horizontal bar H swings the vertical lever F in a direction to release the horizontal lever
115 C to the upward action of its spring *b*, and that thus the downward pressure on the key is released, leaving it to rise and assume its normal position.

Ninth, that under the several movements
120 above described obviously the tone or note represented by the key to which such mechanism is applied is and will be sounded each and every time a perforation of the perforated strip is passing over the position of the wedge-
125 shaped projection *u* of the horizontal lever W, and that such sounding of the said note or tone will and does continue for and during the length of such perforation, and therefore, as a consequence, with a horizontal lever, W, hav-
130 ing a wedge-shaped projection or knob, *u*, a horizontal bar, H, vertical lever F, and horizontal lever C for each and every key of a reed-organ, together with a raceway, U, and

swinging frame L, of suitable width to take in such series of keys and such series of mechanism, and a proper arrangement of perforations in a strip of paper fed through such race-
 5 way, as aforesaid, a tune or musical composition can be automatically played upon the instrument by simply turning the crank, or in any other suitable manner driving the mechanism.

10 Obviously as the forward and backward swing of the vertical frame L with the cross-bars J K is constant and continuous, and the lever W, having the wedge-shaped projection, is alternately depressed and elevated, there
 15 might be many times when the horizontal shouldered bar and cross-bars J K would not connect as desired, and thus occasioning a bind between them, which necessarily would react through the wedge-shaped projection on
 20 the perforated paper strip to its injury and damage; but by the combination and arrangement of the yielding metal strip x for a bearing and rest of a horizontal lever, W, on the horizontal shouldered bar H this is entirely
 25 prevented, as is apparent without explanation.

A toggle-lever, as at Y, may be substituted for the vertical lever F, as is obvious, (see Fig. 6, which is a detail view of such substitution;) and, again, the mechanism described
 30 might be arranged to act directly on the valve instead of through the key.

As shown and described, the lever C is thrown up by the reaction of its bent spring b ; but obviously this spring may be dispensed
 35 with, and the throwing up of the lever secured by and through the upward movement of the key A under the reaction of its valve-spring or otherwise. Again, the lever C may be dis-
 40 pensed with and the vertical lever F arranged to act directly upon the face of the key, as shown in Fig. 6, in connection with the toggle-lever; and if the vertical lever be so arranged its ac-
 45 tion to depress the key may be rendered the more effective and direct by giving its face in contact with the key more or less eccentricity or cam shape.

In lieu of arranging the wedge-shaped projection u and its lever under the paper strip, as
 50 has been herein particularly described, it may be arranged above the paper strip. Such arrangement is shown in Fig. 7, W' being the said lever, and W^2 a bent spring arranged to bear upon its upper edge, a' , and to hold its

wedge-shaped projection u in contact with the
 55 perforated strip q , and when a perforation comes opposite thereto to force such projection into the same, and thus into contact with
 a lever, W^3 , below the paper strip, and thereby through such under lever depress the hori-
 60 zontal bar H against its spring i . The lever W' above the paper strip rises and so remains while an unperforated portion is passing under its wedge-shaped projection u , and thus
 65 as its contact with the under lever, W^3 , is then broken, obviously the horizontal bar H is left free to rise under the operation of its spring. Through this rising and lowering of the hori-
 70 zontal bar H, obviously, as before described, its shoulders $n o$ are placed in position for the cross-bars J K of the swinging frame L; but
 as with lever W' arranged above the paper strip the rising and lowering of the horizontal bar H is necessarily the reverse of that with
 75 the lever W' below the paper strip, the shoulders $n o$ on the bar have to be reversed in position, as shown in Fig. 7. In this case the horizontal bar H is pulled backward through
 its upper shoulder and upper cross-bar, J, of swinging frame L, and is pulled forward
 80 through its lower shoulder and lower cross-bar, K, of swinging frame.

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

1. A vertical lever, F, horizontal bar H, having shoulders $n o$, vertical swinging frame L, having cross-bars J K, and lever W, combined and arranged together, and in relation to the
 85 feed of a perforated strip and to the valve, &c., of an organ, substantially as and for the purpose and operation described.

2. The combination, with a lever operated by and through a moving perforated strip, of a horizontal bar, H, swinging frame L, vertical
 95 lever F, and horizontal lever C, all constructed, connected, and arranged together substantially as and for the purpose described.

3. In a mechanical musical instrument or key-board attachment for musical instruments,
 100 the yielding face or bearing x of the horizontal bar H, substantially as and for the purpose described.

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