(No Model.) 2 Sheets—Sheet 1.

G. H. DAVIS.

ELECTROMECHANICAL MUSICAL INSTRUMENT.

No. 606,279. Patented June 28, 1898.

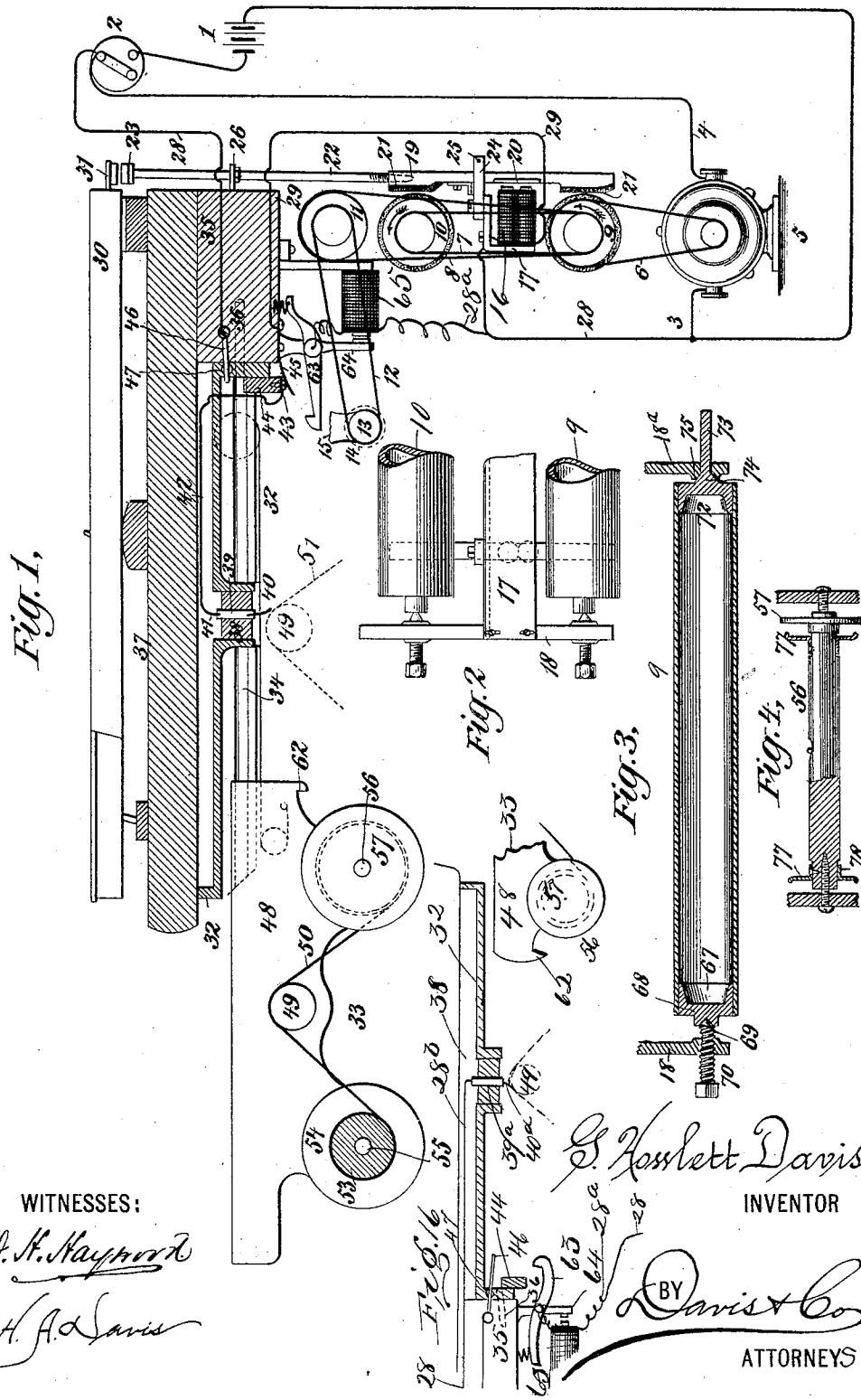

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

WITNESSES:

D. K. Maynard

H. A. Davis

G. Hosslett Davis

INVENTOR

BY Davis & Co

ATTORNEYS

(No Model.) 2 Sheets—Sheet 2.

G. H. DAVIS.

ELECTROMECHANICAL MUSICAL INSTRUMENT.

No. 606,279. Patented June 28, 1898.

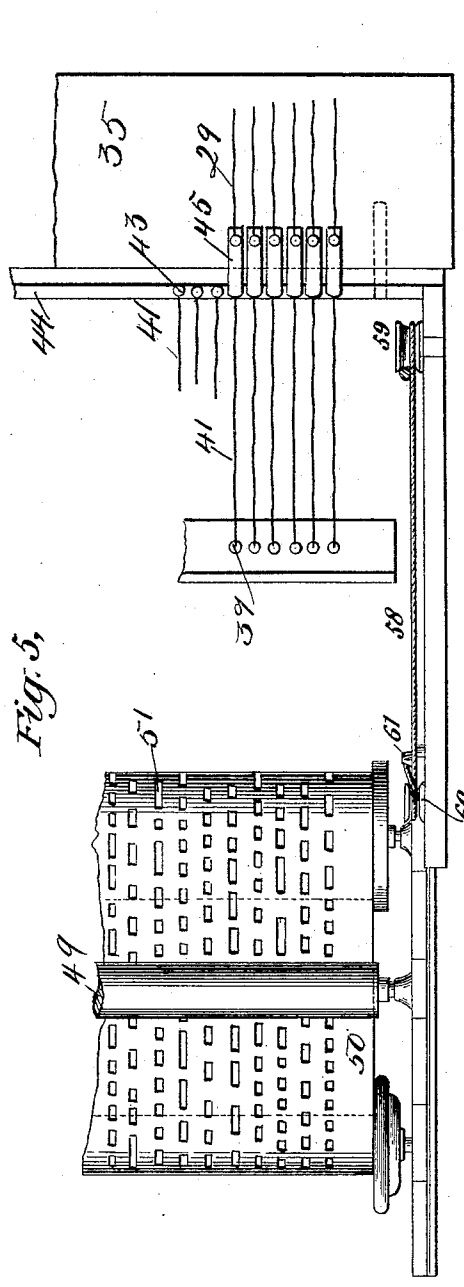

Fig. 5.

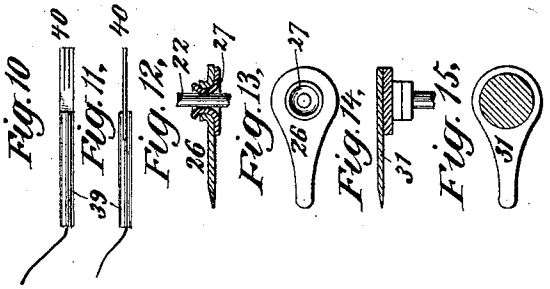

Fig. 10. Fig. 11. Fig. 12. Fig. 13. Fig. 14. Fig. 15.

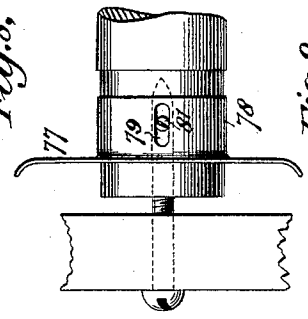

Fig. 8.

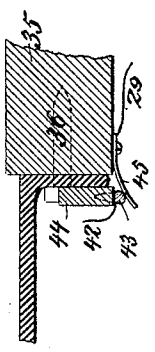

Fig. 9.

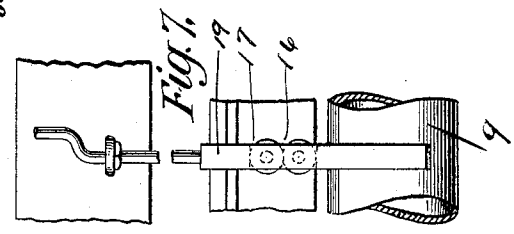

Fig. 7.

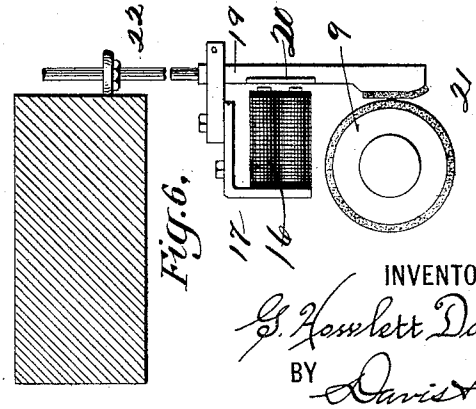

Fig. 6.

WITNESSES:

W. H. Haywood

H. A. Davis

INVENTOR

G. Hewlett Davis

BY Davis & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

GEORGE HOWLETT DAVIS, OF NEW YORK, N. Y.

ELECTROMECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 606,279, dated June 28, 1898.

Application filed May 1, 1896. Serial No. 589,332. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HOWLETT DAVIS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new, useful, and valuable Improvement in Electromechanical Musical Instruments, of which the following is a full, clear, and exact description.

My present invention relates to electromechanical musical instruments, and has for its object to provide the combination and arrangement of parts such as will be hereinafter fully described, and the novel features of which will be pointed out in the claims concluding this specification.

In the accompanying drawings, forming a part of this specification, Figure 1 shows a transverse vertical section of my complete device. Fig. 2 is an enlarged detail view of the left-hand ends of the friction-drums and their immediate coöperating parts. Fig. 3 is a longitudinal section of one of the friction-drums. Fig. 4 is a longitudinal section of the take-up music-roller. Fig. 5 is an enlarged detail plan of my detachable music-drawer. Fig. 6 is a detail view of my improvements applied to a single friction-drum, and Fig. 7 is a front view of the same. Fig. 8 is an enlarged detailed view of the left-hand end of my take-up roller and adjustable flange. Fig. 9 is an enlarged detailed view of the separable contact system of my music-drawer. Figs. 10 and 11 are detailed views of my renewable contacts and holders. Figs. 12 and 13 are details of my striker-rod holders. Fig. 14 is a sectional view of my improved key extension, and Fig. 15 is a plan view of the same. Fig. 16 is a partial longitudinal section illustrating the means for automatically releasing the drawer carrying the music-sheet when the end of the latter is reached.

The same parts, however frequently or differently shown throughout the several views of the drawings, are always indicated by like numerals of reference placed on or near said parts.

Proceeding with a detailed description of my invention, I will take up each part in its most natural order of operation, which is most clearly set forth in Fig. 1, which illustrates my entire improvements as applied to a piano and from which it will be understood that the initial motive force employed is electricity, which in this case is shown as supplied from the battery 1, located outside the piano, and its current controlled by the switch 2, preferably located at some convenient point on the piano and which upon being turned on directs a branch of the electric current by the wires 3 4 through the electric motor 5, placed in the bottom of the piano and which, through the medium of the three driving-belts 6 7 8, keep in continuous rotation the two friction-drums 9 10 and the pulley 11, the latter through the elastic belt 12 transmitting continuous motion to the pulley 13 and its gear-wheel 14, bearing in the depending arm 15, the special construction of the parts mentioned being fully shown in the detail views thereof and to be described later. Arranged intermediate of the two continually-revolving friction-drums 9 10 are a series of electromagnets 16, secured upon the L-shaped angle-iron 17, extending across my attachment and suitably supported by the brackets 18, as clearly shown in Fig. 2. Suspended in front of these electromagnets are a corresponding number of striker-rods 19, the lower sections of which are faced opposite the magnets with the iron plates or armatures 20 and opposite the drums with leather strips 21, the upper part of the striker-rod in this instance consisting of the wire 23, threaded at its lower end and capped with the felt piece 23. Upon the upper edge of the angle-iron 17 are secured the slotted cleats 24, corresponding in number and location to the striker-rods and preventing them from falling too far away from the face of the magnets 16, the upper end 22 passing through the bearing-tacks 26, the holes of which are provided with the felt linings 27, for the obvious purpose of preventing noise when the striker-rods work through the same. Now whenever the circuit is completed through the wires 28 29, as by the medium of my improved music-holder shown and to be described later, the magnet included in the particular circuit so completed or closed becomes instantly energized and attracts the armature 20 and causes the leather-faced parts 21 of the striker-rod 19 to impinge the rapidly-revolving drums 9 10, and through its frictional contact therewith the striker-rod is

thrown quickly upward with sufficient force to throw the rear end of the piano-key 30, having the extension 31, upward, together with the action resting thereon, and will keep the same elevated as long as the electric current remains closed, as it is apparent that the striker-rod 19 will be kept lifted as long as it is held in frictional contact with the drums 9 10; but the moment the current is broken the magnet instantly ceases to hold the striker-rod against the drums and allows it to drop down into its normal position, the rate of speed at which the striker-rod rises and falls being limited practically only by the highest attainable rate of making and breaking the circuit. Thus my improvements permit of repeating any particular note much faster than could possibly be done by hand.

It is obvious that the mechanism thus far described, and which I will term the "lower action," may be actuated by any desirable form of device for making and breaking its series of independent magnetic circuits, and it is equally obvious that the striker-rods may be arranged to operate innumerable forms of apparatus, such as type-setting machines, &c.

My separable music-holder, through which the magnet-circuits are opened and closed by the perforated and imperforate parts of the music-sheet it controls, consists of two principal parts—viz., the base-plate 32 and the drawer 33, which latter slides in the grooves 34 of said base-plate. The base-plate 32 is separably secured to the bed-block 35 by means of its two metal dowels 36, which enter correspondingly-arranged dowel-holes in the bed-block 35, and the dowels are made of such strength and size as to sustain the entire music-holder in rigid position against the bottom of the keyboard 37. Running transversely through the center of the base-plate is a wood strip 38, in which are set a series of contact-holders 39, in the bottom of each one of which is secured the contact-brush 40 and to the top of which is secured one end 41 of the connecting-wire 42, the other end being run and connected to the contact-screw 43. The screws 43 are arranged equidistant upon the lower edge of the wood strip 44, and the correspondingly-arranged contact-tongues 45 form contact therewith when the base-plate 32, guided and supported by its dowels 36, is placed into operative position, in which position a series of independent metallic circuits can be traced from the contacts 39 40 through the wires 42 to contact-screws 43, all on the base-plate, and from these through the contact-tongues 45 on the base-block to their respective magnets 16 through the wires 29, and after passing through the magnets the various currents are grounded upon the angle-iron 17 and from thence conducted by the single wire through the battery 1 to the switch 2 and from thence led to the single ground-contact tongue 46, which forms a metallic contact with the metal base-plate by riding upon the ground-contact screw 47, arranged upon said frame, and is from thence conveyed to the metal frame 48 of the drawer 33, and, finally, to the metal roller 49, arranged to freely revolve in said frame 48. Said roller contacts with all of the brushes 40 whenever the drawer is shoved back into position upon its slides and thereby completes the circuits through all of the magnets; but to prevent this a thin music-sheet 50, having the series of perforations 51, transposed from a music-score and in lines equal in number and lateral separation to the contact-brushes 40, the imperforate portions 52 when passing between the ends of said brushes 40 and the roller 49 serving to insulate one from the other or break the circuit, which is again closed the moment a perforation 51 passes under the brushes 40, and obviously the circuit remains closed during the continuation of the slot or perforation, a long slot producing a sustained note, and vice versa. For holding and controlling the music-sheet I employ the usual delivery-spool 53, having the flanges 54, and to which the rear end of the music-sheet is permanently pasted, the journals 55 of said spool resting in suitable slotted bearings in frame 48, the other end of the music-sheet being detachably secured to the take-up roller 56, the gear-wheel 57 meshing with the pinion-gear 14 upon the drawer being closed, when the said take-up roller is caused to revolve and wind upon itself and propel the music-sheet 50, the friction of which upon the roller 49 revolves the same and effects a rubbing contact with the brushes 40. The drawer 30 is normally kept open by the weighted or spring-tensioned cord 58, passing over the stationary pulleys 59 60, and one end attached to a lug 61 on the sliding drawer, and in order to retain the drawer in position when closed I provide the lug 62 thereon, which is engaged by the spring-latch 63, and this spring-latch has a depending arm 64, which forms the armature for the electro-magnet 65, which releases the latch and allows the drawer to open automatically.

In one end of the wooden strip 38 is a set contact-holder 39^a, (see Fig. 16,) in which is secured a brush 40^a, adapted at certain times to contact with the roller 49, carried by the drawer, and to the top of the holder 39^a is connected the wire 28^b, which leads to the battery 1 or is in any suitable manner connected with the main circuit. A wire 28^a forms the other terminal of the circuit and, as herein illustrated, is connected at one end to the conductor 28 and includes the magnet 65, and at its other end is connected to the latch 63. It will be manifest that when the perforation at the end of the music-sheet comes opposite the brush 40^a the brush will contact with the roller 49 and a circuit will be completed from the battery 1 through the wires 28 and 28^a to the latch 63 through the frame of the drawer and roller 49 to brush 40^a and holder 39^a and from thence by wire 28^b to battery 1. The magnet 65 is thus energized and attracts the arm 64, and thus trips

the latch 65 and releases the drawer, which then automatically opens by the means here inbefore described.

Proceeding with a more detailed description of several of the parts hereinbefore mentioned, I will first take up the friction-drums 9 10, a longitudinal section of one of which is shown in Fig. 3 and from which figure it will be seen the body of the drum is a cylindrical tube 66, in the ends of which are secured two plugs, the left-hand plug 67 having the cone-bearing 68 to receive the cone-shaped end 69 of the adjustment-screw 70, working in the supporting-bracket 18. The right-hand plug 72 has an extension-shaft 73, having a cone-shaped shoulder 74, which is forced to fit snugly in its bearing 75 in support 18^a by the adjustment-screw 70. The take-up roller 56, having the gear-wheel 57, is provided at either end with the adjustable flanges 77, (see Figs. 4 and 8,) having the collars 78, in which are made the slots 79, working over the adjustment-screws 80, whereby the flanges are adjusted and secured upon the roller.

A serious objection has been heretofore encountered in operating musical instruments by perforated music-sheets, owing to the fact that the paper-stock forming such sheets shrinks and expands laterally and transversely under varying conditions of the temperature and atmosphere, such expansion in some cases being sufficient to prevent the music-sheet from being wound upon the roller between the guide-flanges without crimping the edges of the paper and preventing the sheet from being wound back upon the delivery-roller. The sheet is thus rendered useless, as it must lie perfectly flat and even. This objection is thoroughly avoided by means of my improved take-up roller, as by adjusting the flanges toward or away from each other such changes in the width of the music-sheet are compensated for, and also renders unnecessary any lateral adjustment of the take-up roller relatively to the delivery-roller.

The contact-brushes 40 are preferably made with three or more tongues, as shown in Fig. 10, and inserted into a slit made in its holder 39, as shown in Fig. 11.

The striker-rod guide 26 is stamped out of metal of the shape shown and with a hole through its body, Fig. 12, which hole is lined with the felt 27, Fig. 11, and its pointed and sharpened end is adapted to be driven into the wood base-block 35, thus providing a quick and convenient means of locating and guiding the upper end 22 of the striker-rod.

The key extensions 31 are of a similar shape to the striker-rod guides, and their sharpened ends are intended to be driven into the rear ends of the keys, as shown in Fig. 1, but their circular-shaped body is imperforate and is faced with a disk of felt, as clearly shown in Figs. 12 and 13.

In Figs. 6 and 7 I have shown modifications of my improvements in which I employ but one friction-drum; but as the operation and construction of this device are otherwise identical with the double-drum mechanism hereinbefore so fully described further description of this modification is deemed unnecessary.

Many other modifications may be made without avoiding the spirit of my invention, as

What I claim is—

1. The combination with a continuously-rotating friction-drum, of a vertically-movable striker-rod arranged in close proximity to said friction-drum and an armature connected thereto, said striker-rod being arranged to engage and actuate a sounding device when raised, an electromagnet disposed opposite said armature and operating, when energized, to draw the striker-rod into frictional engagement with the rotating friction-drum, and means for automatically making and breaking the magnet-circuit at predetermined intervals, substantially as described.

2. In an electromechanical musical instrument, the combination with electrically-operated playing mechanism, of a base-plate carrying a series of insulated contact-points, a music-roll-holder drawer sliding upon said base-plate and carrying a contact roller or bar arranged to contact with all of said contact-points when the drawer is closed, means for holding said drawer closed, and means for automatically opening said drawer when the latter is released, substantially as described.

3. In an electromechanical musical instrument, the combination with electrically-operated playing mechanism, of a base-plate carrying a series of insulated contact-points, a music-roll-holder drawer sliding upon said base-plate and carrying a contact roller or bar arranged to contact with all of the said contact-points when the drawer is closed, an electrically-controlled catch for holding said drawer closed, and means for automatically opening said drawer when the catch is released, substantially as described.

4. In a take-up roller for perforated music-sheets, the combination with a cylindrical roller having reduced ends as shown, of annular collars adjustably fitted over said reduced ends and having their peripheries flush with the periphery of the body of the roller, means for holding said collars fixed in their adjusted positions, and annular flanges formed on the outer ends of said collars, substantially as described and for the purpose specified.

5. The combination with a cylindrical take-up roller having reduced ends as shown, of annular collars fitted over said reduced ends and having their peripheries flush with the periphery of the body of the roller, said collars having longitudinal slots formed therein, annular flanges formed on the outer ends of said collars, and adjusting-screws screwed in said roller and projecting through said slots, substantially as described.

6. The combination with a musical instru-

ment of a striker-rod guide having a circular-shaped body and a hole made therethrough, being lined with felt and having a pointed extension.

7. The combination with a musical instrument of a key extension, the same having a circular-shaped body, from which a pointed projection extends, and a felt or elastic disk secured to one of the faces of said body.

8. The combination with a revoluble friction-drum, of a vertical striker-rod the upper end of which engages the key or other striking mechanism, and the other end suspended in close proximity to said drum, and an electromagnet adapted when energized to attract a soft-iron armature carried by said striker-rod and thereby cause the latter to be drawn into frictional contact with the revolving drum and be forced upward to actuate the key or striking mechanism, substantially as described.

9. The combination with a delivery-roll, of a music-sheet coiled thereabout, a second cooperating rewinding-roll about which said sheet is recoiled, guides or collars adjustable endwise upon said receiving-roll, and means intermediate the rolls, coöperating with the music-sheet to control the action of sound-producing devices of a musical instrument.

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

GEORGE HOWLETT DAVIS.

Witnesses:
OWEN WARD,
C. R. COMES.