

(No Model.)

2 Sheets—Sheet 1.

W. H. GILMAN.
MECHANICAL MUSICAL INSTRUMENT.

No. 403,834.

Patented May 21 1889.

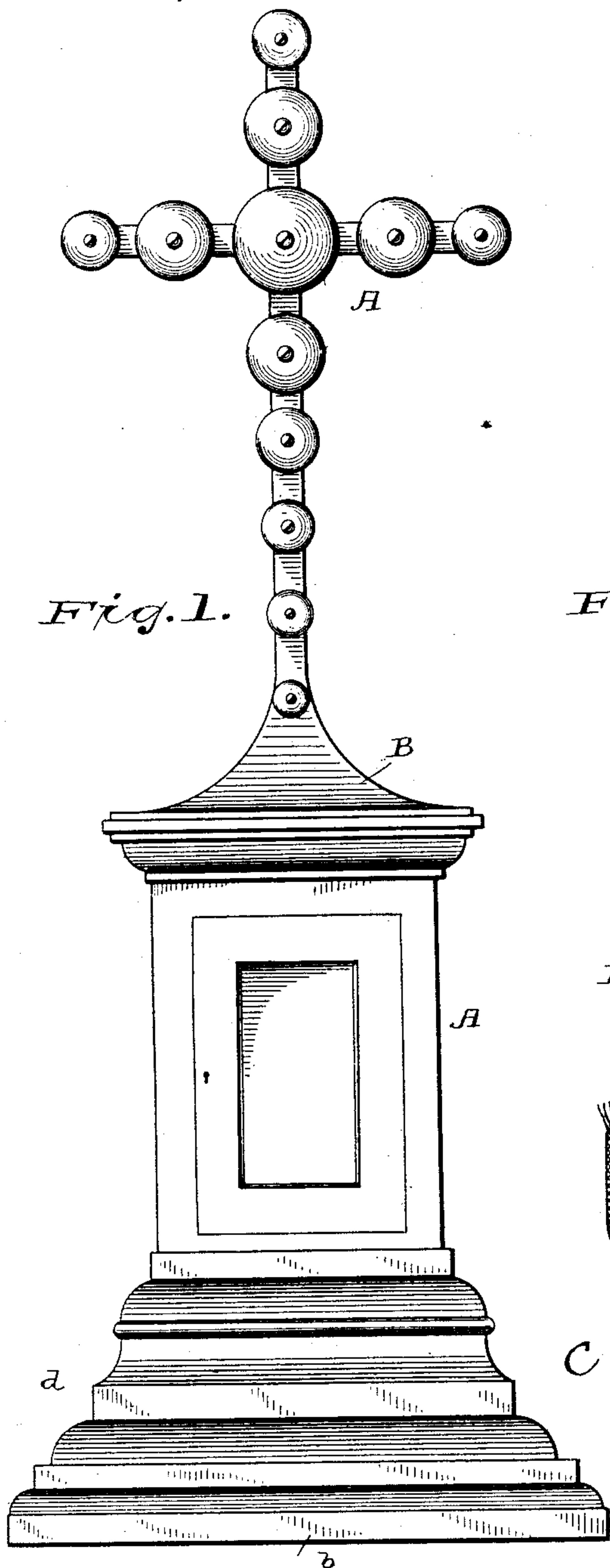


Fig. 1.

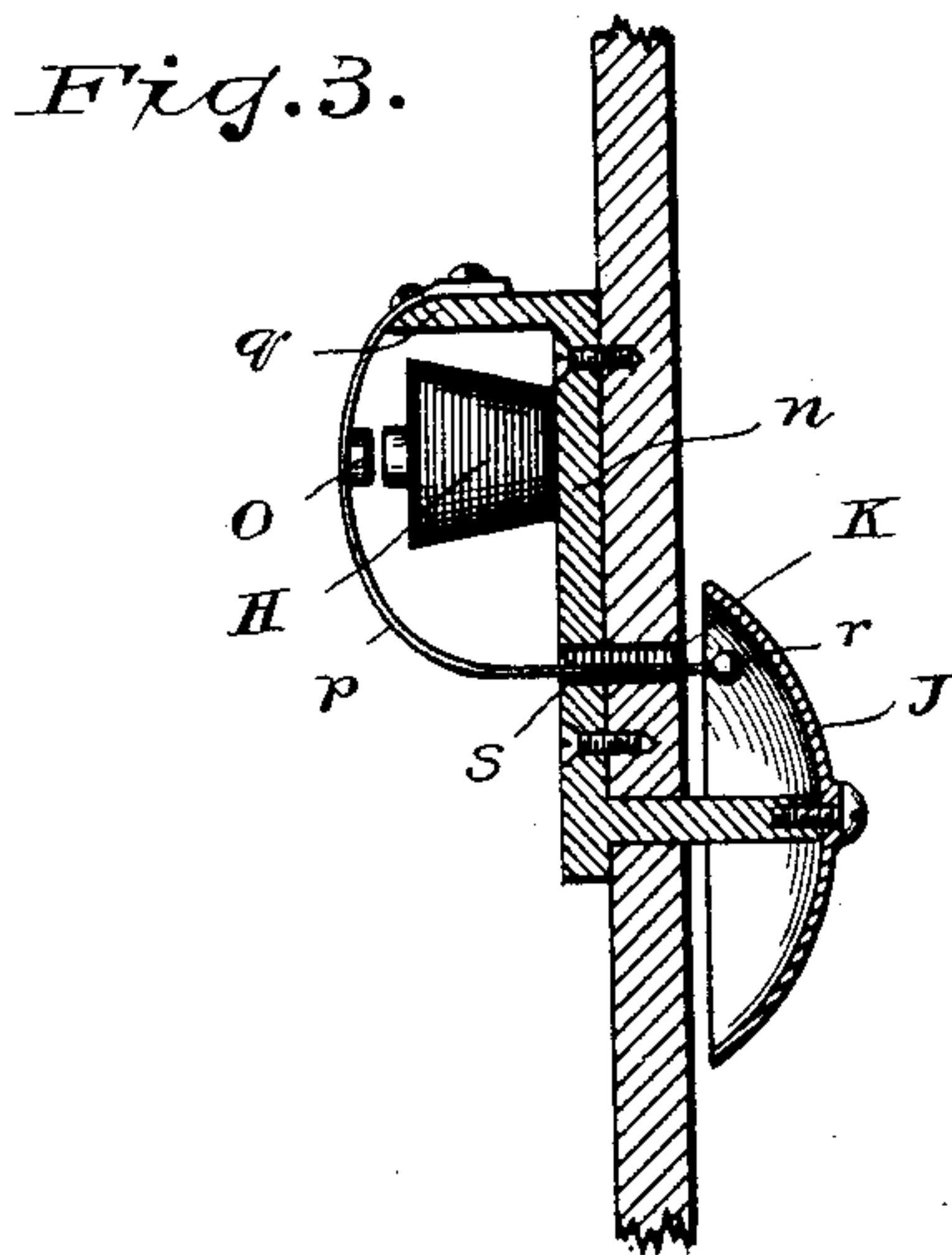
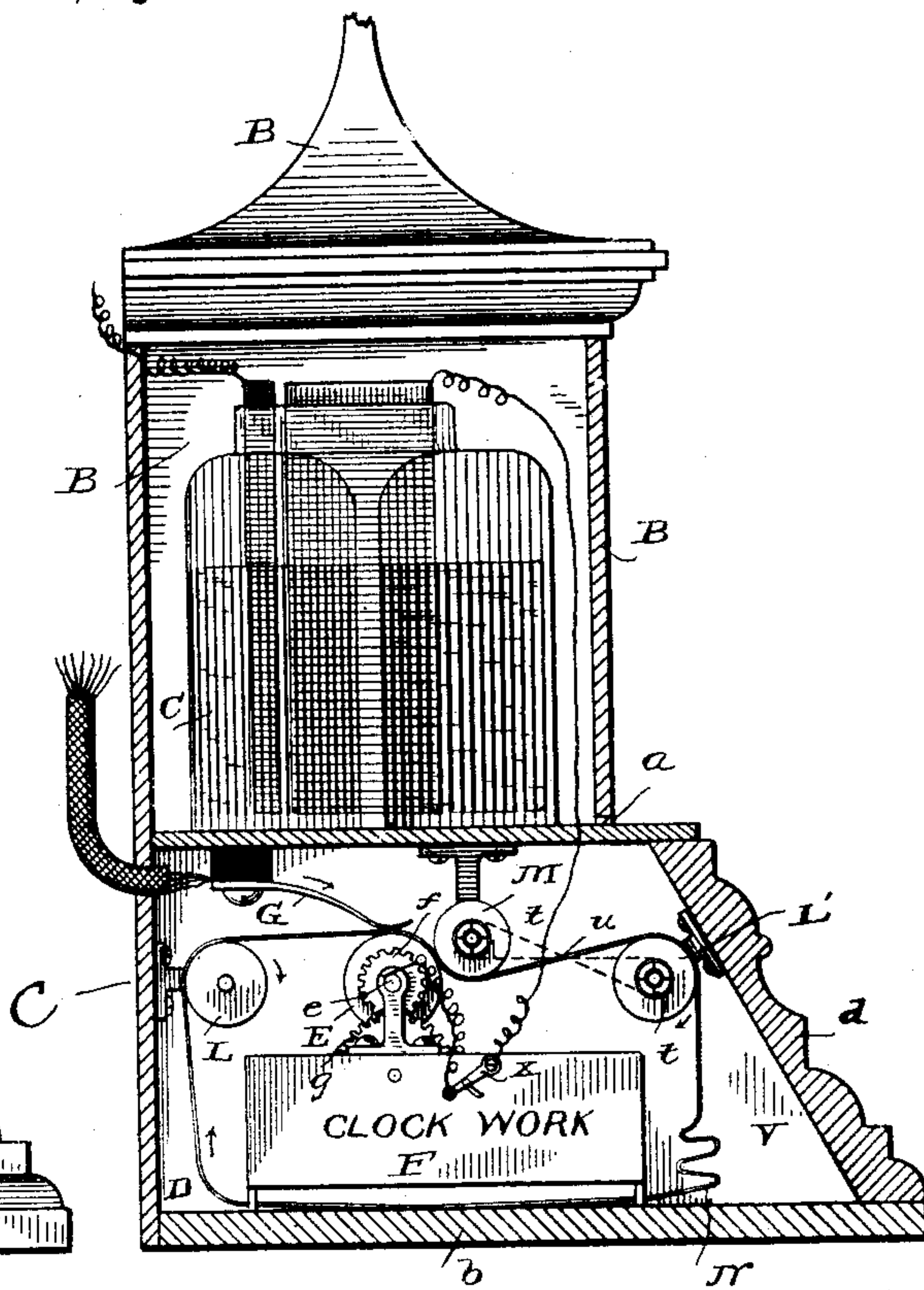


Fig. 3.

Fig. 2.



Witnesses,

H. A. Lamb,
R. Wallis

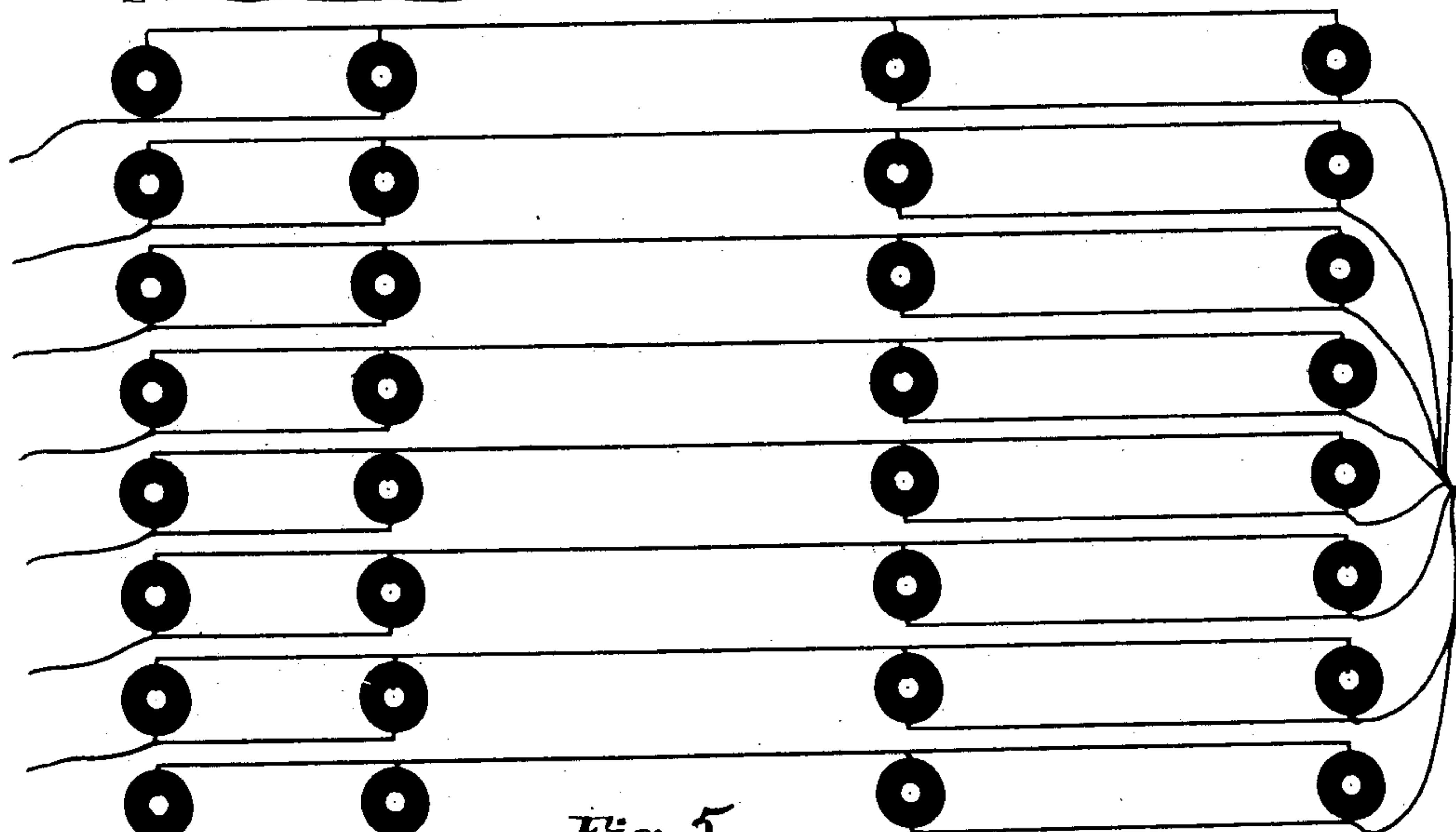
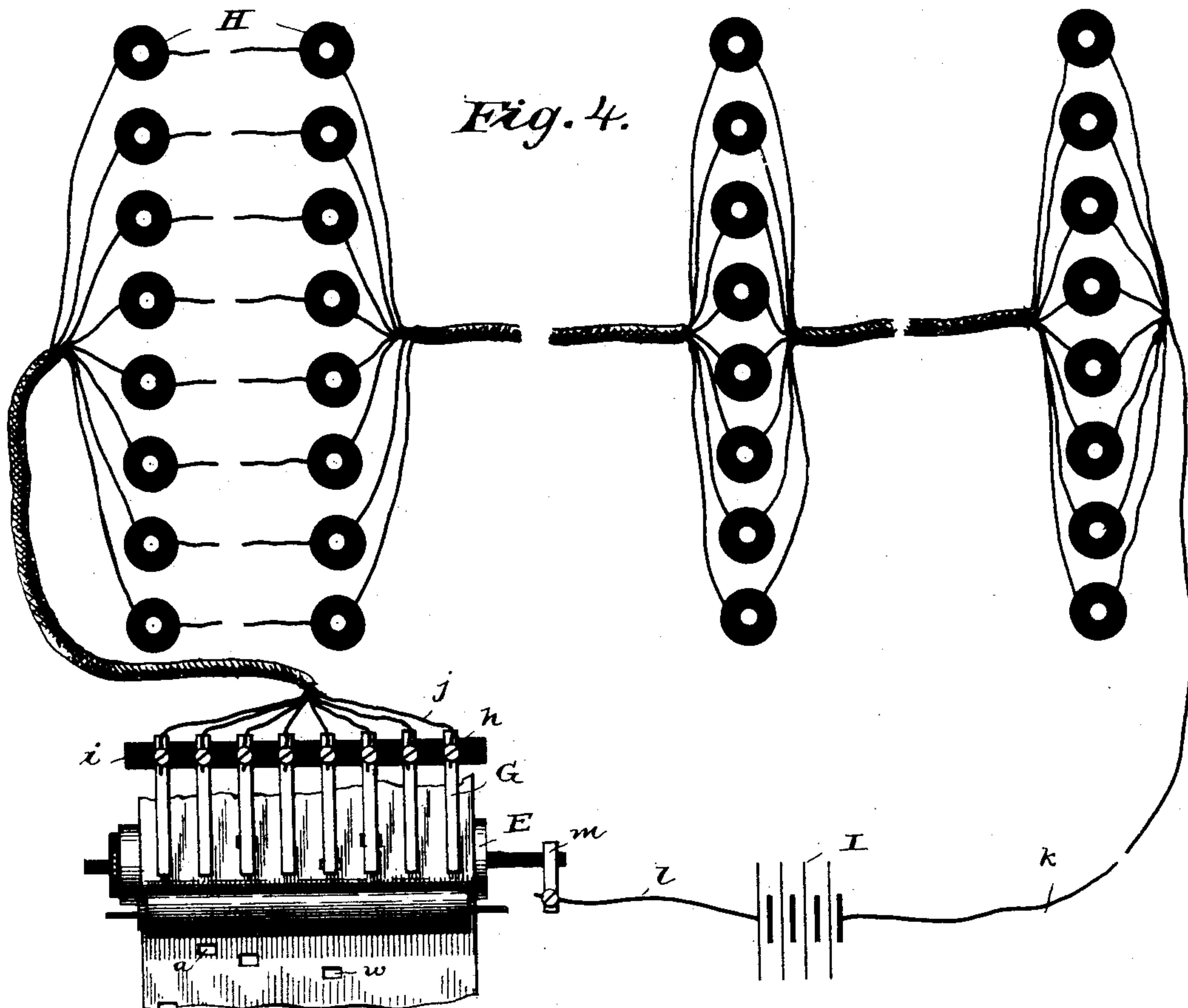
Inventor.

Willard H. Gilman
By F. R. Harding,
his Attorney.

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UNITED STATES PATENT OFFICE.

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WILLIAM S. REED, BOTH OF LEOMINSTER, MASSACHUSETTS.

MECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 403,834, dated May 21, 1889.

Application filed July 21, 1888. Serial No. 280,599. (No model.)

To all whom it may concern:

Be it known that I, WILLARD H. GILMAN, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Electric Chimes; 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.

My invention relates to self-playing instruments, and more particularly to a system of producing musical sounds from chimes or bells in which each bell or bells representing a particular musical note yields its sound by the operation of electro-magnetic means.

My invention consists in certain details of construction, arrangement, and combination of parts, all of which will be fully described, and specific points of novelty in which will be designated in the appended claims.

Referring to the accompanying drawings, Figure 1 is a view in front elevation, showing one form in which my invention may be embodied. Fig. 2 is a vertical section of Fig. 1, parts being broken away for the sake of space. Fig. 3 is a detail sectional view showing the annunciator, its hammer, and the electro-magnetic means for actuating the latter. Fig. 4 is a diagrammatic view of the circuit and connections, showing my invention complete. Fig. 5 is a modification of the diagram shown in Fig. 4.

Referring to the accompanying drawings, in Figs. 1 and 2, A designates a suitable ornamental casing of any approved shape or construction, having the inner recessed compartment, B, containing the source of electricity by which the electro-magnets are energized. The casing A is supported upon a base, C, consisting of the top plate, *a*, bottom plate, *b*, and side plates, *c* *d*, respectively. As shown in Fig. 2, this base C is provided with an inner compartment, D, in which is located the mechanism controlling the production of musical sounds by the several annunciators. This mechanism consists of a rotating cylinder, E, mounted in suitable bearings, *e*, and provided with the pinion *f*, formed integral with one end thereof and intermeshing with the larger pinion, *g*, which latter forms the

actuating instrumentality of the clock-work mechanism F. (Shown conventionally in the drawings.) This clock-work mechanism may be of any approved or desired construction or pattern, or, indeed, it might be an electric motor, if preferred, the object being merely to give rotary motion to the cylinder E.

Referring now to Figs. 2 and 4, G G represent a series of spring contact-fingers rigidly attached at one extremity by the binding-posts *h* to a piece of insulation, *i*, and each bearing at its free extremity upon the cylinder E. The contact end of each spring G is formed curved, as shown in Fig. 2, so that a very small area is in metallic contact with the cylinder E. It will also be observed that the insulation, *i*, is in both different horizontal and vertical planes from the cylinder E, each contact-spring curving obliquely down from its insulated support *i* to the cylinder E. Thus it will be seen that the tension of each spring G is exerted obliquely and downwardly in the direction of the arrow upon the cylinder E.

Each contact-spring G is connected through binding-post *h* by a suitable wire, *j*, with its corresponding electro-magnet H, which in turn is in circuit by wire *k* with one pole of the battery I, the other pole of which is in electrical communication with the shaft of the cylinder E by the wire *l* and contact-brush *m*. Each electro-magnet H is secured in close proximity to each pole upon a base or bracket, *n*, and has its free extremity attached in an opposite plane upon the curved stem *p* of the annunciating-hammer K, which is made of springy or flexible metal and has one extremity rigidly attached to the arm *q* of the bracket *n*, while its other free extremity is provided with a metallic ball or knob, *r*, which in turn rests normally out of contact with the body of the bell J.

The object of making the stem *p* of the annunciating-hammer K of spring metal is to dispense with the use of a retracting-spring for withdrawing the armature after it has been attracted by the adjacent pole of the electro-magnet H, for the reason that the said stem *p*, being rigidly attached at one extremity and having its other extremity passing through the perforation *s* in the base *n*, serves to react and replace the armature O to

its normal position after the magnet H has become de-energized. However, it will be well understood that instead of employing this construction the ordinary non-elastic bell-hammer may be utilized, provided a suitable retracting-spring is attached thereto similar to the key of the Morse instrument.

Referring again to Fig. 2, L and L' designate two drums or rolls mounted upon suitable bearings, as shown, and capable of rotation in the direction of the arrows, and M designates another roll similarly constructed and rotatably journaled, so that it will in its revolution make impact with the face of the cylinder E. On one end of each of the respective rolls L' and M is a small pulley, *t*. Over these pulleys works the cross-belt *u*, whereby the motion which is transmitted from the cylinder E to the roll M is communicated to the roll M'.

N designates an endless web or sheet of paper arranged to travel in the direction of the arrow over the roll L, between the spring-fingers G and the cylinder E, under roll M, over roll L, and down to the point *v*, where it falls by gravity in a heap similar to the continuously-fed tape of a stock-ticker. The endless web or paper N is provided with a series of relatively-arranged perforations, *w*, as shown clearly in Fig. 4, which latter correspond in location, position, and length to the pitch and duration of the note represented by the particular bell corresponding to such perforation, and as the web N passes over the cylinder these perforations *w w* are brought or registered in proper position or sequence with the spring contact-fingers G G under the influence of the actuating clock-work. Thus as each perforation *w w* passes under its respective contact-spring G, the free end of the latter will by virtue of its tension be forced through such perforation into metallic contact with the face of the rotating cylinder E, thereby closing the circuit from the battery I by wire *l*, brush *m*, cylinder E, spring G, wire *j* to its respective electro-magnet H, which latter is energized and causes the attraction of its armature O, and consequently the impact of the annunciator-hammer against the bell I, thus producing a musical note corresponding to the note of the bell struck by the hammer.

In Fig. 2 is shown a switch which serves the dual capacity of opening the circuit from the battery to the cylinder E and of stopping the operation of the clock-work mechanism. The purpose of this switch is obvious, since by a single movement of the same the passage of the sheet end over the cylinder E will be arrested, and at the same time the circuit from the battery I will be opened. Owing to the tension of each contact-finger G being exerted in the direction of the arrow and the direction of rotation of the rolls M L, the endless sheet N will be kept perfectly taut against the face of the cylinder E, and, further, will be continuously fed by friction in the direc-

tion of the arrow as long as the clock-work F is in operation. It will be apparent that the sheet N may contain any number of pieces of music, which can be repeated *ad libitum*, according to the duration of operation of the clock-work mechanism, which latter may be rewound periodically, or may be provided with any of the usual self-winding attachments.

Now, referring to Fig. 4, I have shown eight contact-fingers, G, each of which is in circuit by means of wire *j* with four bells, all capable of yielding the same fundamental note. Thus when any contact-finger G closes the circuit through a perforation, *w*, in the sheet N four bells will be simultaneously sounded. In this arrangement each electro-magnet H H of the respective four bells is in series with each other. In Fig. 5 the arrangement is substantially the same, except that the electro-magnets H H are placed in divided or multiple arc circuit. In both of these constructions the operations will be substantially similar. However, various changes in the winding and construction of the electro-magnets will lead to differential results in the duration and difference in time of the musical notes emitted by the several bells.

It will be readily seen that since the chimes heretofore in use are congregated or assembled together in close proximity to the audience the sounds yielded by the several bells are deafening and commingled, and are consequently deficient in a great measure of the mellowness and charm which can be obtained by the arrangement constituting my invention.

Of course it will be understood that the selection of the several sizes and shapes of bells is of great importance, and due precaution must be taken in carrying out my invention to adjust the place of impact of the annunciator-hammer against the bell, so that its stroke will yield the fundamental note of the latter. A good bell when struck yields one note, so that any person with an ear for music can determine what it is. This is called the "consonant," and when it is perfectly heard the bell is said to be true. Any bell of moderate size may be tested in the following manner: Tap the bell just on the curve of the top and it will yield a note one octave above the consonant. Tap the bell about one-fourth distance from the top and it should yield a note which is a quint or one-fifth of the octave. Tap it two-fourths and one-half lower and it will yield a tierce or one-third of the octave. Tap it strongly just above the rim and the quint, tierce, and the octave will now sound simultaneously, yielding the consonant or key-note of the bell. If the tierce is too sharp, the bell's note wavers between a tone and a one-half tone above it. If the tierce is flat, the note wavers a tone and one-half tone below it. In either case the bell is said to be false.

The quality of the bell depends not only on the casting and the fineness and mixture of

the metals, but upon the due proportion of the metal to the caliber of the bell. The larger the bell the lower the tone. Thus it will be understood that in the manufacture and arrangement of the several parts representing the chromatic scale great care must be exercised.

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

1. The combination of a plurality of bells severally representing one or more musical notes, electro-magnetic means for severally actuating said bells, an electric circuit including said electro-magnetic means, a series of spring-fingers, G, controlling said electric circuit, the rotatable cylinder E, also included in said electric circuit, clock-work mechanism for rotating said cylinder, the perforated sheet N, passing between the fingers G and the cylinder E, and guiding-rollers M, L, and L' for said sheet, substantially as described.

2. The combination, with a plurality of bells, of electro-magnetic means for severally actuating said bells, an electric circuit including said electro-magnetic means, a series of spring-fingers, G, also included in said circuit and severally connected with their respective electro-magnetic means, a single bar of insulation separating and supporting said spring-fingers G, a rotatable cylinder, E, also included

in said electric circuit, the perforated sheet N, passing between the fingers G and the cylinder E, clock-work mechanism for actuating said cylinder E, and guiding-rollers for the said sheet N.

3. As a new article of manufacture, the combination, with the casing B, having a receptacle for the battery C, of the battery C, located therein, a series of bells, A A, mounted upon the casing B in a suitable manner, electro-magnetic means for actuating severally said bells, an electric circuit extending from said battery C to said electro-magnetic means, a series of spring circuit-controllers severally connected in said electric circuit and normally resting upon the face of the metal cylinder, a metallic cylinder also included in said electric circuit, a sheet of flexible material provided with perforations arranged to pass between said spring circuit-controllers and said cylinder, and mechanism for feeding said perforated sheet between the circuit-controllers and cylinder, the whole being mounted upon a suitable casing, in the manner shown, substantially as described.

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

WILLARD H. GILMAN.

Witnesses:

GEO. H. E. TROUVELOT,
JOHN G. ELDER.