B. S. DEAN.

REGISTERING AND RECORDING MEANS FOR MUSICAL INSTRUMENTS.

APPLICATION FILED NOV. 21, 1906.

930,738.

Patented Aug. 10, 1909.

2 SHEETS—SHEET 1.

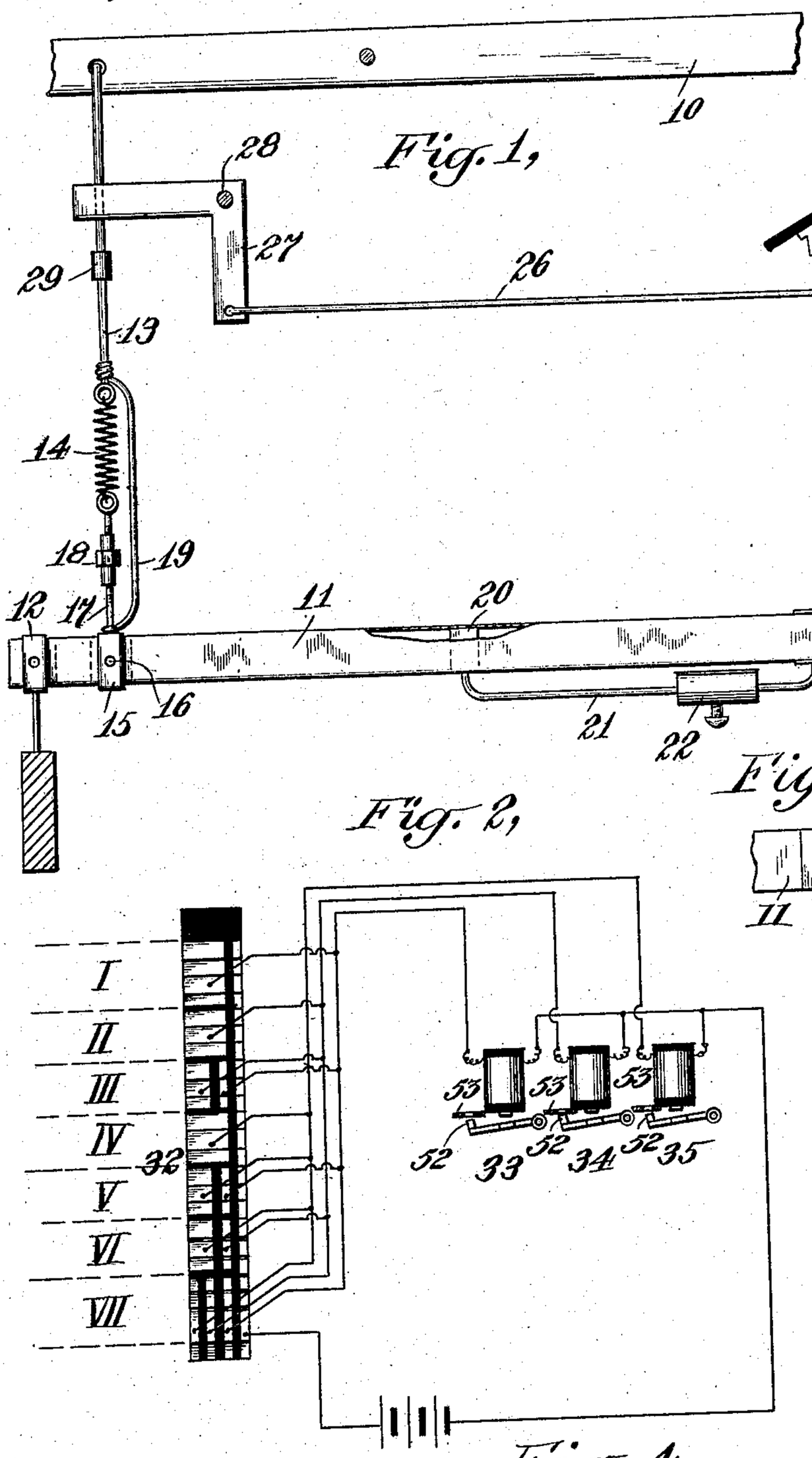
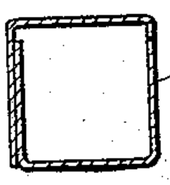


Fig. 1,

Fig. 2,

Fig. 3,

Fig. 4,



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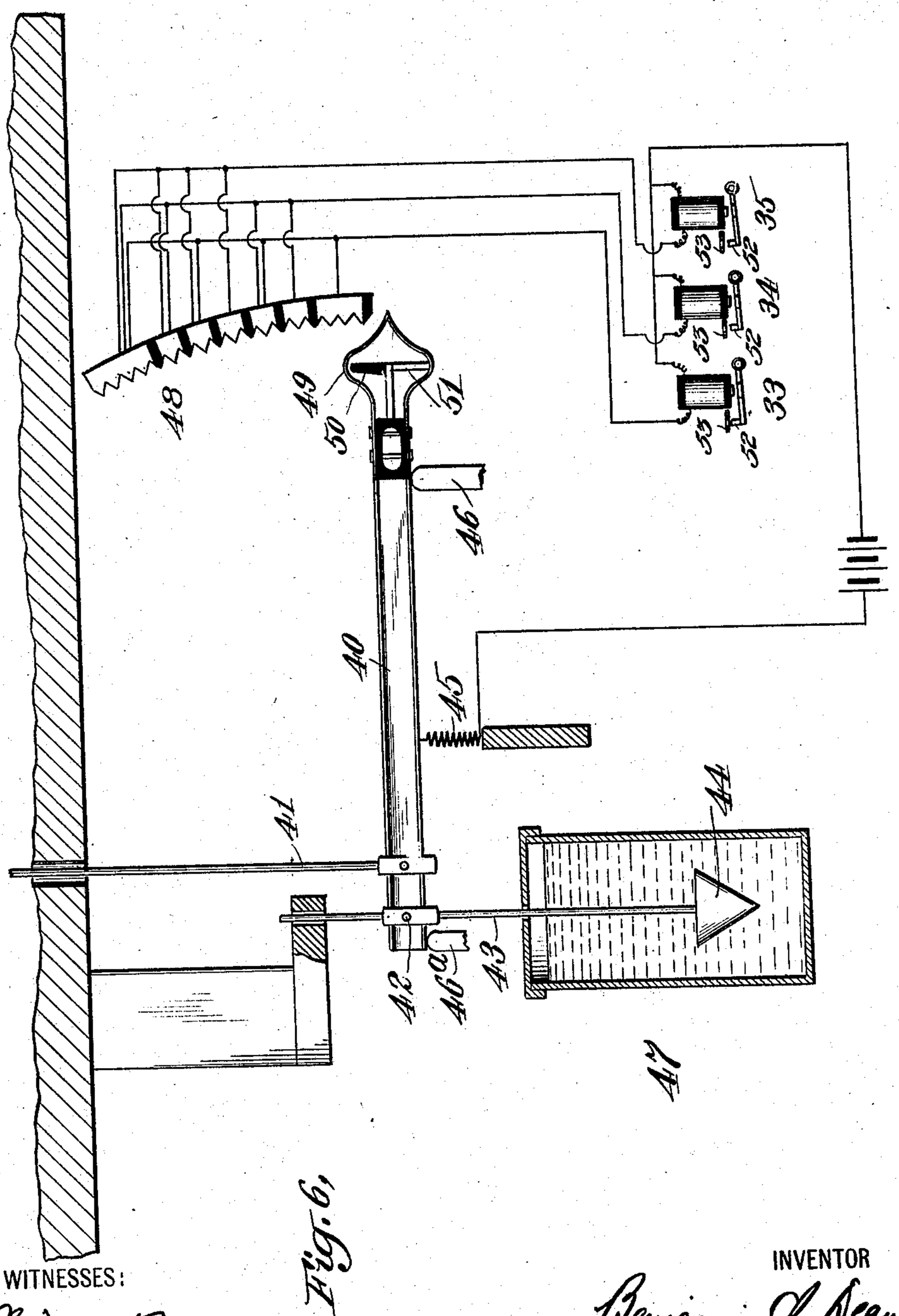

Fig. 5,

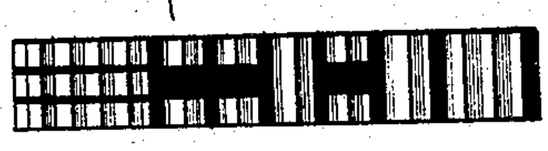

Fig. 6,

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REGISTERING AND RECORDING MEANS FOR MUSICAL INSTRUMENTS.

No. 930,738. Specification of Letters Patent. Patented Aug. 10, 1909.

Application filed November 21, 1906. Serial No. 344,362.

To all whom it may concern:

Be it known that I, BENJAMIN S. DEAN, a citizen of the United States of America, and a resident of San Francisco, county of San Francisco, State of California, have invented certain new and useful Improvement in Registering and Recording Means for Musical Instruments, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in registering and recording means for musical instruments, and particularly to means controlled in its operation by a musical instrument when played to perforate music record sheets, such music record sheets being afterward employed for producing the melody played. The particular class of music record sheet is one which is arranged to have several perforations therein for each tone to be produced differently located widthwise of the sheet in accordance with the expression desired. To cause the production of a perforation properly located, I provide an operating bar, which I herein term an inertia bar, one for each of the finger keys of the instrument on which the original melody is played, and which is directly operated by movements of the said finger keys or some other moving part of the instrument action. The inertia bar is arranged to be moved different distances, in accordance with the strength of the impulse transmitted thereto, and properly located perforating devices are operated in accordance with the distance which the inertia bars are caused to travel. I preferably employ three perforating devices for each tone, the three perforating devices representing, however, a possible variation of seven different degrees of expression intensity. Referring to the perforating devices as 1, 2 and 3, we may assume that perforating device 1 produces a perforation in the record sheet which represents an intensity of one unit; perforating device 2 will produce a perforation representing an intensity of two units; perforating devices 1 and 2 will then produce perforations which, taken together, may represent an intensity of three units; then, if perforating device 3 be made to produce a perforation representing four units, perforating devices 1 and 3 will represent five units, 2 and 3 six units, and 1, 2 and 3 seven units. The means for producing tones of this description forms no part of the present invention, but, for a complete understanding of my system in this connection, I will herein refer to a co-pending application Serial No. 288,987, filed November 25th, 1905, in which such system is shown and claimed.

My present invention relates not to the means for producing the tones, but to the means for registering and recording tones produced by perforating a record sheet, so that such tones may be reproduced in another instrument, and the main object of my invention is to so record and register that, not only will the tones be reproduced, but they will be reproduced with the varying expression intensities with which they were originally produced.

In order that the present invention may be thoroughly understood, I will now proceed to describe the same with reference to the accompanying drawings which illustrate certain embodiments thereof, and will then point out the novel features in claims.

In the drawings: Figure 1 is a view in side elevation of a mechanism of this description. Fig. 2 is a diagrammatic view showing the electrical connections and circuits which cause the operation of the perforating devices. Fig. 3 is a detail fragmentary view of the end of the inertia bar including the contact member carried thereby. Fig. 4 is a view in transverse section of the inertia bar. Fig. 5 is a view in side elevation of a structure constituting a modification of the mechanism shown in the other figures. Fig. 6 is a detail face view of the stationary contact member thereof.

Referring first to the form of mechanism shown in Figs. 1 to 4 inclusive, 10 designates conventionally the ordinary finger key, or other movable part in a musical instrument action, the operation of which and of similar finger keys is intended to be employed for the production of a perforation record, by which similar playing may be effected in automatic instruments. An inertia bar 11 is pivotally mounted upon a fixed pivot 12 at a point beneath the said finger key 10, the finger key being connected with the inertia bar by means of a link 13, a spring 14, and an adjustable connection. The said adjust-

able connection includes a stirrup 15, which is pivoted to the bar 11 at 16, a stem 17 secured to the stirrup, and a turnbuckle 18 by manipulation of which suitable adjustment is obtained.

19 designates an extension, one end of which is secured fast to the link 13, and the other end of which loosely surrounds the stem 17, and, butting against the face of the said inertia bar 11, constitutes a limiting stop to limit the extent of movement of the inertia bar 11 toward the finger key 10 under the influence of the spring 14.

The inertia bar 11 is preferably so constructed as to be as light as possible. In the present form of my invention, I have shown it as a tube of stiff paper (see Fig. 4 which shows a cross section thereof), the tube of paper being reinforced by wooden blocks 20 at various points and wherever additional strength is needed. A guide 21 is secured beneath the said bar upon which an adjustable weight 22 is mounted, said weight being adjustable toward and away from the pivotal point 12, so that the moment of inertia of the bar with respect to its pivotal point may be varied. At its extreme outer end, the inertia bar carries a contact member 23, preferably made of thin spring metal. This contact member is adapted to engage with various contact pieces carried by a member 24, here shown in the form of a lever pivoted at 25, and adapted to be moved toward and away from the inertia bar 11. Near its upper end the said member 24 is connected by means of a link 26 with a bell crank lever 27 pivoted about a stationary point 28. The other arm of the bell crank lever is arranged in the path of movement of a button 29 carried by the link 13, the said button arranged to engage and rock the bell crank lever 27 upon its pivotal support 28 every time the finger key 10 is operated. The said member 24 is retracted to a normal rest position by means of a spring 30, a stop 31 limiting the said rearward movement when the finger key 10 is operated. The first effect will be to rock the inertia bar 11 upon its pivotal support 12, lifting the free end thereof, which will cause the contact member 23 to travel along in front of the face of the contact pieces 32 carried by the member 24. The final movement of the finger key will cause the button 29 to operate the bell crank lever 27, so as to pull the member 24 over toward the inertia bar, thereby compelling certain of the contact pieces 32 to engage with the contact member 23. The contact member 23 is arranged to close circuit between certain of the contact pieces 32 when such contact is made, and to operate perforating devices in accordance with just which contact pieces are engaged.

In the diagrammatic view Fig. 2, reference characters 33, 34 and 35 represent perforating devices which are connected by suitable wires with various contact pieces 32, and the various contact pieces 32 are shown in this figure diagrammatically, this portion of the figure representing substantially a face view of the end portion of the member or lever 24. These perforating devices may comprise, as indicated conventionally in the drawings, punches 52 carried by the armature levers, and co-acting dies 53 secured in suitable fixed positions. By tracing out the circuits, it will be seen that there are seven sets of contact pieces through which circuit may be closed to produce a single, multiple or permutative action of the perforating devices 33, 34 and 35. In the said diagrammatic view Fig. 2, I have marked off the various groups of contact members 32 by the Roman characters I to VII inclusive, the said Roman characters representing the varying intensities of expression recorded by the perforating devices.

The manner in which the various groups of circuit members 32 are selected by the member 23 of the bar 11 is as follows: If the finger key 10 be depressed gently, so as to produce a very soft tone, the inertia bar 11 will be caused to travel the entire distance permitted, so that, when finally the lever 24 is moved forward, circuit will be closed through the group of circuit closing members 32 represented by the reference character I, and which are located at the extremity of the member 24. If, on the other hand, the finger key 10 is depressed with a sharp blow, the inertia of the bar 11 will oppose movement thereof, which inertia will have to be overcome by the spring 14. This inertia will be overcome with different rapidities by the spring 14 in exact proportion to the intensity of the blow given to the key 10, and, as the lever 10 always operates to pull the member 24 forward at the end of its stroke, different groups of circuit closing members 32 will engage the member 23 carried by the rod 11, as will be well understood. If the greatest possible impactive force be delivered to the key 10, the member 24 will be moved forward before the inertia bar will have had time to make any appreciable upward movement, and hence circuit will be closed through the group VII of circuit closing pieces 32, and the various degrees of intensity with which the key 10 is struck between the maximum and the minimum will result in engagement of the other groups of circuit closing pieces between I and VII.

In Figs. 5 and 6 I have shown a slight modification of this, but acting upon exactly the same principle. In this case a bar 40 is employed, which is connected to the key lever or other part of the musical instrument action by a link 41, and is pivoted at 42 to a pivot pin which is carried by a rod 43, the

lower end of which is plunged into a liquid, and is provided with a head 44. A spring 45 tends to return the bar 40 to a normal position, stops 46 and 46ª limiting such return movement. In this instance, a quick blow will lift the free end of the bar carrying the contact member all the way up before the part carrying the pivot pin 42 is able to move, but, if the finger key is struck with a softer blow, the member 43 will be able to move upward more or less against the resistance of the liquid in the vessel 47, which acts directly upon the top of the head 44. In this case, therefore, it will be seen that the inertia of the bar 40 is resisted to a greater or less degree, in accordance with the impactive force transmitted to the said lever, by the liquid in the vessel 47, and a proportionate degree of movement will be transmitted to the said bar in exact accordance with the intensity of the blow. Groups of contact pieces 48, similar to the contact pieces 32 in the other structure, are herein provided, the contact pieces in the present instance, however, being stationary. The bar 40 carries a contact member 49, which operates only when the bar is tending to return to its normal position. That is to say, when the bar is moving upward electric circuit is not closed, the said member 49 then resting upon an insulating part 50, but, on the return movement or while the bar is at rest, the said member 49 is in normal engagement with a metallic piece 51, which forms a common return for all the perforating devices. The contact member 49 is very flexible and hence the frictional resistance in running over the surface of the contact pieces will not be sufficient to unduly retard the movement of the bar at that end thereof. It will be noted that, while the mechanism shown in Fig. 5 employs a spring 45 connected with the inertia bar 40, said spring 45 has the function only of returning the said bar to a normal position, and in no way acts as a yielding device, as does the spring 14 of the mechanism shown in Fig. 1. The liquid contained in the vessel 47, together with the part 43, 44, acts as a yielding device to yieldingly oppose movements of the bar 40, in proportion to the force of the blow imparted or transmitted thereto, while, in the mechanism shown in Fig. 1, the spring 14 operates for this purpose.

What I claim is:

1. In an apparatus of the class described, the combination with a movable part adapted to be operated by a blow imparted thereto, of means controlling the extent of movement thereof in proportion to the force of the blow delivered, and recording means controlled by the said part in accordance with its extent of movement.

2. In an apparatus of the class described, the combination with an inertia bar, and means for controlling the movement thereof in accordance with the force of a blow imparted thereto, of electric circuits closed in accordance with the extent of movement of said inertia bar, and recording means controlled by the said circuits.

3. In an apparatus of the class described, the combination with a movable part adapted to be operated by a blow imparted thereto, yielding means for opposing the movement of said part, and an element operated by the moving part but controlled as to the extent of its movements by the said yielding means, of recording means controlled by the said element in accordance with the extent of movement thereof.

4. In an apparatus of the class described, the combination with a pivoted inertia bar, and means for transmitting the force of a blow to said bar to move the same, of yielding means controlling the extent of movement of said bar in accordance with the force of the blow transmitted, and recording means controlled by the said bar in accordance with its extent of movement.

5. In an apparatus of the class described, the combination with a pivoted inertia bar, of an inertia weight adjustably mounted thereon, yielding means for opposing the force of a blow imparted thereto, and recording means controlled by said inertia bar in accordance with the extent of its movement.

6. In an apparatus of the class described, the combination with a pivoted inertia bar, circuit closing means carried thereby, means for imparting movements to said bar, and yielding means for opposing the force of a blow employed for moving said bar, of a plurality of contact pieces forming circuit terminals for engagement with the circuit closing member carried by said bar, and an electrical recording means in circuit with said contact pieces.

7. In an apparatus of the class described, the combination with a movable part adapted to be operated by a blow imparted thereto, and yielding means for opposing the force of the blow to regulate the amount of movement imparted to the movable part in accordance with the force of the said blow, of a plurality of perforating devices, and means for operating the same individually or collectively in accordance with the extent of movement of the said movable part.

8. In an apparatus of the class described, the combination with a movable part adapted to be operated by a blow imparted thereto, and yielding means for opposing the force of the blow to regulate the amount of movement imparted to the movable part in accordance with the force of the said blow, of a plurality of perforating devices, and means for operating same individually,

collectively or permutatively in accordance with the extent of movement of the said movable part.

9. In an apparatus of the class described, the combination with a movable part adapted to be operated by a blow imparted thereto, and yielding means for opposing the force of the blow to regulate the amount of movement imparted to the movable part in accordance with the force of the said blow, of a circuit closing member carried by said part, a member arranged to move toward and away from the said circuit closer, contact pieces carried by said member, and means for moving the said contact-piece carrying member to engage the circuit closer carried by said movable part after the said movable part has completed its movement.

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Witnesses:
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