

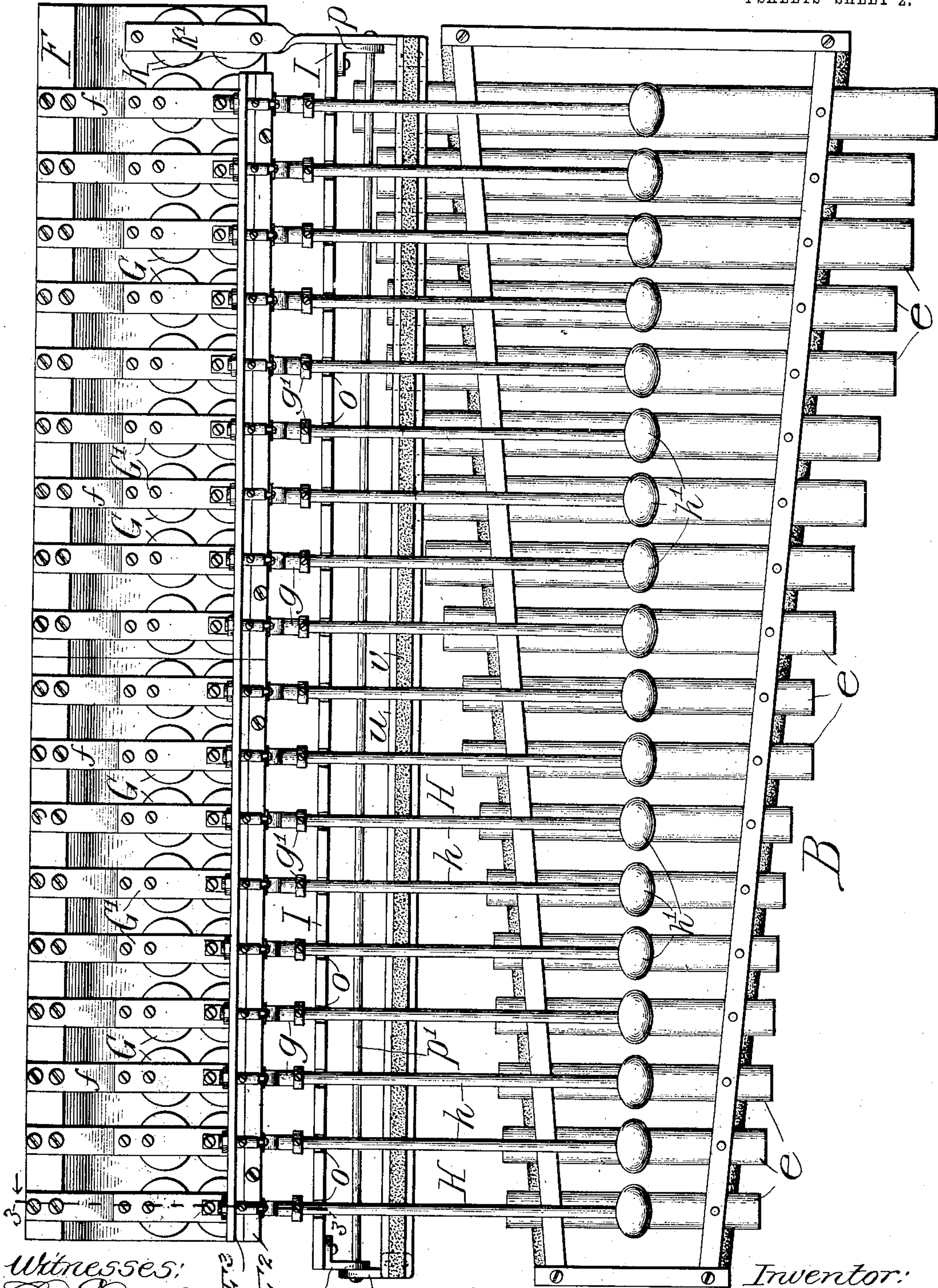
No. 859,620.

PATENTED JULY 9, 1907.

H. K. SANDELL.
ELECTRICAL SELF PLAYING INSTRUMENT.

APPLICATION FILED FEB. 5, 1906.

4 SHEETS—SHEET 2.



Witnesses:
Edw. J. Gaylord.
John Anders.

Fig. 2.

Inventor:
Henry K. Sandell,
By Dymforth, Dymforth & Lee,
Attys.

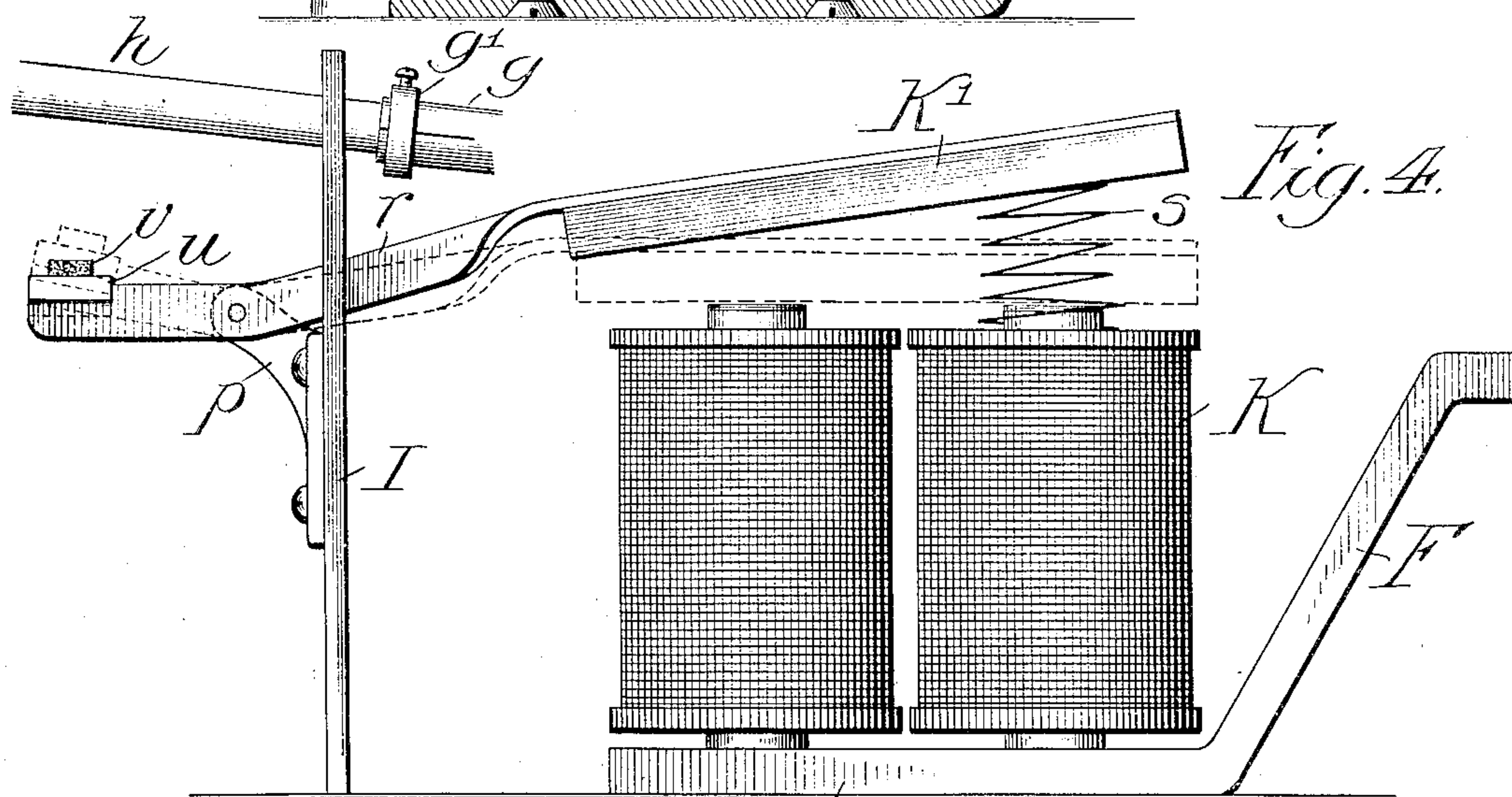
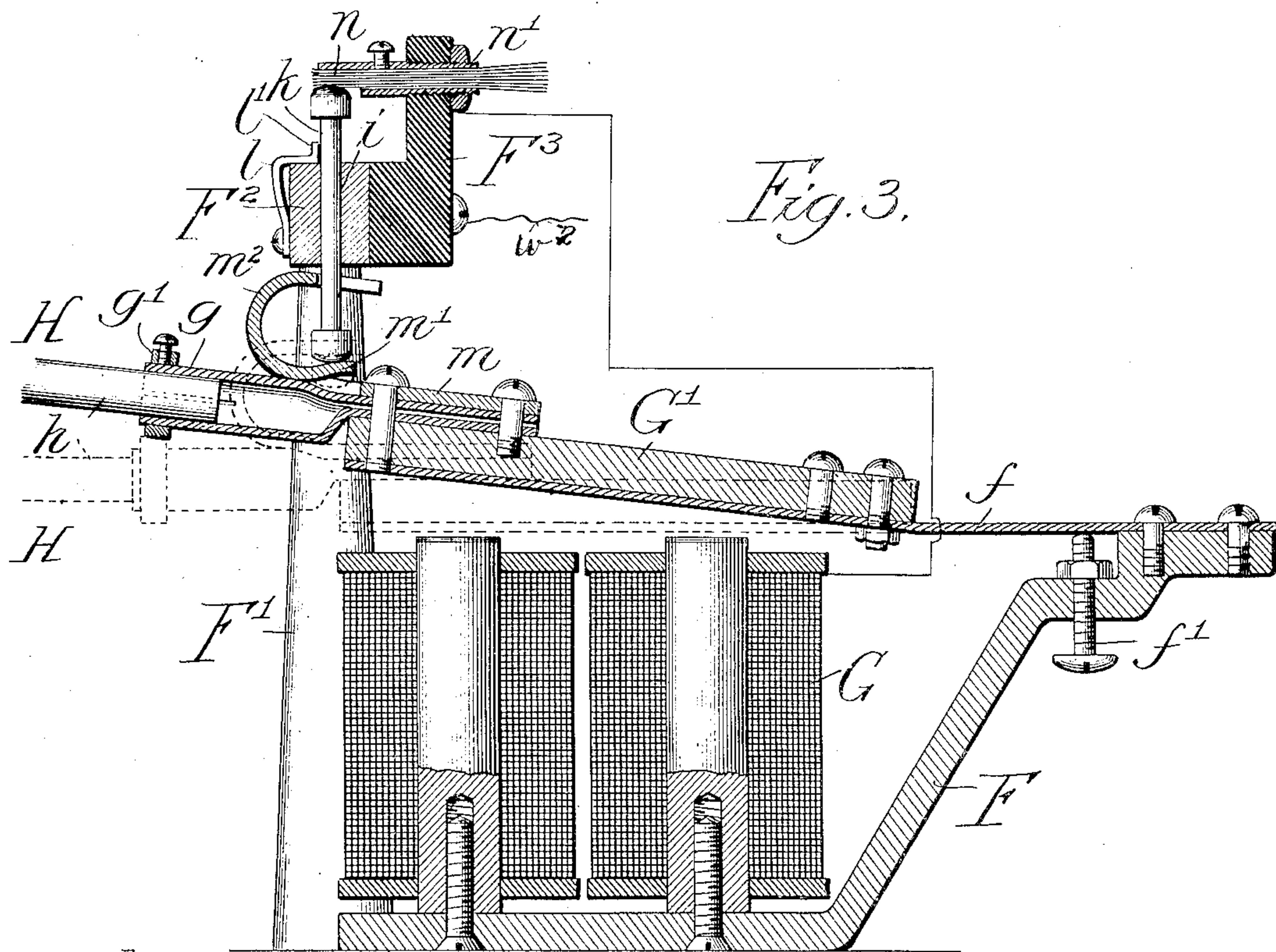
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4 SHEETS—SHEET 3.



Witnesses:
Ed. C. Chayford.
John Enders.

Inventor:
Henry K. Sandell,
By Dymforth, Dymforth & Co.,
Attys.

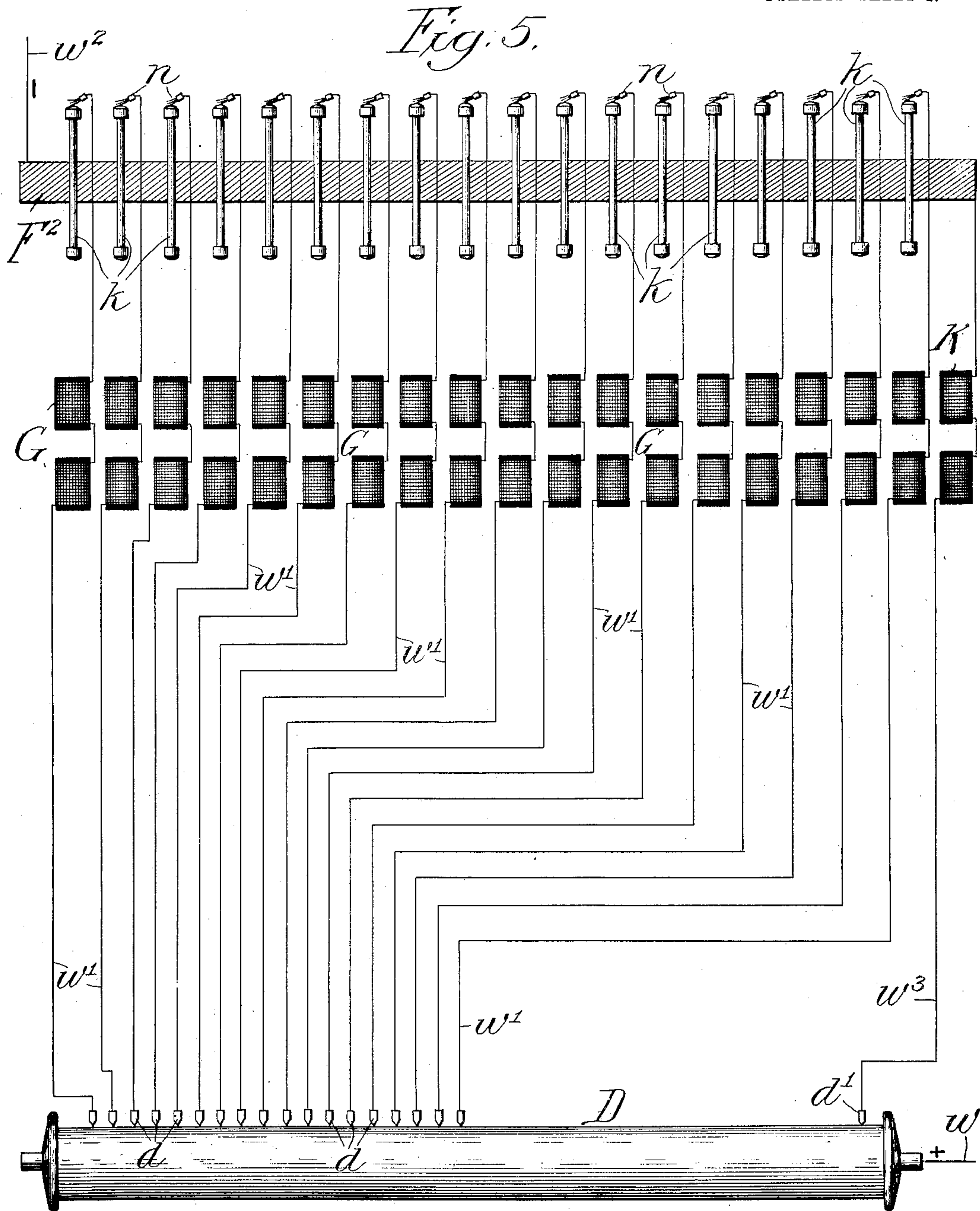
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By Dymforth, Dymforth & See,
Attys.

UNITED STATES PATENT OFFICE.

HENRY K. SANDELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO MILLS NOVELTY COMPANY, A CORPORATION OF ILLINOIS.

ELECTRICAL SELF-PLAYING INSTRUMENT.

No. 859,620.

Specification of Letters Patent.

Patented July 9, 1907.

Application filed February 5, 1906. Serial No. 299,490.

To all whom it may concern:

Be it known that I, HENRY K. SANDELL, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electrical Self-Playing Instruments, of which the following is a specification.

The object of my invention is to provide an electrical self-playing instrument in which the source of sound is a diaphragm, a taut string, or a strip or block of resonating metal, glass, wood or the like, or a bell, and the sound-producing medium of which is a vibratory hammer actuated by the closure of an electric circuit controlled by a traveling perforated music-sheet.

One form of embodiment of my invention is that of a xylophone, this being the form I have selected for illustration in the accompanying drawings, in which—

Figure 1 is a broken view of the machine in vertical sectional elevation; Fig. 2, a plan view of a xylophone and the electro-magnetically operated hammers for playing it; Fig. 3, a broken enlarged view in sectional elevation the section being taken at the line 3 on Fig. 2 and viewed in the direction of the arrow and showing by dotted representation the position of the armature carrying the hammer when attracted by the magnet in striking the hammer against the instrument; Fig. 4, a broken view in end elevation of a magnet-controlled device for diminishing the force of the hammer-strokes, and Fig. 5, a diagram of an electric-circuit arrangement for operating the hammers and the stroke-diminishing device.

According to the construction illustrated in Fig. 1, the entire mechanism of the machine is inclosed, as preferred, in a case A, divided by a horizontal partition *a* into a lower compartment and an upper compartment, the latter containing a shelf *A*¹ and housing the xylophone B and the electro-magnet-actuated mechanism for playing it, and the lower compartment housing the feeding mechanism for the perforated music-sheet C, as also, if desired, an electric or other motor (not shown) for driving that mechanism, and the electrical-contact mechanism which the perforated sheet is caused to traverse. This electrical-contact mechanism and the feed for the sheet are similar to the corresponding devices shown and described in Letters Patent of the United States No. 807,871, granted to me December 19, 1905, for an electric self-playing violin, and involve the following described parts:

An electric-contact roller D journaled in a pair of similar brackets depending from the shelf *a*, and one of which is shown at *b* in Fig. 1; a spring-pressed roller D¹ supported, to co-operate frictionally with the roller

D, in hangers, like the hanger *b*¹, pivotally fastened by a rod *b*² to the brackets *b* and resiliently pressed against the surface of the contact-roller by the spring-device *b*³, the roller D¹ carrying on one end a gear-wheel *c* meshing with a pinion *c*¹ on the adjacent end of the pivot-rod *b*², which carries a drive-pulley *c*² connected by an endless belt *c*³ with the shaft of the said motor; a series of electric spring-contacts *d* supported to bear against the surface of the roller D; and the perforated music-sheet C passing over a guide-board C¹ between the contacts *d* and the roller D and between that roller and the roller D¹.

The xylophone may be of any ordinary or suitable variety of construction, that shown having eighteen sounding-bars *e* graduated, chromatically, in a range of one and one-half octaves, though the number of these bars may be any that is desired. An electric-hammer device E is provided for each bar *e*, thus forming a series of these devices supported on a frame F, preferably of metal, fastened upon the shelf *A*¹. It is desirable to form the frame in two sections, as represented in Fig. 2, or more than two, to abut endwise, each section carrying a set of the hammer-devices, a set thereof, according to the representation, consisting of nine, though that is a merely arbitrary division. As the hammer devices all involve the same construction, description of the construction of one will suffice.

G (see Fig. 3) is an electro-magnet, represented as of the double-spool variety, fastened on the frame F, to which is also fastened one end of a flat spring *f* extending across the magnet-poles and carrying the armature G¹. A set-screw *f*¹ working in the frame serves for adjusting the tension of the spring. A tubular metal socket *g*, split longitudinally at its forward end, and there carrying a set-screw-fastened collar *g*¹, is firmly secured at its rear flattened end upon the forward part of the armature, which is normally held away from the magnet-poles by its carrying-spring *f*. The armature carries the hammer H composed of a head *h*¹ on the outer end of a preferably flexible stem *h*, which may best be formed of tubular metal, as brass, and which enters, at its rear end, into the split end of the socket *g* wherein it is releasably and adjustably held by the collar *g*¹ and its set-screw.

Each section of the frame F is provided at its ends with post-members F¹, F¹ connected at their upper ends by a bar F², preferably of metal, having secured along its rear side a strip F³, preferably of wood or other insulating material, and shown as of general inverted-L shape in cross-section. The bar F² contains a longitudinal series of vertical holes *i*, each hole registering with

a different hammer at its socket-holder *g*, and in each hole is reciprocally confined a metal plunger *k*, forming a circuit-breaker, provided on each end with a head and frictionally held, yieldingly, in its hole *i* by a
5 spring *l* fastened on the bar to bear against the plunger, as shown in Fig. 3; this spring having an upturned end *l*¹ in the path of the upper head of the plunger and affording a stop for the purpose hereinafter explained. On the flattened rear end of each socket *g* is secured a flat
10 strip of metal *m* having a raised bearing-lip *m*¹ underneath the lower head of the respective plunger *F*²; and beyond the lip-section of the strip it is formed into a hook-shaped guide *m*², bifurcated toward its upper extremity to embrace the plunger. Each magnet *G* is
15 contained in a different branch *w*¹ of the circuit of a suitable electric generator (not shown), the positive pole of which is connected by a wire *w* with the contact-roller *D* and its negative pole, by a wire *w*², with the bar *F*², and each branch-wire *w*¹ connects a different contact *d* with a corresponding contact, shown
20 as a brush *n*, in position to engage with the upper head of a plunger *k*; all as represented in the diagram presented in Fig. 5. The contact-brushes are preferably formed, as shown, of bunches of fine wires adjustably
25 confined in tubes *n*¹, which are supported, as represented of the brush-tube illustrated in Fig. 3, in a longitudinal series of horizontal openings provided in the upper part of the strip *F*³.

The operation of the mechanism thus far described
30 is as follows: The motor which drives the belt *c*³ being set in motion, the rollers *D* and *D*¹ are turned to feed the music-sheet *C*. As any perforation in the traveling sheet registers with a contact *d* the electric circuit is closed over the respective branch *w*¹, thereby energiz-
35 ing the electro-magnet in that branch to attract its armature and strike the hammer it carries against the respective bar *e* of the instrument *B* to sound it. The attraction of the armature breaks the circuit by the resultant engagement of the respective guide *m*², in descending, with the lower head of the plunger *k* it embraces, which separates the upper head of the latter
40 from its contact-brush *n*. The extent of downward stroke of the plunger is limited by the stop *l*¹ in the path of its upper head, to prevent the armature from striking its magnet, whereby the working of the armature is noiseless. This breaking the circuit de-ener-
45 gizes the electro-magnet, permitting its spring-armature to rise and, in rising, to elevate the plunger again into engagement with its contact-brush *n*, thereby
50 again closing the circuit to repeat the stroke of the hammer. Thus, while a perforation in the music-sheet is traversing a contact *d*, the particular hammer will be repeatedly vibrated to produce the desired frequency of stroke of the respective hammer against the bar, or
55 block, *e* upon which it plays.

As a desirable adjunct of my invention, I provide means, most clearly illustrated in Fig. 4, for diminishing the force of the hammer-strokes; and following is a description of the said means: Between the instru-
60 ment *B* and the row of electro-magnets *G* there rises a stationary plate *I* extending lengthwise of the instrument and provided with vertical guide-slots *o* at intervals coinciding with the hammer-stems to receive the

latter into the slots for guidance in their vibratory movements. From the opposite end-portions of one
65 side of this slotted plate there project brackets *p*, *p*, in which a rod *p*¹ is supported near its ends, which project beyond the brackets. *K* is an electro-magnet, like the magnets *G*, supported at one end of the row of the latter on the shelf *A*¹ and having its armature *K*¹ on a
70 stem *r* pivoted between its ends upon a projecting end of the rod *p*¹, the armature being yieldingly supported in raised position relative to the poles of the electro-magnet, which it crosses, by a light spiral spring
75 *s*. On the opposite projecting end of the rod *p*¹ is journaled an arm *t*, and this arm and the rearwardly projecting end of the armature-stem *r* are connected by a stop-bar *u* carrying lengthwise on its upper surface a strip of felt *v*, or other suitable sound-deadening material. The electro-magnet *K* is connected with a
80 contact *d*¹, bearing against the roller *D*, by a branch-wire *w*³ leading to the frame-bar *F*².

By means of the mechanism last described, when the contact *d*¹ engages with the roller *D* through a perforation in the traveling music-sheet, the resultant circuit-
85 closure effects attraction of the armature *K*¹ by its magnet *K* and thus raises the bar *u* into the path of the hammer-stems *h*, whereby they are intercepted in their strokes and are flexed over the stop-bar *u* to strike more lightly the bars *e* of the instrument *B*.
90

While my invention, as shown and described, involves electric power for playing the instrument, it is within my invention to employ pneumatic power for the purpose.

What I claim as new and desire to secure by Letters
95 Patent is—

1. In combination with a musical instrument of the character described, an electrical mechanism for playing it comprising a circuit having branches, a contact-roller
100 in said circuit, feeding means for the perforated music sheet co-operating with said roller, electrical contacts between which and the said roller the sheet is fed, electro-magnets each connected with a contact by one of said branches and each provided with a vibratory armature,
105 hammers on flexible stems connected with the armatures adapted to be actuated by their vibrations, means for diminishing the hammer stroke consisting of an electro-magnet, a contact with which said electro-magnet is connected by one of said branches, a spring-raised armature having a pivotally supported stem for said electro-mag-
110 net, and a stop-bar located to be moved by the stem into the path of the hammer stem.

2. In combination with a musical instrument of the character described, an electrical mechanism for playing it comprising a circuit having branches, a contact roller
115 in said circuit, feeding means for a perforated music-sheet co-operating with said roller, contacts forming the terminals of corresponding ends of said branches and between which and the said roller the music sheet is fed, a frame, electro-magnets supported on said frame, one in
120 each branch a plurality of armatures one for each magnet, a plurality of springs one for each armature by which the armature is fastened to the frame, hammers on stems one connected with the free end of each armature a series of contacts one in each branch supported adjacent to each
125 armature and a circuit-breaker in each branch of the circuit supported on the armature and normally engaging a contact.

3. In combination with a musical instrument of the character described, an electrical mechanism for playing
130 it comprising a circuit having branches, a contact roller in said circuit, feeding means for feeding a perforated

music sheet co-operating with said roller, contacts forming the terminals of corresponding ends of said branches and between which and the said roller the music sheet is fed, a frame, a row of electro-magnets supported on said
5 frame one in each branch and each provided with an armature, a plurality of springs fastened to the frame and each supporting one of the armatures, hammers on flexible stems connected with the free ends of the armatures, a series of contacts one in each branch supported adjacent
10 to each armature, and a circuit breaker in each branch of the circuit, supported on the armature and normally en-

gaging a contact and means for diminishing the strokes of the hammers consisting of a magnet having its armature spring-raised and provided with a stem by which it is pivotally supported on the frame and a stop-bar connected
15 with the free end of said stem and extending underneath the hammer stems.

HENRY K. SANDELL.

In presence of--

A. U. THORIEN,
W. B. DAVIES.