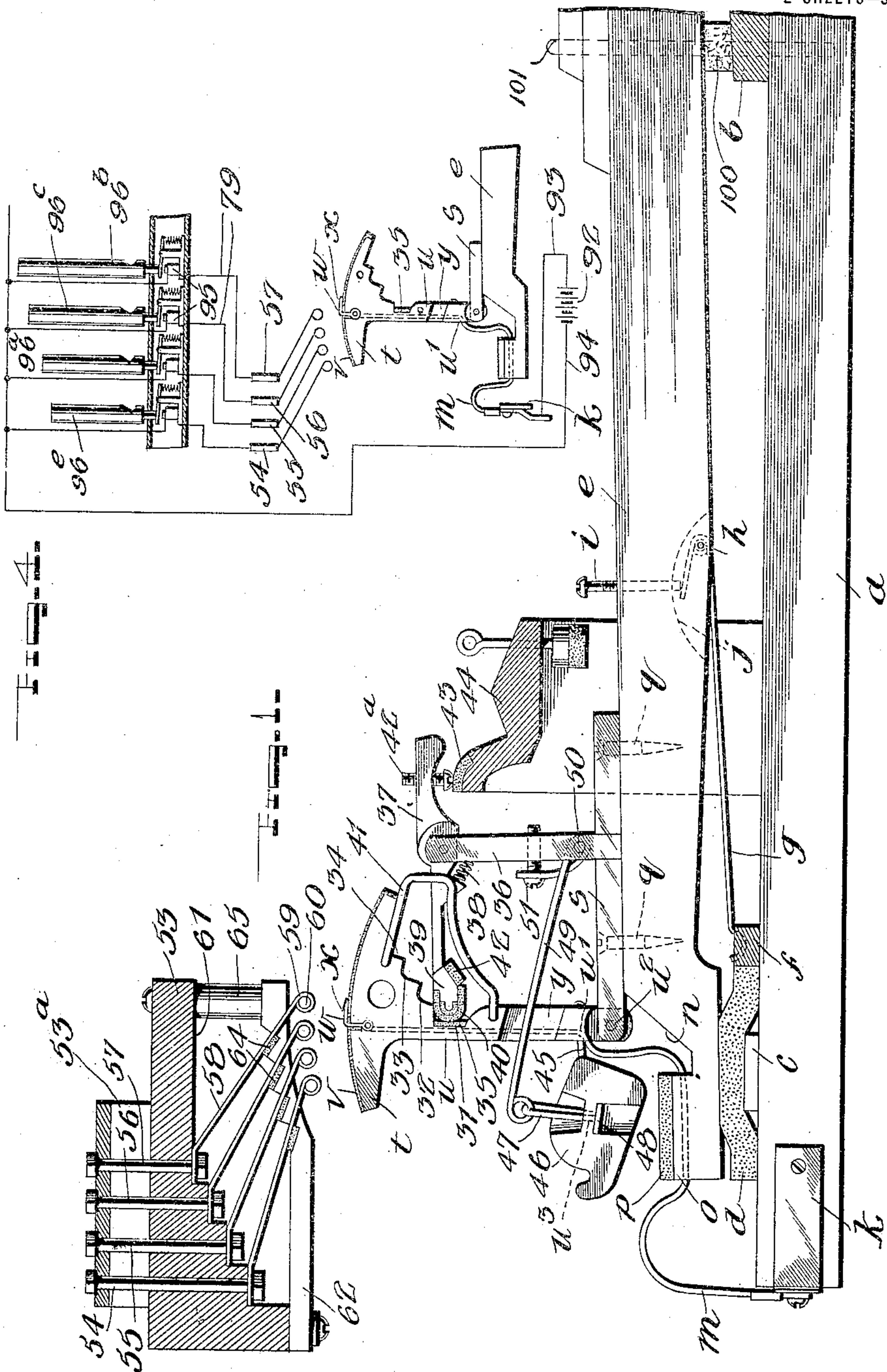


KEY CONTROLLED CONTACT MAKER FOR USE WITH MUSICAL INSTRUMENTS.

APPLICATION FILED OCT. 15, 1912. RENEWED JULY 3, 1915.

Patented Sept. 28, 1915.

2 SHEETS—SHEET 1.



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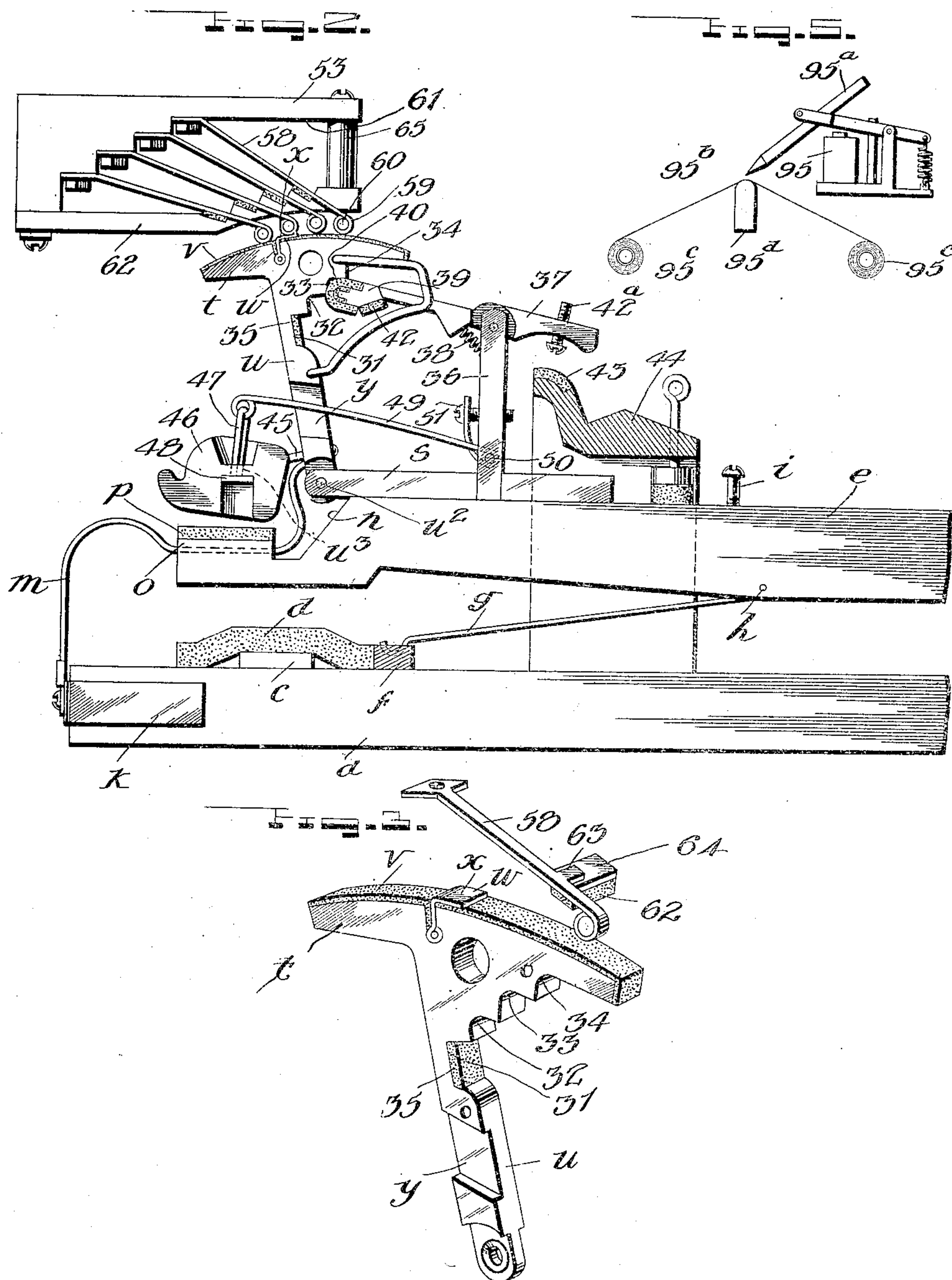
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UNITED STATES PATENT OFFICE.

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KEY-CONTROLLED CONTACT-MAKER FOR USE WITH MUSICAL INSTRUMENTS.

1,155,301.

Specification of Letters Patent.

Patented Sept. 28, 1915.

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To all whom it may concern:

Be it known that I, JOHN W. DARLEY, JR., a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Key-Controlled Contact-Makers for Use with Musical Instruments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in key controlled contact maker for musical instruments.

The object of the invention is to provide an inertia-controlled means operated by a key, whereby a sound-producing means may be thrown into operation by a single movement of said key; the particular sound-producing means that is thrown into operation being determined by the speed impressed upon the key by the performer. This is only one application of the device, and it may be found useful in many others, for one instance the sound-producing means may be replaced by recording means to record the speed impressed upon the key by the performer.

My invention has especial application to organs, harmoniums, and similar instruments, where it is desired to put in operation sound-producing means, of the same or different pitch, and of the same or different timber, by a single movement of the key. At the present time, this is obtained in organs by means of a series of movable stops, which must be moved by hand from time to time, and which either materially interfere with the playing of the performer or else require the services of an assistant, and also preclude the possibility of producing music having the variety of expression such as is produced on the ordinary pianoforte. The invention may also be adapted to the striking of strings, according to the will of the performer, and in fact is applicable to a large number of instruments, or to a large number of purposes, one of which is the recording of the speed impressed upon the key.

My invention as shown in the drawings is applied to an organ, in which the speed of movement of the key is caused to be the determining factor in selecting and closing electric circuits, the closing of which will

cause the operation of reeds or pipes of the organ, as hereinafter described.

In the accompanying drawings Figure 1 is a side view showing a key and related parts, and the inertia-controlled contact maker for closing and varying the electric circuits, parts being shown in section; Fig. 2 is a similar view to Fig. 1, showing the key depressed, the inertia-controlled means being in its third position, closing the third of the electric circuits; Fig. 3 is a detail perspective view of the contact maker and one contact; Fig. 4 is a diagrammatic view showing the electric circuits; and Fig. 5 shows how the magnets 95 may operate a pen 95^a, for marking a line on the paper 95^b when the magnet 95 is energized, the paper being wound onto the roll 95^c by any source of power, passing over the fixed rest 95^d after leaving the supply roll 95^e to which a brake is applied.

a represents the support for the keys, which extends the entire length of the keyboard and is provided with the usual balance rail *b*, and balance pin 101 with felt washer 100, front pin and front stop washer not shown, and a rear stop *c* covered with a thick layer of felt *d*, which acts as a cushion.

e represents one of the keys which is made in the usual form, except as hereinafter described.

f is a strip fastened to the support *a*, and on this strip are supported a number of springs *g*, one for each key, coiled around the pivot *h*, and the tension of which may be adjusted by the screw *i*, the key being cut away as shown in dotted lines at *j* for the reception of this spring. This spring is provided to partially counterbalance the effect of gravity upon the rear end of the key and its attached parts, so that the keys may be readily depressed at their front ends, and the tension of the spring is adjustable by the screw *i* so that the touch of all keys may be made alike.

On the support *a* is an electrically conducting strip *k* extending the full length of the key-board, and to said strip are fastened flexible wires *m*, one for each key, each of which wires runs through holes in the rear of the keys *e*. This key is cut away at its rear, as shown at *n*, leaving a projecting portion *o* covered with felt *p*. Secured to the top of each key by means of screws *q* are pieces *s* on the rear end of which is pivotally

mounted the inertia-controlled contact maker, shown in perspective in Fig. 3. This consists of an upright portion *u* and a portion *t*. The top of this portion is covered by a layer of felt *v* and over this layer of felt is secured a contact strip, as shown at *w*. The part *u* is cut away, as shown at *y*, to allow clearance for the spring 49 and is provided with four notches, 31, 32, 33 and 34, the notch 31 being provided with a felt lining 35. The wire *m*, after passing through the part *o* of the key, passes through a hole at *w'* at one side of the part *u* and thence upwardly over the side of the contact maker and is connected with the contact strip *w* on the top of the contact maker.

To each part *s* is attached an upright standard 36, and in the top of this standard is pivotally mounted a lever 37. A spring 38 is located between said lever and the standard 36 and normally tends to press the rear end of the lever upward. This rear end is provided with an expanded head 39 adapted to engage in one of the recesses 31, 32, 33 and 34, and is provided with a felt strip 40.

41 represents a guiding wire, the ends of which are fixed in the parts *t* and *u*, respectively, of the contact maker, and the front of the head 40 is provided with a felt cushion 42 adapted to engage with this guiding wire so as to guide the head 39 into one of the notches 31, 32, 33 and 34. It will be noted that the wire 41 is eccentric with reference to the center *u'*, and is substantially parallel with the edges forming the outer extremities of the notches 31, 32, 33 and 34. Hence as the contact maker moves from the position shown in Fig. 1, to that shown in Fig. 2, if for any reason the head 39 should not be raised sufficiently fast by the spring 38, the wire 41 will strike the pad 42 and lift the head 39 to a position determined by the maximum movement of the contact maker, then as the spring 49 tends to return the contact maker toward the position shown in Fig. 1, the head 39 drops into the appropriate notch such as 33 in Fig. 2. Hence the head 39 is always set in the correct stopping position by the contact maker, and all that the spring 38 has to do is to prevent the head 39 from falling before the proper notch bears against it. The front of the lever 37 is provided with an adjusting screw 42^a which is adapted to rest, when the parts are in the position shown in Fig. 1, upon the felt strip 43 of the rail 44, which is rigidly mounted on the key support *a* in the position shown.

Attached to the rear of each contact maker by means of a pin 45 is a weight 46 preferably made of lead. This is hollowed out near the center and is provided with a loop 47, of flexible material, which passes down through a perforation in the weight

and is attached to a leather head 48. The upper end of the loop 47 engages one end of a spring 49 which is coiled around a pivot pin 50 mounted in the standard 36, the free end of this spring engaging an adjusting screw 51 in the standard 36, whereby the tension of the spring may be varied.

The contact maker and the parts carried thereby are so proportioned that the center of gravity of the entire mass, which is pivotally supported in the rear end of the piece *s*, is at or near the point of attachment *w'* of the loop 47 to the weight 46, so as to avoid all unequal stress, and the weight 46 is carefully shaped with this end in view. The parts are so proportioned that a light blow upon the key will throw the contact maker up without disengaging the rear end of the lever 37 from the recess 31. When a swifter blow is struck, the rear end of the key moves upwardly so swiftly that the weight 46 cannot move bodily with the key, but tends to lag behind. As a consequence, the contact maker turns as upon its center of gravity, thus moving with reference to the key so as to release the rear end of the lever 37 which will then engage with the notch 32. A still heavier blow will cause the rear end of the lever 37 to engage the notch 33, and similarly a still heavier blow will cause the rear end of the lever 37 to engage with the notch 34. This effect is obtained because the inertia of the contact maker can be considered as acting at *w'*, at the end of the lever arm from *w'* to *u'*. When the key returns to its normal position, shown in Fig. 1, the screw 42^a strikes the pad 43, withdrawing the head 39 from the notch with which it was in engagement, and the spring 49 returns the contact maker to its initial position, also shown in Fig. 1.

It is evident that if the front end of the key is allowed to rise slightly after having been depressed, that the circuit will be broken, by the contact plate *X*, leaving the ring 59 with which it had contacted, before the screw 42^a strikes the pad 43. If now the front end of the key be again depressed before the screw 42^a strikes the pad 43, then the contact maker *X* will again make contact with the same ring as before and this repetition of contact of *X* with the same ring may occur indefinitely, as long as the front end of the key is not allowed to rise sufficiently to cause the screw 42^a to strike the pad 43.

53 represents a supporting rail rigidly mounted on the key support *a* which extends the full length of the key-board. Secured in the rail 53, above each key, are four wires 54, 55, 56 and 57, four being shown for each key, although a greater number could be used if desired; suitable

changes being made in the rail 53, and a suitable number of notches, such as 31, 32, 33 and 34, being provided. Between the wires belonging to alternate pairs of keys there is placed the grooved distance piece 53^a which serves to keep the wires straight and in position. To the end of each wire is attached a flexible conductor or contact strip 58 which terminates in a ring 59 in which is located a wooden pin 60, this pin being used to prevent the spring from giving a rasping noise when struck by the contact maker as hereinafter described. To the bottom of the rail 53, which is cut away as shown at 61, is attached a horizontal guide 62, one for each two keys, the front of which on its upper side is dentated and on its lower side is curved, as shown in Fig. 1, alongside of which the contact strips pass, layers of felt 64 being provided on the dentated upper side on which projections 63 on the strips 58 rest, as shown in Fig. 3, the felt 64 on one dentation of the guide 62 only being shown, the remainder of the guide 62 being omitted. The springs 58 are made rights and lefts so that one piece 62 serves for two sets of springs.

65 represents a distance piece separating the front end of the part 62 from the front end of the rail 53.

The parts are so proportioned that when a light blow is struck upon one of the keys the contact maker will be thrown up and only the front ring 59 will contact with the contact strip *x* on the top of the contact maker. If a heavier blow is struck the second of said rings will be brought into contact with said strip; if a still heavier blow is struck the third of said rings will be so thrown into contact with the strip *x*, as shown in Fig. 2, and if a still heavier blow is struck another one of the contact rings will be brought into contact with the strip *x*.

The electric means for operating the pipes will next be described, reference being had especially to Fig. 4. The conducting strip *z* is connected with the battery 92 by means of a wire 93, and from this battery leads a wire 94 which is connected to one side of the magnets of all the pipes; the other side of each magnet is connected by a wire, such as the wire 79, to one of the vertical wires as 57. Each one of the magnets, such as 95, controls one of the pipes 96. It is obvious that if a key is struck a light blow, that the circuit will be completed through the first of the rings 59, and the pipe 96^b caused to be sounded. Or the pipe 96^b will be sounded when the key is slowly depressed thus bringing the contact maker into contact with the front contact ring 59. The pipe 96^c will be sounded when the depression of the key is made with sufficient speed to bring the lever 37 into the notch 32, thus bringing the contact maker into contact with

the second contact ring, and so on. The same is true of the other notches and rings. Thus each pipe will sound when, and only when, the corresponding speed of key depression is obtained.

In Fig. 1 there are four vertical wires shown in connection with one key, and each key has, of course, four wires. I have found this sufficient in practice, but I do not limit myself to four wires per key.

To generalize, for each key there is a contact maker, a group of vertical wires; the number of notches on the contact maker being equal to the number of vertical wires per key.

In the claims by "sounding means" is meant any device simple or complex, whether containing controlling devices or not, that is capable of emitting an audible sound. By "vibration emitter" is meant any device that is capable of producing vibrations in itself or in another body.

It is to be understood that the electric circuits, which include magnets for operating the valves for the pipes or reeds, may include magnets for operating or controlling any device, or the magnets themselves may be replaced by any device sensitive to an electric current, or the electric circuit may be replaced by pneumatic or hydraulic tubes, or a mechanical connection, or the contacts need not actually touch but merely approach each other and a high tension source of electricity be employed; it not being intended to limit this application to claims for the mechanism controlled, for this may be various, but it is intended to cover broadly the controlling means and a useful controlled mechanism whose operation is varied in any manner depending upon the speed of the key. Furthermore, it is evident that the vertical wire 57 may not be connected to any circuit, hence no effect will be produced until the speed impressed upon the key is sufficient to cause the contact plate *x* to touch the ring 59 connected to the next higher wire 56, and so for any other wire that is disconnected. It is obvious that the ring and spring connected to 57 may be omitted entirely and the same result will obtain. Furthermore, it is obvious that all of the vertical wires may be omitted with their corresponding contact rings, excepting one so located as to permit the closing of the circuit therethrough when a predetermined speed is impressed upon the key.

I claim broadly as new:—

1. The combination of a plurality of vibration emitters, means for operating said vibration emitters, keys, fixed electrical contacts, one for controlling the operation of each emitter, a moving contact maker mounted on each of said keys, and means for causing said contact maker to engage one of said fixed contacts, the one of the fixed con-

tacts depending upon the speed impressed upon the key upon which said moving contact maker is mounted.

2. The combination of a key, a source of electricity, an electric circuit having a plurality of branches, a means for controlling the flow of electricity in said branches moved by said key a distance varying with the speed of said key, and a detent for supporting said means near the limit of its movement until the key has almost returned to the initial position, said detent being so arranged that said means can be moved by short strokes of said key whereby the said branches may be closed and opened in succession.

3. In a mechanism for controlling an electric circuit having a plurality of branches, the combination of a key, a member moved by said key a distance depending upon the speed of said key, a contact carried by said member and adapted to close one of said branches, and means for supporting said contact in position to close said circuit, yet permitting of the opening of said circuit when said key is allowed to rise slightly.

4. In a key controlled contact maker, the combination of a key, fixed electrical contacts, a contact maker mounted on said key, and means for causing said contact maker to make contact with one of the fixed contacts, the one of the fixed contacts depending on the speed of the key.

5. In a key controlled contact maker, the combination of a key, a fixed electrical contact, a contact maker moved by said key, means for moving said contact maker into a position to make contact with the fixed contact, at a predetermined speed of movement of said key, and means for supporting the contact maker in the contact-making position, so that while supported it moves with said key.

6. The combination of a key, a member moved by said key, means for causing a movement of said member varying with the speed of said key, and means for supporting the said member near the limit of said movement, said supporting means being so arranged that said member can be moved by said key while said member is supported by said supporting means.

7. The combination of an electric circuit having branches, a movable contact maker, a key, means for causing said contact maker to close any one of said branches, the one of the branches closed depending upon the speed impressed upon said key, and means for supporting said contact maker so that while supported it can be moved by said key to close or open said branch.

8. The combination of an electric circuit, a movable contact maker, a key, means for causing said contact maker to close said circuit only when a predetermined speed is im-

pressed upon said key, and means for supporting said contact maker so that while supported it can be moved by said key to close or open said circuit.

9. The combination of an electric circuit, a movable contact maker, a key, means for causing said contact maker to close said circuit whenever a speed exceeding a predetermined speed is impressed upon said key, and means for supporting said contact maker so that while supported it can be moved by said key to close or open said circuit.

10. The combination of a key, an electric circuit terminating in a fixed contact, a movable contact operated by said key, means for causing said fixed and movable contacts to close said circuit when said key is depressed more swiftly than a predetermined speed, and means for supporting said movable contact maker to keep said circuit closed but permitting of its movement by said key while supported to open or close said circuit.

11. The combination of magnets, a key, a member moved by said key a distance depending on the speed of said key, circuits closed by said member for energizing said magnets, and means for supporting said member near the limit of said distance but permitting of its movement by said key while so supported to close or open said circuit.

12. The combination of a magnet, a key, a member moved by said key a distance that changes with the speed of said key, a circuit closed by said member at a predetermined speed of said key for energizing said magnet, and means for supporting said member near the limit of said distance but permitting of its movement by said key while so supported to close or open said circuit.

13. The combination of a key, a member having a movement that varies with the movement of said key, and having another movement that varies with the speed of said key, and means for supporting said member near the limit of said last-named movement, but permitting of its movement by said key while so supported a distance that varies with the movement of said key.

14. The combination of an electric circuit, a movable contact maker, a key, means for causing said contact maker to close said circuit at a predetermined speed of said key, and means for supporting said contact maker so that while supported it can be moved by said key to close or open said circuit.

15. The combination of an electric circuit having a fixed terminal and a movable terminal, a key for moving said movable terminal, means for causing said movable terminal to function with said fixed terminal

so as to cause a flow of electricity in said circuit at a predetermined speed of said key, and means for supporting said movable terminal so that while supported it can be moved by said key to cause or terminate said flow of electricity.

16. The combination of an electric circuit having branches, a contact maker, a key, means for moving said contact maker to a position to close any one of said branches, the one of the branches closed depending upon the speed impressed upon said key, and means for supporting said contact maker in said contact making position so that while supported said contact maker can be moved by said key to close or open said branch.

17. The combination of an electric circuit, a contact maker, a key, means for moving said contact maker to a position to close said circuit when the speed impressed upon said key exceeds a predetermined speed, and means for supporting said contact maker, in the contact making position, so that while supported said contact maker can be moved by said key to close or open said circuit.

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

JOHN W. DARLEY, JR.

Witnesses:

EDWARD D. MARTIN,
EDMUND B. CLARY.