P. J. DREHER.

ELECTRIC PIANO PLAYER.

APPLICATION FILED MAY 11, 1911.

1,133,370.

Patented Mar. 30, 1915.

3 SHEETS—SHEET 1.

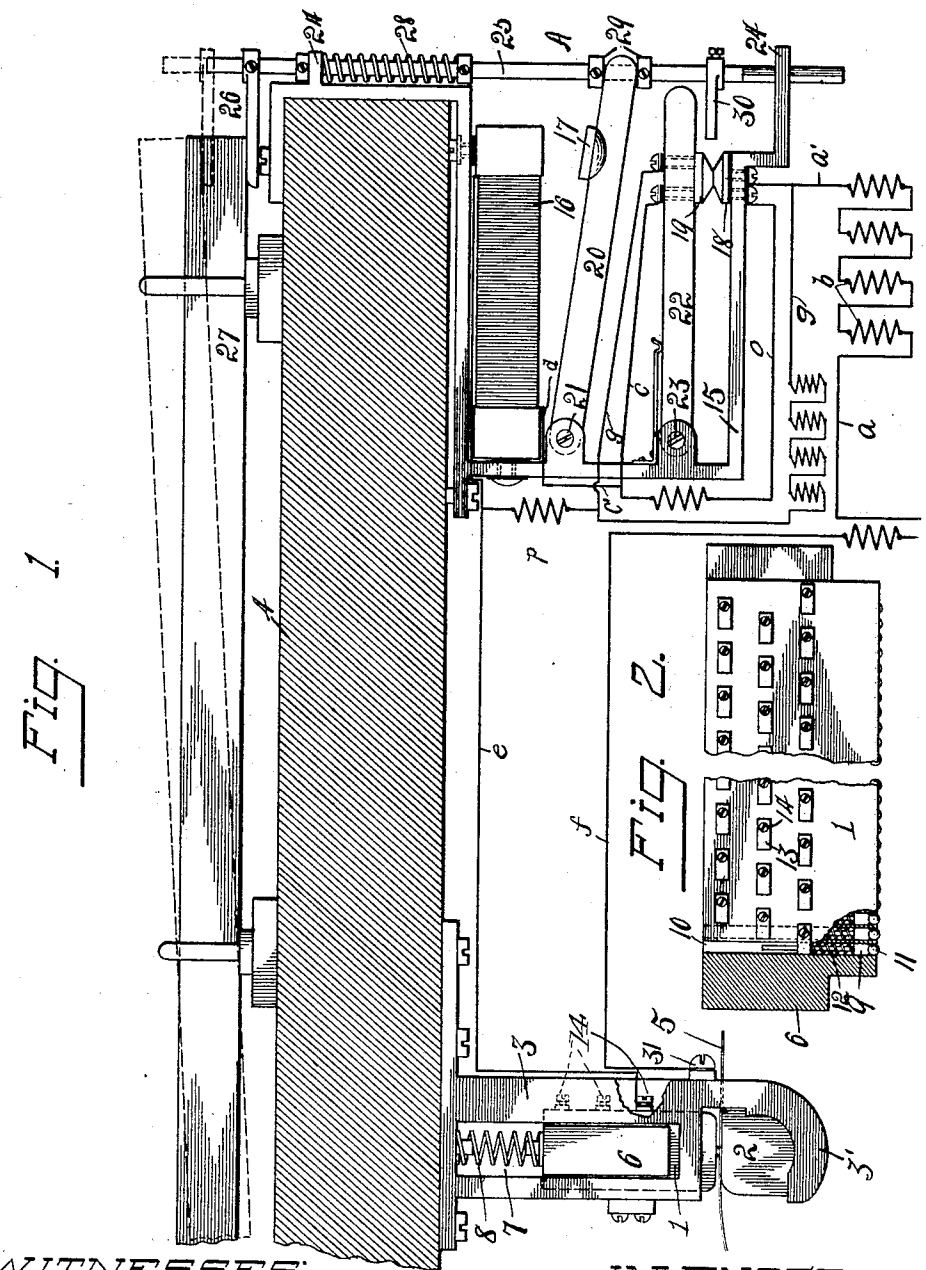


Fig. 1.

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 5.

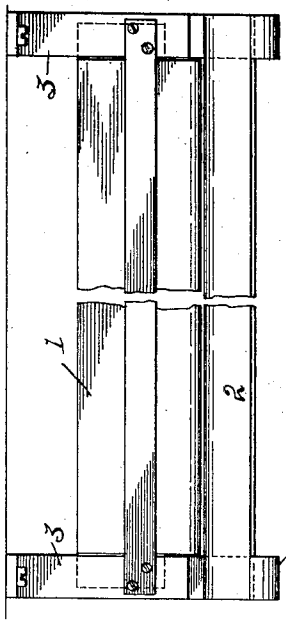


Fig. 6.

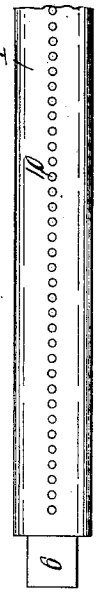


Fig. 8.

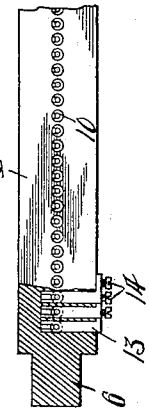


Fig. 7.

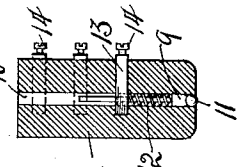


Fig. 4.

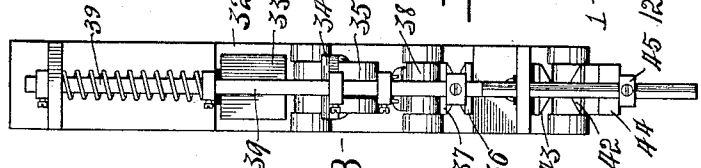
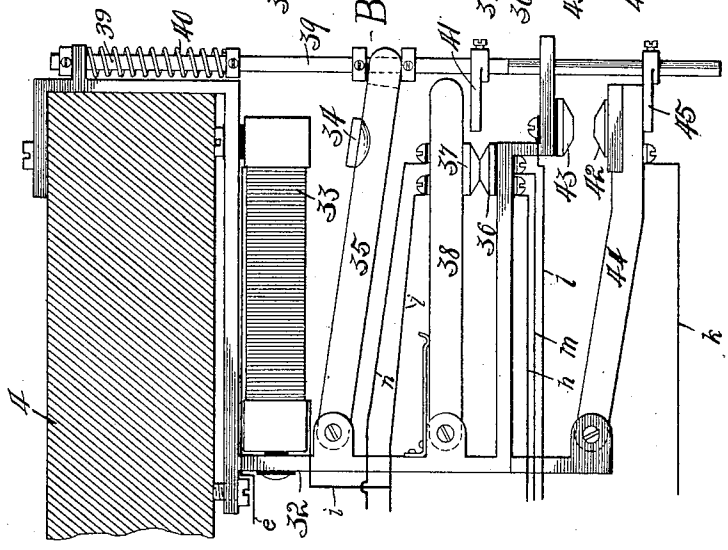


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 9.

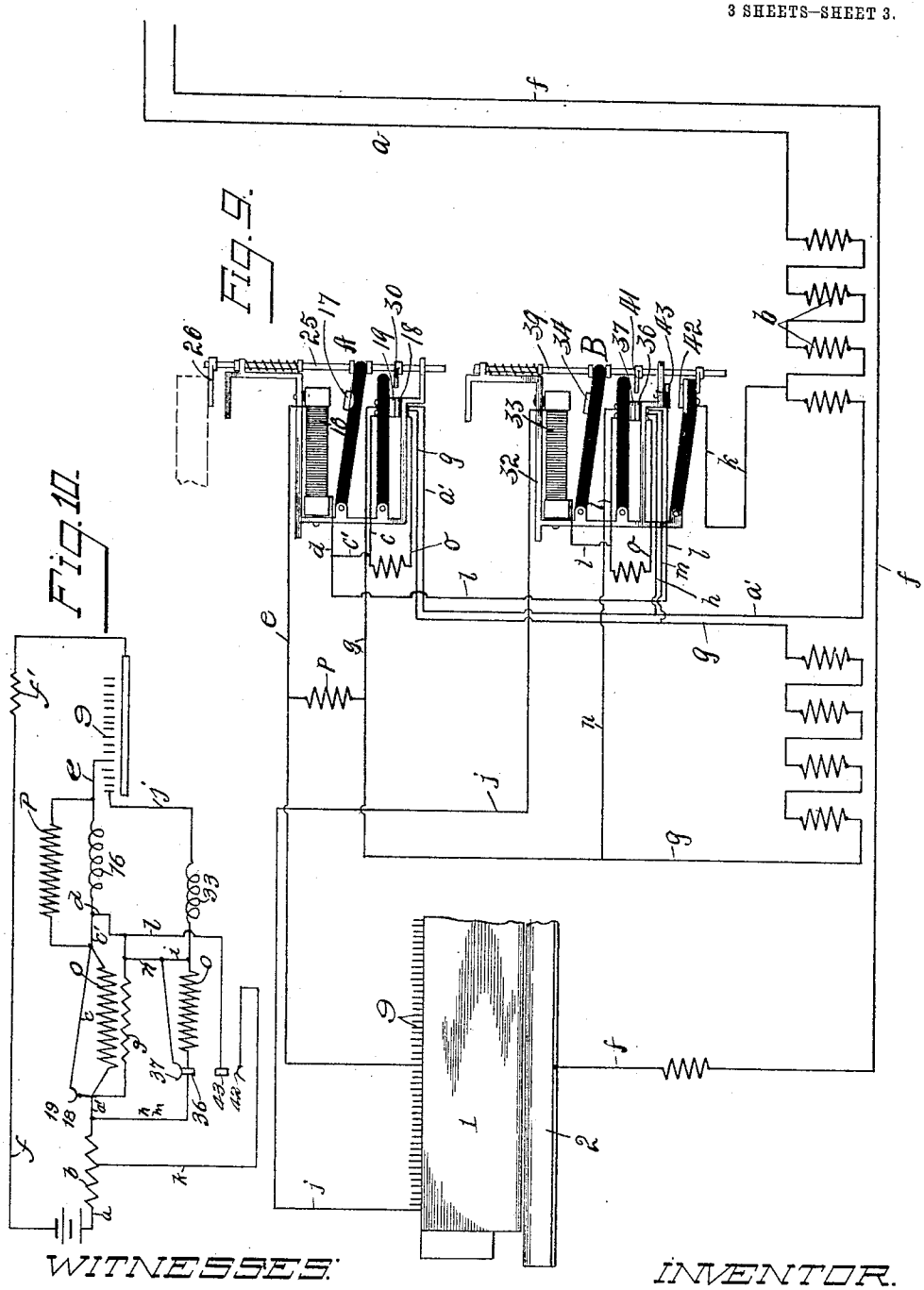


Fig. 10.

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ELECTRIC PIANO-PLAYER.

1,133,370. Specification of Letters Patent. Patented Mar. 30, 1915.

Application filed May 11, 1911. Serial No. 626,611.

To all whom it may concern:

Be it known that I, PHILLIP JACOB DREHER, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Electric Piano-Player; 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, reference being had to the accompanying drawings, and to the figures and letters of reference marked thereon, which form a part of this specification.

My invention relates to automatic players, and particularly to electrically controlled means of this class; and it has for its object the provision of simple and improved electrically operated means of this character, which is controlled by the movement of a note-sheet through a part thereof and is provided with circuits in which different resistances are automatically thrown into and out of circuit in order to vary the degree of loudness of the tones in the bass or treble, as the desired volume and loudness of the notes struck may require.

A further object of my invention is to improve upon the tracker-board construction of instruments of this class, whereby to enhance the practicability and commercial value thereof.

Further objects of the invention will be apparent from the following description.

The invention is fully described in the following specification, and while in its broader aspect it is capable of embodiment in numerous forms, a preferred embodiment thereof is illustrated in the accompanying drawings, in which,—

Figure 1 is a cross-section of the keyboard of a piano, with a key mounted thereon and a control unit for said key comprising one of the features of the invention associated therewith. Fig. 2 is a rear side elevation of the upper member of the tracker board with parts thereof broken away. Fig. 3 is a cross-section of a portion of the keyboard with a high tension unit attached thereto. Fig. 4 is a rear elevation of such unit. Fig. 5 is a front elevation of the tracker-members of the piano. Fig. 6 is a bottom view of a portion of the upper member of the tracker-board. Fig. 7 is a cross-section thereof. Fig. 8 is a top plan view thereof with portions broken away. Fig. 9 is a diagrammatical view of the wiring for a key-operating unit of the invention. Fig. 10 is a diagram showing the arrangement of the electric circuits.

Throughout this specification wherever the word "tension" is employed with reference to a current it is to be understood as existing between opposite ends of the magnet windings.

Referring to the drawings, 1 and 2 designate the upper and lower members, respectively, of the tracker-board of my invention, said members being carried at their ends by the brackets 3, 3 which are secured to the under side of the keyboard 4 of a piano. The inner or adjacent edges of the members 1 and 2 are spaced apart to permit the passage of a note-sheet 5 (Fig. 1) therebetween, and the lower member 2 is formed of electrically conductive material and rests at its ends, in the present instance, upon the lower hooked ends 3′ of the bearing brackets 3, while the upper member 1 is preferably formed of a non-conductive material and has its ends provided with tenons 6 for working within registering vertical slots 7 in the brackets 3. The upper member is yieldingly held in lowered position by compression springs 8 which are disposed between the upper ends of the slots 7 and the tenons 6, as shown in Fig. 1.

The member 1 of the tracker-board carries a spring pressed plunger 9 for each key of the associated piano and also two or more extra plungers for the purpose hereinafter described. Each of the plungers 9 works within a vertical socket 10 in the member 1 and preferably has its lower end thrust against a ball 11, which bears upon the note-sheet in its passage between the members 1 and 2 of the tracker-board and is adapted to make contact through perforations in a note-sheet 5 with the lower tracker-board member 2, as is apparent. The lower ends of the sockets 10 are preferably slightly contracted to prevent the complete passage of the asso-

ciated ball 11 therethrough. A spring 12 encircles each plunger 9 and has its lower end thrust against the plunger head, and its upper end thrust against a block 13. This block projects transversely through a socket provided in the rear side of the tracker member 1 and has its inner end forked and straddling the associated plunger and its outer end provided with a laterally projecting lip through which a binding screw 14 threads.

Each of the plungers 9 is in electrical circuit, as hereinafter described, with a key actuating unit A, one of which units is provided for each key of the instrument. Each of the units A comprises a bracket 15, which is shown as being secured to the under side of the rear edge of the keyboard 4; an electro-magnet 16, which is secured to the upper portion of the bracket 15; an armature 17, and the switch blocks 18 and 19. The armature 17 is carried beneath the rear end portion of the electro-magnet 16 by an arm 20, which is preferably of vulcanized fiber or other suitable insulating material and pivoted at its inner end to the bracket, as at 21. The switch block 18 of the unit is insulatingly mounted on the lower rearwardly projecting arm of the bracket 15 and its coacting member 19 is carried by a switch arm 22, which is preferably of insulating material and pivoted at its inner end to the bracket, as at 23. Mounted for vertical reciprocatory movements in guide parts 24 of the bracket is a key actuating plunger rod 25, which has a finger 26 projecting forward from its upper end portion beneath the rear end of the associated piano key 27 whereby to move said key to strike a note when the rod 25 is raised. The rod 25 is yieldingly held in lowered position by the action of a coiled compression spring 28 thereon and is influenced to have a key striking movement by a raising of the armature arm 20 due to the free end of said arm being connected in any suitable manner to said plunger, as by fitting loosely between shoulders or collars 29 thereon. A finger 30 projects from the lower end portion of the plunger 25 in position to engage under the free end of the switch arm 22 and effect a raising of said arm and a consequent breaking of the connection between the switch blocks 18—19 when the rod 25 has reached a predetermined point in its raising movement for the purpose hereinafter more fully described.

In the diagrammatical view of the wiring shown in Fig. 9 the current enters through the wire *a* and if the current be of high voltage it is reduced to approximately 30 volts by its passage through a series of resistances *b* after which it flows through the wire *a'* to the switch block 18 of each key operating unit A. If the switch blocks 18 and 19 are in contact as is normally the case the current flows from the block 19 through the connection *c*, *c'* and *d* to the electro-magnet coil, and thence through the connection *e* to the associated plunger 9 of the tracker-board. The wire *e* attaches to the binding screw 14 of the proper block 13 and the current flows through said block, spring 12, plunger 9, and ball 11 to the lower tracker member 2 when said ball and member are in contact. The current leaves the lower tracker member 2 through one of the supporting bracket arms 3' to which a wire *f* having a resistance *f'* is attached, as by a binding screw 31, Fig. 1. The current which follows the course above described may be designated the key-striking current and is the one which primarily energizes the electro-magnet to attract the associated armature 18 and effect a consequent raising of the armature arm 20 and attached plunger rod 25 when contact is made between the associated ball 11 and tracker-member 2. The raising of the rod 25 in this manner imparts a note-striking movement to the associated key 27, and when the rod is near the limit of its upward or striking movement the finger 30 thereof engages and moves the switch arm 22 to break the contact between the switch blocks 18 and 19. When the switch 18—19 is thus opened the current which flowed therethrough passes through a resistance *g*, which is connected in parallel with said switch, to the electro-magnet coil. The resistance in the circuit *g* decreases the strength of the current which flows therethrough to the electro-magnet, so that the latter is energized only sufficiently to hold the note which was struck.

In order to make it possible to give the note striking mechanism a stronger impulse, for expression purposes, a second mechanism is provided, which is adapted to be automatically thrown into series connection with the electro-magnet of any particular note-striking mechanism or unit A, and said second mechanism is divided into two identical sets, which control the communication of stronger impulses to the keys of the bass and treble notes respectively.

The above mentioned sets of mechanism are controlled from the tracker-board, wherein suitably disposed contact balls 11 are adapted to register with suitably provided openings in the note-sheet, in the well known manner, to complete the circuit, hereinafter described.

Each of the units B is similar in construction to the units A, in that each comprises a bracket 32 which is secured to the keyboard 4 and is of similar shape to the bracket 15 of the unit A, an electromagnet 33, an associated armature 34 which is carried by a pivoted arm 35, and a pair of switch blocks

36 and 37, the former of which is carried by the bracket 32 from which it is insulated while the latter is carried by a pivoted spring pressed arm 38.

A rod 39 which is normally held in depressed position by a spring 40 is carried at the rear end of the bracket 32 for vertical reciprocal movements and has connection with the armature arm 35 to cause said rod to have a vertical movement against the tension of its spring when the armature 34 is attracted by its magnet. A finger 41 on the rod 39 coacts with the switch arm 38 to move it to break contact between the blocks 36 and 37 when the rod is at a predetermined point in its rising movement. In addition to the parts of each unit B just described which are common to the units A, each unit B is provided with a set of normally open switch blocks 42 and 43, the former being insulatingly carried by an arm 44 which is pivoted to a portion of the bracket 32 and the latter being insulatingly fixed to a portion of said bracket, as shown in Figs. 3 and 4. The movable switch-block 42 is raised into contact with its companion upon a vertical movement of the associated rod 39, due to a finger 45 projecting from the lower end of said rod under the free end portion of the arm 44.

When the circuit of unit B is closed by a contact of the ball 11 with the lower tracker member 2, a current flows from the wire a' through the wire h, switch 36—37, and connection i to the electro-magnet 33, and thence through the connection j to the plunger and ball 11 which is in contact with the tracker member 2, from whence it is grounded through the wire f. The energizing of the electro-magnet 33 in the unit B attracts the armature 34 and effects a raising of the associated rod 39, which in turn moves the switch arm 38 to break contact between the blocks 36 and 37 and raises the switch arm 44 to move the blocks 42 and 43 into contact. The closing of the switch 42—43 of the unit B short circuits a portion of the resistance units b in the wire a—a' and permits a strong current, which is preferably of approximately 50 volts, to flow through the connection k, switch 42—43, and connection l—d to the electro-magnet 16 of the proper note striking unit A. Upon the breaking of contact between the switch blocks 36—37 of the unit B the current which was flowing therethrough to the associated electro-magnet 33 is passed around said blocks to such magnet through the connection m, the portion of the circuit g in which the resistances are disposed and connections n—i, thus supplying the electro-magnet 33 with a current of sufficient strength to hold the associated armature 34 in attracted position. It is thus apparent that the passing of a stronger current through the note striking unit A causes a quicker and harder note striking movement of the associated rod 19.

In order to prevent arcing between the switch-blocks 18—19 and 36—37 of the respective units A and B, when the contacts are broken, a resistance o is provided around the blocks 18—19 of each unit A, and also around the blocks 36—37 of the unit B. A similar resistance p is provided between the wires g and e.

I wish it understood that my invention is not limited to any specific construction or arrangement of the parts except in so far as such limitations are specified in the claims.

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

1. A piano player comprising in combination, a mechanism consisting of a striker, an electro-magnet having an armature to actuate said striker, and an energizing circuit for said electro-magnet including a switch and a resistance in a shunt around the switch, said switch being located to be actuated by said striker toward the end of the movement of the latter to cut in said resistance; and an expression mechanism consisting of an electro-magnet, a circuit for energizing said electro-magnet, a normally closed switch in said circuit, a device for opening said normally closed switch, said device being actuated by said last mentioned electro-magnet, a connection parallel to said expression mechanism circuit for passing a current around said resistance and expression mechanism electro-magnet to said striking mechanism electro-magnet, and a normally open switch in said connection which is positioned to be closed by the above mentioned switch opening device when said first mentioned switch of the expression mechanism circuit is opened.

2. A piano player comprising in combination, a mechanism consisting of a striker, an electro-magnet having an armature to actuate said striker, and an energizing circuit for said electro-magnet including a switch and a resistance in a shunt around the switch, said switch being located to be actuated by said striker toward the end of the movement of the latter to cut in said resistance; and an expression mechanism consisting of an electro-magnet, a circuit for energizing said electro-magnet, a normally closed switch in said circuit, a device for opening said normally closed switch, said device being actuated by said last mentioned electro-magnet, a connection parallel to said expression mechanism circuit for passing a current around said resistance and expression mechanism electro-magnet to said striking mechanism electro-magnet, and a normally open switch in said connection which

is positioned to be closed by the above mentioned switch opening device when said first mentioned switch of the expression mechanism circuit is opened, said normally open switch reducing the resistance in the energizing circuit when it is closed.

In testimony whereof, I have hereunto signed my name to this specification in the presence of two subscribing witnesses.

PHILLIP JACOB DREHER.

Witnesses:
C. W. OWEN,
E. E. THOMAS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."