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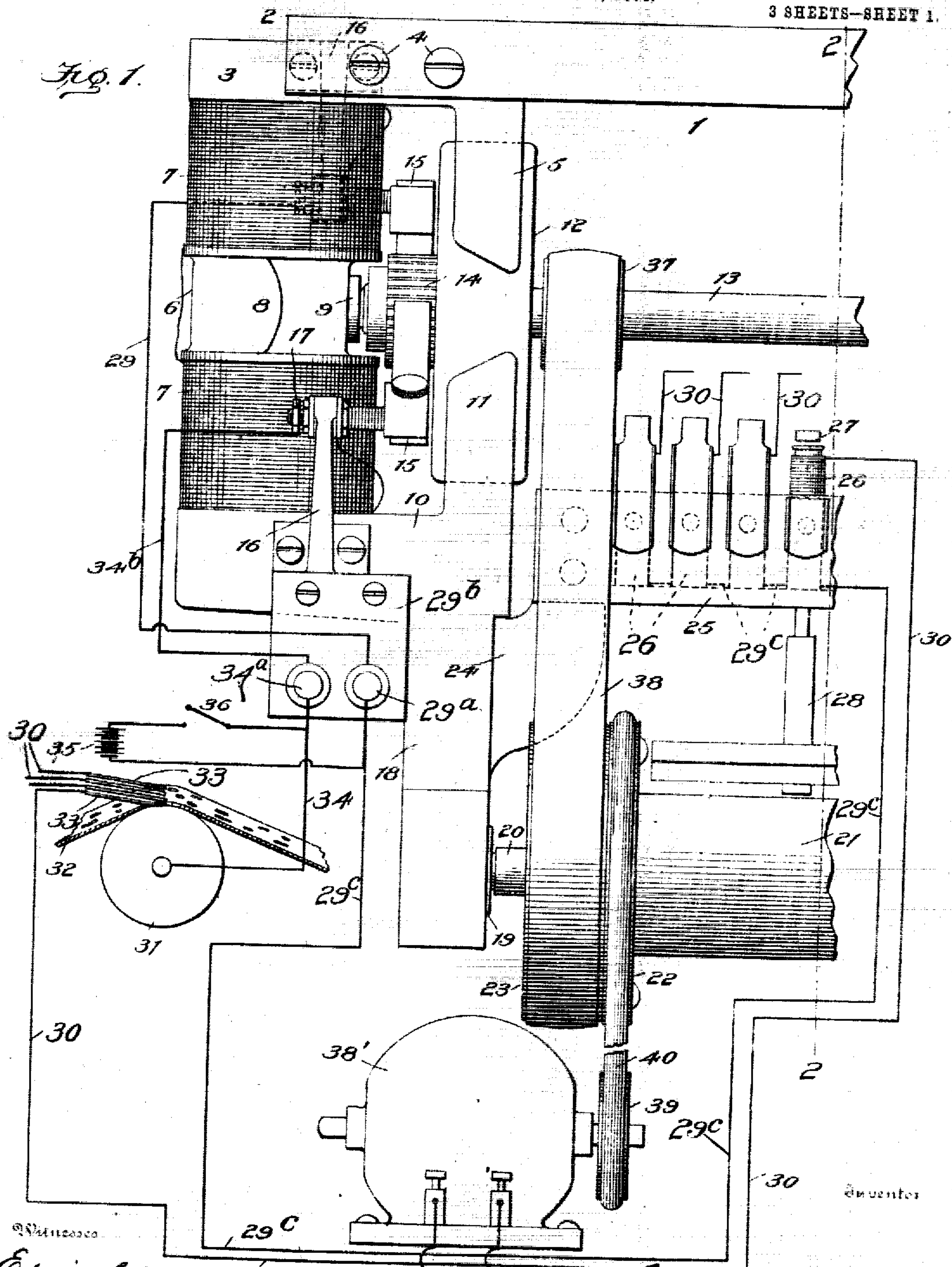
G. H. DAVIS.

PATENTED FEB. 6, 1906.

ELECTRICALLY ACTUATED AND CONTROLLED SELF PLAYING MUSICAL INSTRUMENT.

APPLICATION FILED MAR. 29, 1904.

3 SHEETS—SHEET 1.



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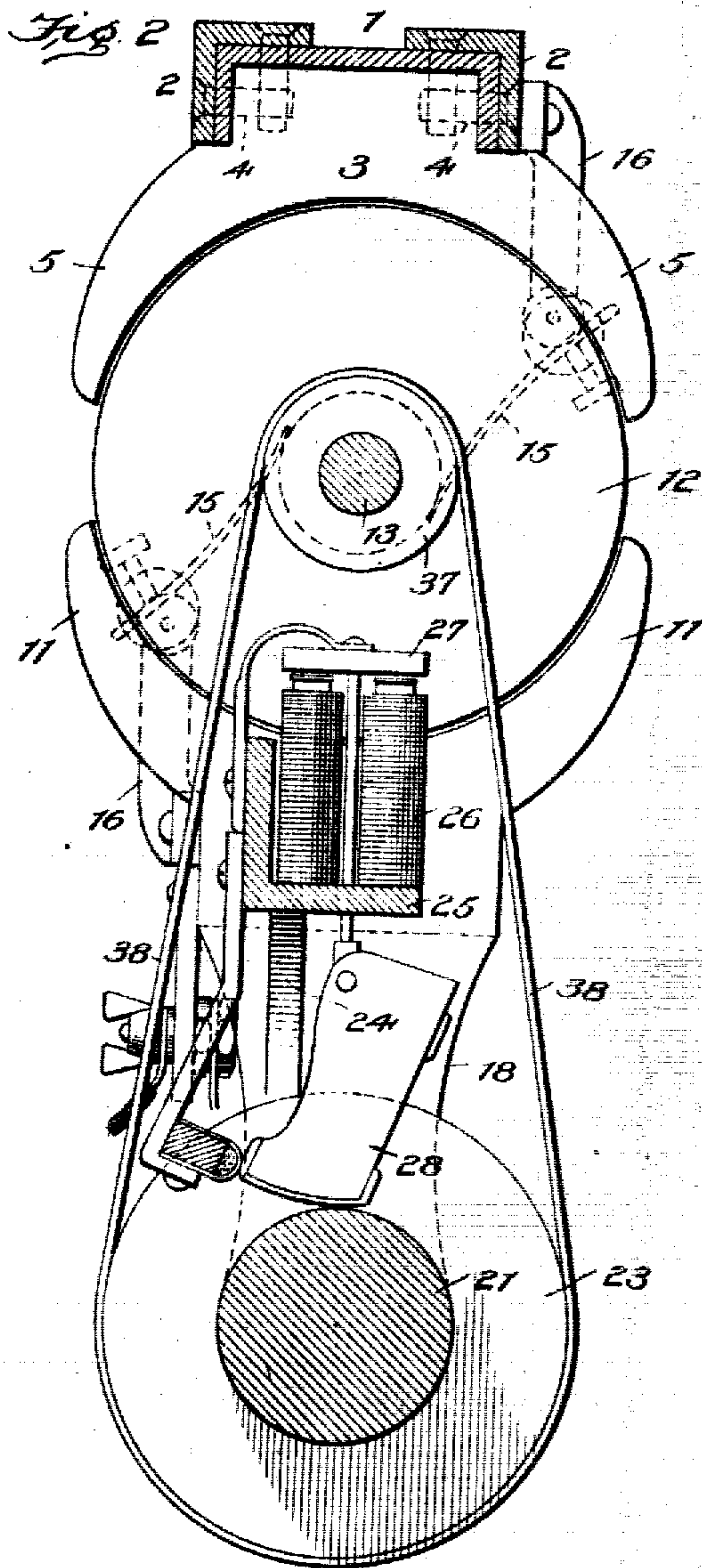
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Witnesses

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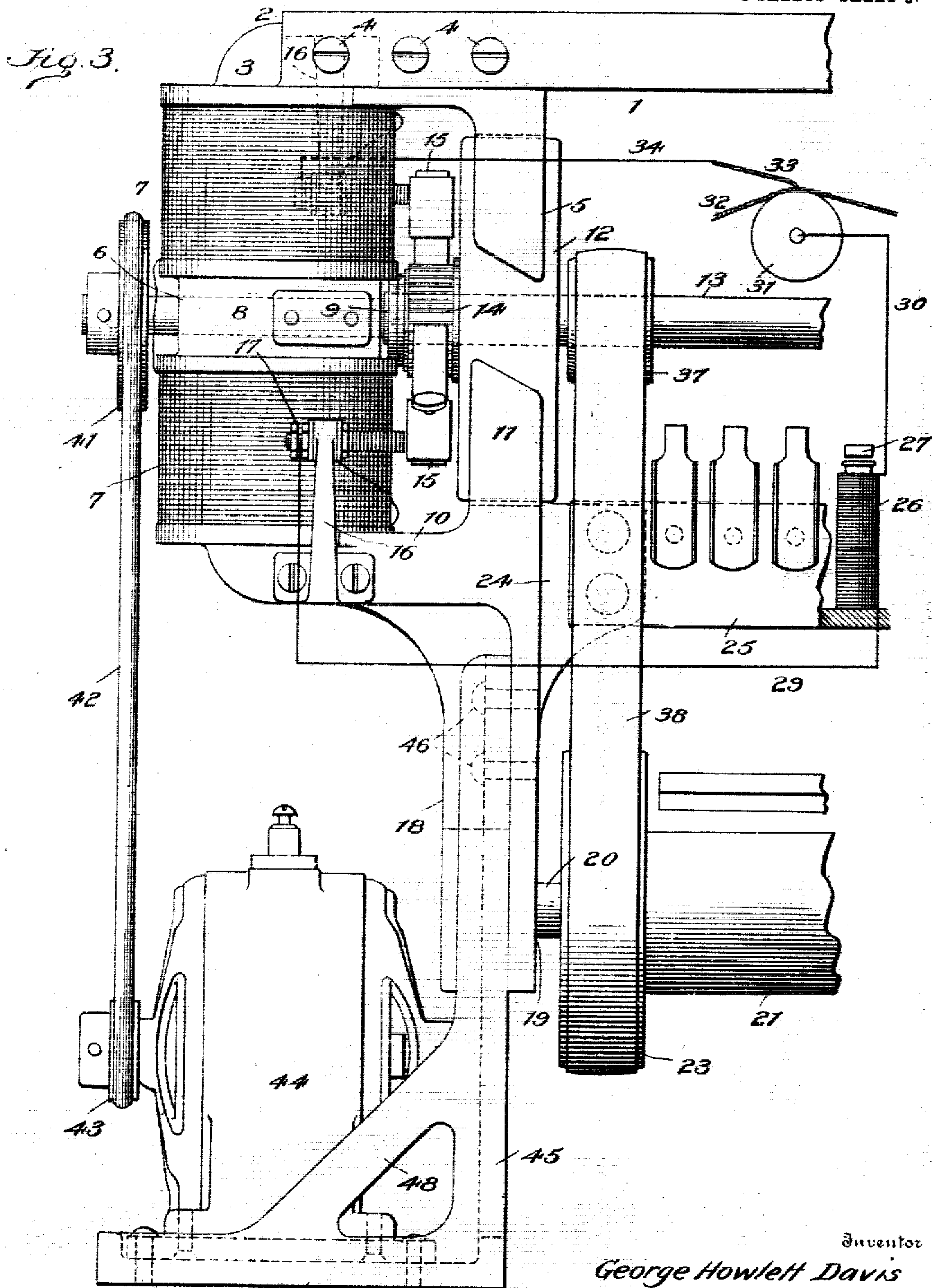
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UNITED STATES PATENT OFFICE.

GEORGE HOWLETT DAVIS, OF WEST ORANGE, NEW JERSEY.

ELECTRICALLY ACTUATED AND CONTROLLED SELF-PLAYING MUSICAL INSTRUMENT.

No. 812,117.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed March 29, 1904. Serial No. 200,834.

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 Electrically Actuated and Controlled Self-Playing Musical Instruments, of which the following is a specification.

My present invention has relation to new and useful improvements in electrically actuated and controlled self-playing attachments for pianos and other keyed musical instruments, and more particularly to self-playing attachments which embody in their structure a plurality of key-actuating devices, which are controlled by electromagnetic means to strike the keys of the musical instrument.

The primary object of the invention is to provide an improved and efficient means for supplying the electric current to the various electrically-operated devices embodied in the attachment and also for supplying the power necessary to impart rotation to the several rotatable elements included therein.

A further object is to construct, in combination with an electrically-operated attachment, an electric machine which may be energized by a current from a battery or other source to serve as a motor for the moving parts of the attachment, and also to provide for dispensing with the batteries and transforming the electric machine into a generator to supply electric current to the key-actuating means.

A further object is to so arrange and construct the motive and generative powers of the attachment that they may be satisfactorily, efficiently, and safely operated by a direct or alternating commercial circuit of any voltage or phase.

A further object is to provide a field piece or casting for the electric machine which will also serve as a part of the supporting-frame for the rotating parts of the attachment.

Before particularly describing the elements and combinations of elements for accomplishing the above-stated objects of my invention I would state that heretofore the employment of high-voltage commercial electric circuits for actuating electromagnetic piano-players has proved expensive, unsatisfactory, and dangerous, owing to the fact that the excess of potential causes the contacts to spark

when broken or separated by the music-sheet, which sparks char the sheet and have been known to ignite the same and cause disastrous conflagrations. By the means to be hereinafter set forth the commercial current is expended upon a prime motor which drives a generator creating a current of sufficient potential to properly energize the key-actuating means, but not as great as the current of the commercial current. The winding for, say; sixty-five magnets, with or without external spark-reducers, of sufficiently high resistance is expensive when compared with magnets which are wound for only four volts, as in my present device. If the slightest cross or short circuit occurs in a device having a high-potential current circulating through its several parts, then the increased sparks occurring at the paper note-sheet are sufficient to ignite the latter and may cause the destruction of the sheet and instrument.

My invention not only greatly reduces the cost of the magnets, but also entirely obviates all danger from sparking at the note-selecting contact-fingers and permits the utilization of alternating currents for operating electromagnetic musical instruments, which to my knowledge has never heretofore been practicable.

The invention consists in the novel arrangement and aggroupment of the various elements in operative combination, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

I accomplish the objects above set forth by the structure and arrangement of elements set forth in the accompanying drawings, to be taken as a part of this specification, and wherein—

Figure 1 is a view in front elevation of an end portion of an electrically-operated piano-playing attachment in combination with which the improvements embodying my invention are constructed and operated. Fig. 2 is a sectional view on the lines 2 2 of Fig. 1. Fig. 3 is a view in front elevation, illustrating another species of the invention than that shown in Figs. 1 and 2.

Referring to the drawings, reference numeral 1 designates the base-plate of the instrument-playing attachment, which is provided at its longitudinal edge portions with depending flanges 2, between which is secured

the field-casting of an electric machine or dynamo, said field-casting being so constructed as to constitute a part of the frame of the instrument. This field-casting above referred to is yoke-shaped in elevation and consists of a horizontally-disposed metallic member 3, which is rigidly secured between the flanges 2 of the plate 1 by means of fastening devices of any suitable kind, which are illustrated at 4 as consisting of screws. This member 3 is provided at one end with a downwardly-projected portion 5, which constitutes one of the pole-pieces of the machine, as will presently appear. Depending from the outer end of the member 3 is a vertical portion or magnet-core 6, provided at its opposite ends with proper windings 7 7, which, as hereinafter described, are adapted under certain circumstances to be energized to operate the electric machine as a motor, said winding being suitably connected with a source of electrical supply. These windings 7 7 are separated from each other at their inner ends by a space 8, on the inner side of which is provided a bearing 9 for a purpose to more fully appear hereinafter. From the lower end of the member 6 the field-casting is formed to provide an inwardly-directed member 10, lying parallel to the member 3 and provided at its extreme inner portion with a vertical extension 11 in alinement with the pole-piece 5 and constituting the opposite pole-piece of the machine.

Arranged to rotate between the pole-pieces 5 and 11 is the armature 12, which is mounted on a shaft 13, the rotation of which is employed to impart movement to the elements embodied in the structure of the attachment—as, for instance, a music-sheet. One end of this shaft is rotatably mounted in the bearing 9 on the field-casting heretofore mentioned, and adjacent this end of the shaft 13 is the commutator 14 for the armature, said commutator being engaged by brushes 15 15, mounted upon supports 16, arranged between the pole-pieces and the field-magnet and provided with connections or binding-posts 17, as clearly shown in Fig. 1 of the drawings.

Extending downwardly from the inner end of the member 9 is an extension or hanger 18, provided at its lower end with a bearing 19, in which is journaled the gudgeon 20 of the drum 21, said drum being provided at its end portion with pulleys 22 23, which serve a purpose to be more fully set forth hereinafter. The hanger 18 is also provided at its side portion preferably with a laterally and vertically extending bracket or arm 24, to the upper terminal of which is secured one end of the magnet-rail 25, upon which are supported the magnets 26, which when energized attract their armatures 27 to throw the shoes 28 into operative engagement with the

drum 21 to actuate the key-operating devices, all of which appears at large in my Patents Nos. 546,852, September 17, 1895; 719,092, January 27, 1903, and 719,093, January 27, 1903, and which I do not deem it necessary to illustrate or describe in detail in this application.

The circuit for energizing the field-casting of the machine and the magnets controlling the key-actuating means will now be described. Electrically connected to the upper brush of the generator is a conductor 29, which extends to and is connected to a binding-post 29^a, arranged on a connecting-board 29^b, mounted on the member 10. From the binding-post the wire 29 is connected to one of the magnets 26 by a wire 29^c, and the circuit is continued by a conductor 30, leading from the magnet 26 and electrically connected to the metallic finger 33, forming one member of the note-selecting device, which finger contacts the metallic roller 31, which is traversed by the perforated music-sheet 32, said roller constituting the second member of the note-selecting device. The roller is connected by a conductor 34 with a second binding-post 34^a, mounted on the connecting-board 29^b, and the circuit is completed by a conductor 34^b, connected to the lower brush of the generator.

In the drawings I have shown the completed circuit for but one of the magnets 26, as this showing is all that is deemed necessary for the purposes of this application, as it will be understood that a similar circuit is provided for each magnet—that is to say, there is a separate wire 30 connecting each of the fingers 33 with its corresponding magnet and that the wire 29^c is connected in a suitable manner with all of said magnets.

The circuit above described under the construction heretofore used is energized by a battery 35, said battery being in connection with the motor and magnet circuits and provided with a suitable cut-out 36, by means of which it may be disconnected from said circuits. This battery is continuously in circuit with the motor-circuit, being arranged between the music-sheet roll and the motor, and is in circuit with the magnet whenever contact is made by the selecting-fingers with said contact-roller. When the cut-out is closed and the motor and magnet circuits are completed, it will be seen that the armature of the motor will be rotated to drive the shaft 13, upon which is mounted a pulley 37, traversed by a pulley-belt 38, which also passes over the pulley 23 to drive the drum 21. It will be seen that in this case the electric machine acts as a motor to drive the various moving parts of the attachment, all of which act in the manner set forth in the patents above referred to granted to me.

The arrangement just referred to will be

found quite satisfactory where a battery must be depended upon for supplying the current to the motor and the magnet circuits; but in cases where it is possible to use the ordinary "commercial" circuit the battery may be dispensed with by throwing out the cut-out and disconnecting the conductors from the field-windings and connecting them to the binding-posts 17 on the brushes of the motor, so that the rotation of the armature will convert the motor for supplying the power to the attachment into a generator for supplying the current for the magnet-circuits. To supply the power to the rotative parts of the attachment and also to rotate the armature to generate current, I provide a motor 38, which is placed by suitable connections into circuit with the commercial line. This motor carries on its armature-shaft a pulley 39, which is connected to the pulley 22 on the drum 21 by means of a belt 40, so that the rotation of the armature of the motor 38 drives the drum 21 and through the belt 40 the shaft 13 and the armature 12 of the motor, which action of the motor 38 drives all the rotatable parts of the attachment and rotates the armature 12 of the convertible machine to operate said machine as a generator to supply current to the magnet-circuit. This use of the motor 38, actuated by a commercial circuit, will be found to be an important step in this art, for the reason that by such arrangement and use the force of the current in the commercial circuits does not get into the magnet-circuits and endanger the music-sheet and instrument by sparking.

A further advantage to be claimed for the use of a generator in this connection is that the battery may be dispensed with entirely and the current generated within the attachment itself without exterior connections and circuits. In the species shown in Fig. 3 a simple structure is shown for use when the electric machine employed is not a motor to be converted into a generator, but is a generator in the first instance. In this structure the form of the field-casting is the same as that shown in Fig. 1 and also the arrangement of the armature, brushes, armature-shaft, magnet-rail, and drum; but the armature-shaft instead of having bearing at one end in the field-casting is projected entirely through said casting and is provided at its end with a pulley 40, which is connected by a belt 42 to a pulley 43 on the motor-shaft of the prime motor 44 instead of being driven indirectly from the pulley 23 on the drum 21, as shown in Fig. 1. In this modified form the motor 44 is supported upon a platform or bracket which consists of a vertical member 45, securely bolted to the depending hanger 18 on the field-casting, as at 46, and at its lower end this vertical member is provided with a horizontal platform 47, connected to

the said member and additionally braced by an inclined brace member 48. This platform serves as a support upon which the base of the prime motor rests and is secured.

The magnet-circuits from the dynamo, it is thought, will be readily understood without repeating the description of such circuits as referring to Fig. 1 when the motor is employed as a dynamo.

It will also be apparent that in cases where the commercial circuit is not available or is not desired to be used some other form of means for rotating the armature of the dynamo may be employed, such as a manual treadle, spring-motor, or water-motor.

The term "electric machine or dynamo" as hereinbefore employed is intended to be taken as covering any electrical device which receives electrical energy and gives out power mechanically or which may be operated by mechanical power to give out electric energy. Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. An electrically-controlled playing attachment for musical instruments embodying a plurality of electromagnets; a dynamo forming a part of the attachment, circuit connections between the dynamo and said magnets, and a prime motor for driving the dynamo.

2. In an electrically-controlled musical instrument, a dynamo, electrically-controlled playing devices in circuit with the dynamo, and a prime motor to drive the dynamo.

3. In an electrically-controlled musical instrument, the combination with a drum and magnet-controlled playing devices, of a dynamo in circuit with said magnets and a motor to drive said dynamo and the drum.

4. In an electrically-controlled musical instrument, the combination with a plurality of magnetic controlling devices and a rail to support said devices, of a dynamo in circuit with said magnets, the field-casting of which constitutes a support for the rail.

5. In an electrically-controlled musical instrument, the combination with a plurality of magnetic controlling devices, a rail to support said devices and a drum, of a dynamo in circuit with the operating devices, the field-casting of said dynamo including an arm serving as a support for the rail and a hanger in which the drum is journaled.

6. In an electrically-controlled musical instrument controlled by a note-sheet, the combination with magnetic controlling devices and means to feed the note-sheet, of an electric machine capable of use either as a motor or as a generator of current, and connections whereby it may be used as a motor to drive the sheet-feeding means, a circuit including said machine and the magnetic controlling devices, a battery to supply current to run the

motor and energize the controlling devices, a
cut-out to disconnect the battery from said
circuit, and means to operate the machine as
a generator when the battery is disconnected
5 from said circuit, for supplying current to the
circuit which includes the magnetic control-
ling devices.

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

GEORGE HOWLETT DAVIS.

Witnesses:

SPENCER G. AYRES,
WM. WALTON.