

No. 887,774.

PATENTED MAY 19, 1908.

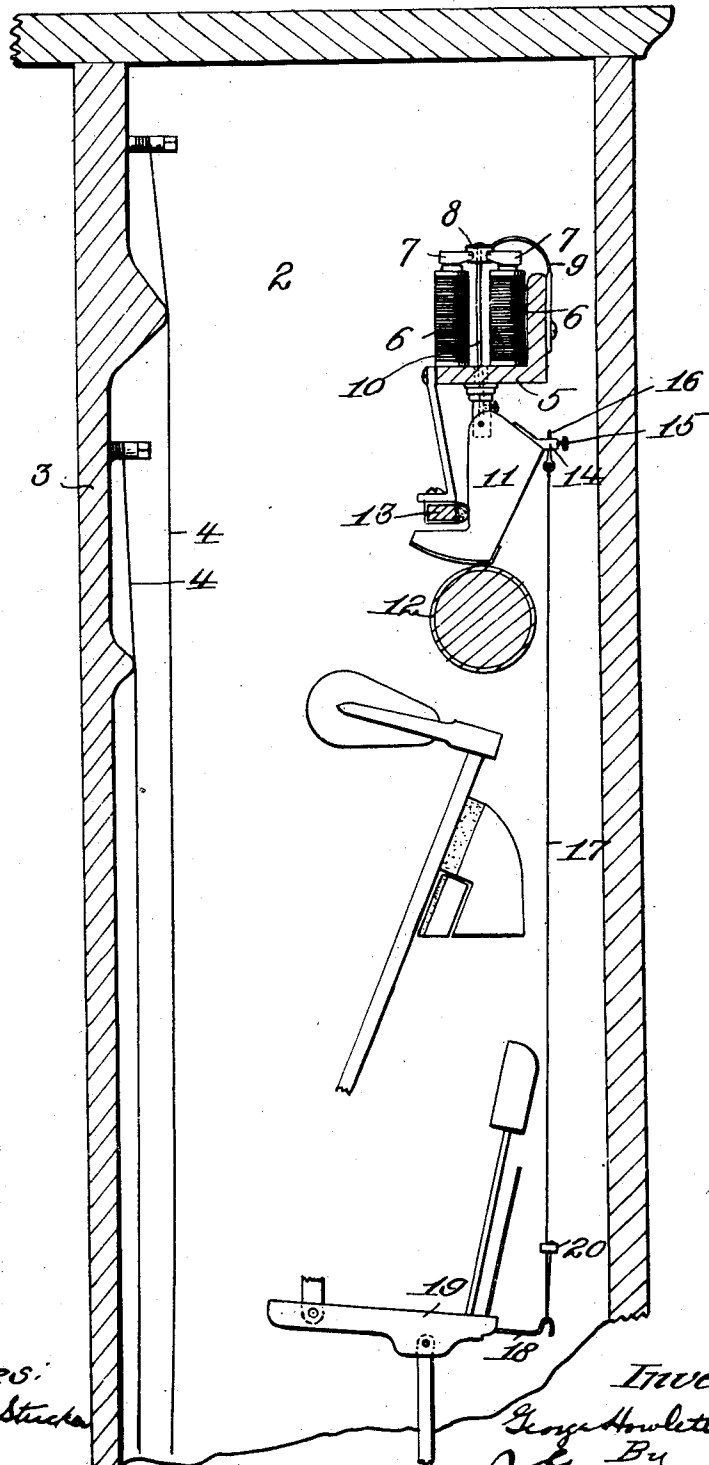
G. H. DAVIS.

SELF PLAYING ATTACHMENT FOR PIANOS.

APPLICATION FILED SEPT. 21, 1905.

2 SHEETS—SHEET 1.

Fig. 1.



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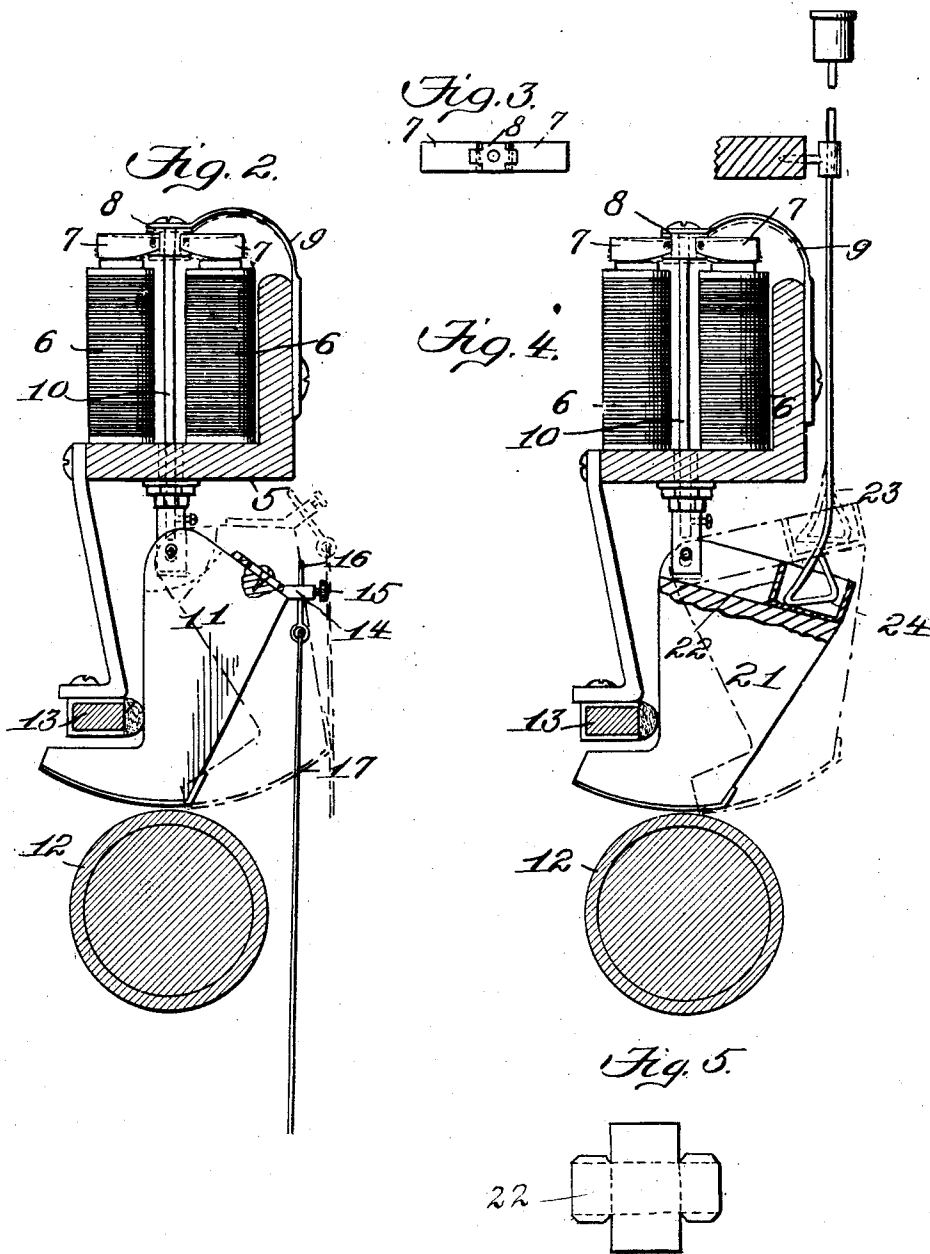
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

GEORGE HOWLETT DAVIS, OF WEST ORANGE, NEW JERSEY.

SELF-PLAYING ATTACHMENT FOR PIANOS.

No. 887,774.

Specification of Letters Patent.

Patented May 19, 1908.

Application filed September 21, 1905. Serial No. 279,472.

To all whom it may concern:

Be it known that I, GEORGE HOWLETT DAVIS, a citizen of the United States, residing at West Orange, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Self-Playing Attachments for Pianos, of which the following is a specification.

The present invention relates to a self-playing attachment for pianos, of that type in which the hammer action is operated by a shoe and roller mechanism, which mechanism in turn is actuated and brought to its operative position by means of electro-magnets energized by the closing of circuits which are controlled by a suitable "reader", and which magnets, when so energized, attract their armatures and move the shoe into operative relation to the continuously revolving roller, the said shoes being so connected with the individual sound-producing instrumentalities, as that movement of any shoe of the series will cause a corresponding movement of the selected hammer or sound-producing device.

The present attachment, according to one form of the invention, is designed particularly with a view of placing it in an operative position in the upper part of a piano casing, to the end that the attachment may be put in place without the necessity of cutting or altering the casing of the piano, as has heretofore been necessary with some of the inside self-players, and to the further end that the construction may be so simplified as to occupy a relatively small space within the piano casing.

One of the features of the present invention is a novel form of armature for the magnets, which bring the shoe and roller mechanism into operation, and this armature has been designed with a view of overcoming the objectionable noise caused by the hammering of the armatures against the magnets when they are energized; and furthermore, to secure a retardation in the return movement of the armature when the magnets are deenergized, so as to prolong the shoe and roller contact and enable the full value of a note to be secured without the necessity of resorting to means for prolonging the note, such as have heretofore been necessary;—an example of this means for prolonging the note being a tandem arrangement of contact fingers at the "reader", so that when a small perforation causes closing of

the circuit and energization of a selecting magnet such an energization of the magnet will, by reason of the tandem contact finger arrangement, be prolonged, the shoe and roller engagement will be continued, and full value of the note will be secured. Furthermore, by the use of the novel armature which I have invented, there is no loss of efficiency by reason of an air gap between the poles of the magnet and the armature face, as the armature faces and poles are always in metallic contact with each other; and a quick initial action of the armature is secured whereby a quick and certain operation of the parts set in motion thereby is effected.

Another feature of my invention is a novel form of shoe for the shoe and roller mechanism, whereby the striker rod which engages key and the sets the piano action in operation, is started from a state of rest upon the initial movement of the shoe by an initial impulse which overcomes its inertia, and upon continued motion of the shoe is given a second and final accelerating impulse, which completes and effectuates the hammer blow, so that the blow of the hammer is given with greater certainty and force than where the striker rod is moved by the ordinary connection.

In order that my invention may be understood by those skilled in the art, I have illustrated in the accompanying drawings, one embodiment thereof and in said drawings—Figure 1 is a longitudinal vertical section through the upper part of a piano, showing the self-player attachment, so much of the piano as is necessary for the understanding of my invention, and the connections between the self-player attachment and the action; Fig. 2 is a detail view of an electro-magnet and the novel form of armature which I have invented the same being associated with one form of actuating mechanism for the sound-producing means; Fig. 3 is a detail plan view of the armature; Fig. 4 is a detail view of the electro-magnet and armature associated with a different form of actuating mechanism, said mechanism comprising my novel shoe and striker-rod connection; and Fig. 5 is a plan view of the pocket-forming blank, hereinafter described.

Referring to the drawings by numerals, like numbers indicating like parts in the several views, 2 denotes the upper part of the piano, in which is mounted the usual string plate 3, to which the usual strings 4 are se-

cured. The piano action is mounted in the usual position within the casing 2, and as it is of usual construction a detailed description of the same to render it clear to those skilled in the art, is deemed unnecessary.

In the upper part of the casing 2 is secured the usual magnet-supporting rail 5, on which are mounted the ordinary magnets 6, which are connected by suitable circuits with a source of electricity, and a "reader" (not shown), so that the magnets 6, during the rendition of a piece, are selected and energized in the usual manner. The said magnets are provided with a sectional or articulate armature made up of two rockable sections 7, normally in the position shown in the full lines in Fig. 1, being sustained in this position by means of a block or carrier 8 which is upheld by a spring 9, secured to the magnet rail 5, in the usual manner. The said armature sections 7 are pivotally connected with the carrier 8, as shown, (felted bushings being employed to obviate noise) and when the magnets are energized the said sections 7 are attracted, and will rock on their lower curved faces over the poles of the magnets 6, to the position shown in the dotted lines in Fig. 2, depressing the block or carrier 8 and forcing down the shoe actuating rod 10, which is connected in any suitable manner at its lower end beneath the magnet rail 5 with the ordinary shoe 11, which shoe 11 will, by this action, be forced into engagement with the continuously rotating roller 12, and, being rocked thereby, exert its pull on the hammer action as will be hereinafter more fully set forth.

The rocking action of the armature sections 7 over the magnet poles will, it is obvious, eliminate absolutely the clattering incident to pulling down an armature against the poles of a magnet, and since these armature sections 7 are at all times in contact at their outer ends with the poles of the magnet 6, and the space between the curved inner ends of the magnet sections and the armature pole is so small as to be practically negligible, the loss of efficiency incident to overcoming the usual complete air gap is overcome, and at the same time a quick initial action of the armature is secured. Furthermore, by this construction of rolling or rocking armature, which is always in metallic contact at two points with the magnet poles, there is a tendency to a comparatively slow release of the armature, which "sticking" or retardation will have the effect of continuing the shoe and roller contact, so as to retard to an appreciable degree the release of the hammer action from the pull of the shoe, and this has the effect of securing a full note value by assuring a full hammer stroke for notes of short duration; thus enabling me to dispense with auxiliary devices, such as tandem contact fingers, for prolonging the energization

of the magnets and securing a corresponding retardation in the return to normal position of the hammer action operating instrumentalities.

It will be observed that the magnet cores and yoke, and the armature sections 7, and carrier 8, constitute a permanently closed magnetic circuit, in which an air gap is never interposed. When the magnet is energized the movement of the armature is due to the tendency of the magnetic circuit to shorten or contract. It is evident that, in the dotted line position, the length, and consequently, the reluctance, of the magnetic circuit is less than in the full line position.

In the form of magnet commonly used in musical instruments, it has been absolutely necessary in order to eliminate noise, to separate the armature from its poles by two thicknesses of silk, but the constant impingement of the armature will in time, wear the silk away, when a most objectionable clicking noise occurs. My new form of magnet permanently avoids noise by entirely obviating a direct blow or impingement and secures efficiency and the other advantages named by reason of the constant metallic connection between the armature and poles, which metallic contact in the usual form of magnet and armature, is never present.

The shoe 11, which normally lies against the usual rest rail 13, has secured to its upper end a projecting lug 14, having an aperture therethrough, and a binding screw 15 which is adapted to hold adjustably in the lug-aperture a pin 16, to an eye at the lower end of which is secured a flexible connection or tape 17. The said tape 17 is connected at its lower end to a hook or other suitable device 18 fixed in the wippen 19, the tape 17 being preferably passed around the bight of the hook and having its end adjustably secured in any suitable manner, as by the slotted block connection 20, with the body of the tape 17, as clearly shown in Fig. 1. By this arrangement the tension of the tape 17 may be readily and accurately adjusted so as to secure a certain and uniform pull upon the hammer action by the shoe and roller mechanism.

It will be seen that the attachment above described may be readily inserted in any standard make of piano without the necessity of altering the construction of the piano or cutting or defacing the same, and that by placing the attachment in the upper part of the piano, above the hammer action, and connecting the shoe and roller mechanism with said hammer action by a flexible connection, that the full efficiency of the player will be secured, while at the same time the hammer action may be manually operated quite free and independent of the self-player, and without any additional exertion or strain, as is the case in some instances where

the striker rods or rigid connections between the parts of the automatic players and the hammer action have been used.

In Fig. 4 I have shown a novel form of shoe, which is designed for use in connection with a striker-rod adapted to act upon the rear ends of the keys. In the construction shown the upper part of the shoe 21 is channeled, and in said channel is cemented or otherwise attached, a pocket 22 to receive the free end of the striker-rod, said pocket being preferably constructed of a single blank of leather or other sound-deadening material, such as shown in Fig. 5. The said pocket 22 receives the lower end of the striker-rod 23, which has an elongated face 24 at its lower end to form an extended bearing which, when the parts are in normal position or state of rest, bears at its inner end upon the bottom of the pocket 22 formed in the channeled shoe 21, with its face 24 out of contact and inclined to the bottom of the pocket 22. When the shoe 21 is swung on its pivot by the roller, in the ordinary manner, the shoe will first give an initial impulse to the striker rod, overcome its inertia, and start it from the position of rest. Immediately after the first impulse or lift has been given to the striker rod 23, continued movement of the shoe 21 will bring the parts to a position in which the elongated face 24 will lie flat against the bottom of the pocket. Further movement of the shoe will result in the member 24 pivoting about its heel in the outer end of the pocket, as shown in dotted lines in Fig. 4, and the final movement thus imparted to the striker rod, will be at an increased speed, owing to the fact that the point at which the power is applied to it is at a greater distance from the pivot of the shoe. Thus it will be seen that at the moment when the final movement commences, the striker rod receives a second blow or impulse. This construction and operation I find is of great value for the reason that by initially starting the striker rod and the parts operated thereby from a state of rest, without initially imposing on the shoe the full burden of carrying the striker-rod and the hammer action which is to be actuated thereby through its full stroke, there is less likelihood of the shoe slipping, and inaccurate action of the parts, the shoe and roller taking with more positive action and securing greater accuracy in operation and certainty of hammer action.

During sustained notes the lower end of the striker-rod slides down the leather pocket 22 for about $\frac{1}{4}$ or $\frac{3}{8}$ of an inch toward the pivot of the shoe; thus, by the change of leverage, allowing the shoe to support the piano action with a decreased strain or friction against the revolving drum and at the same time slightly lowering the key which must be raised to its uppermost limit in order to impart a full and proper movement of the

hammer; and this decrease in strain, or friction on the drum is of great importance for the reason that when, for example, ten sustained notes are being struck, the revolving drum is retard 1 slightly unless relieved in some such manner as above described.

While I have shown and described a particular embodiment of my invention, and that the best now known to me, it will be understood that the disclosure herein given is merely illustrative of one mechanical expression of my invention; and since the same may be widely varied by a skilled mechanic, and yet remain within the purview of my invention, I do not limit myself to anything herein shown and described, except so far as I am limited by the prior art to which this invention belongs.

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

1. In an electric self-playing attachment for musical instruments, the combination with a sound-producing device, of a permanently closed magnetic circuit comprising fixed and movable elements, a movable element of which controls the sound producing device.

2. In a self-playing musical instrument, the combination with a roller, a shoe to be actuated thereby, a striker rod, and connections between said shoe and striker rod whereby a plurality of impulses are successively imparted to said striker rod by said shoe.

3. In a self-playing musical instrument, the combination with a roller, of a shoe to be actuated thereby, and a striker rod having an extended bearing face one end of which normally rests against said shoe.

4. In a self-playing musical instrument, the combination with a roller, of a pivoted shoe to be actuated thereby, and a striker rod provided with an extended, substantially flat bearing face having initial and final points of engagement with said shoe at different distances from the pivot thereof.

5. In a self-playing musical instrument, and in combination, shoe and roller mechanism, a striker-rod, and means for imparting initial and final impulses to said striker rod.

6. In a self-playing musical instrument, and in combination, a roller, a roller-actuated shoe having a striker-rod pocket, and a striker-rod engaging said pocket.

7. In a self-playing musical instrument, and in combination, a roller, a roller-actuated shoe having a striker-rod pocket, and a striker rod having an extended bearing face resting in said pocket.

8. In a self-playing musical instrument, and in combination, a roller, a roller-actuated pivoted shoe having a striker-rod pocket, and a striker rod engaging said pocket and movable toward and from the pivot of said shoe.

9. In a self-playing musical instrument,
and in combination, a roller, a roller-actuated
pivoted shoe having a striker-rod pocket, and
a striker rod having an extended bearing face
5 resting in said pocket and slidable toward
and from the pivot of said shoe.

10. In a self-playing musical instrument,
the combination with a roller, of a pivoted
shoe actuated thereby, and a striker rod hav-
10 ing on its lower end an extended bearing face,

the end of which nearest the pivot normally
rests against said shoe.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit-
nesses.

GEORGE HOWLETT DAVIS.

Witnesses:

MARGARET A. JACOBS,
J. FRED. BERSTECHEER, Jr.