No. 705,952. Patented July 29, 1902.

J. McTAMMANY.

MECHANICAL MUSICAL INSTRUMENT.

(Application filed July 9, 1898.)

(No Model.) 5 Sheets—Sheet 1.

FIG. 1.

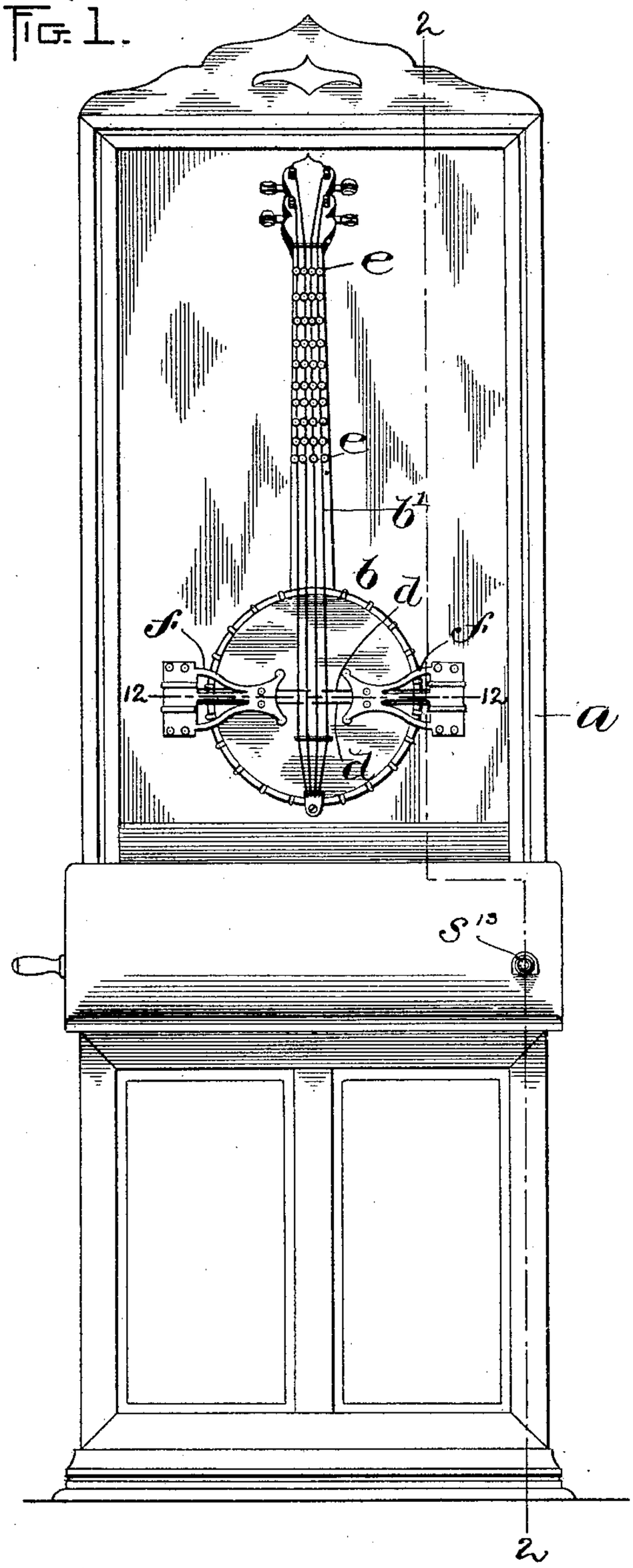
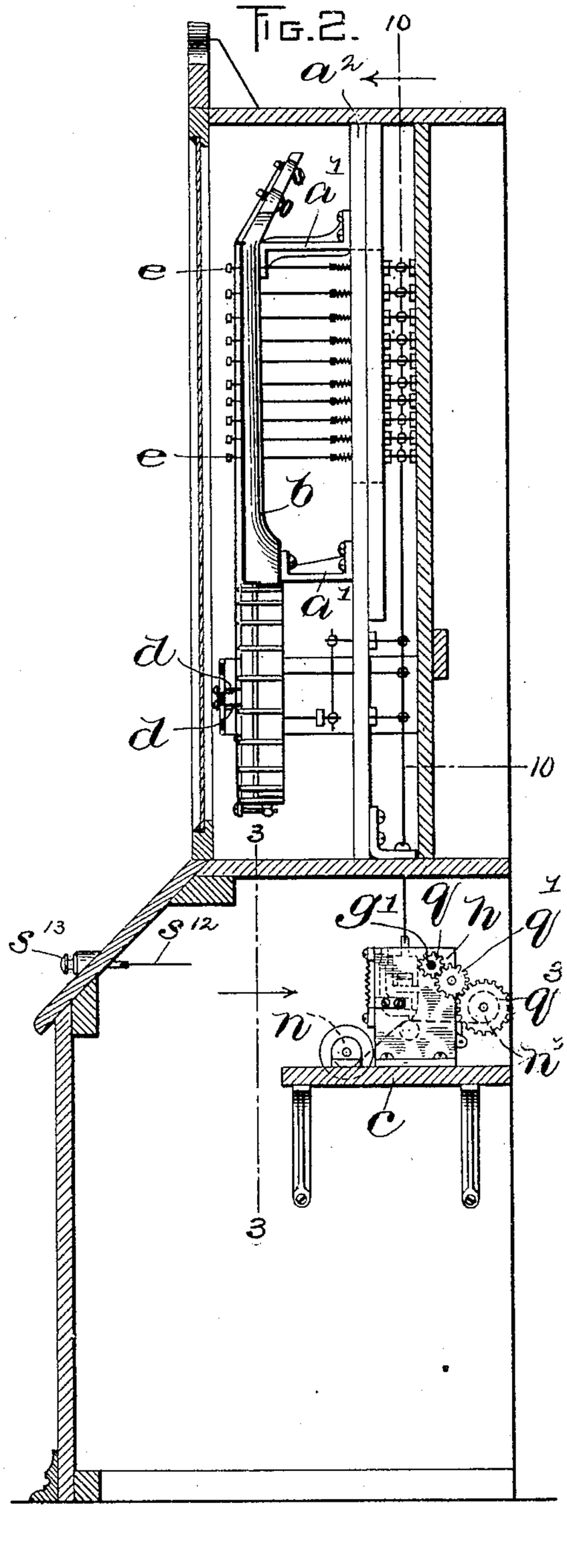


FIG. 2.



Witnesses:
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P. W. Pezzetti

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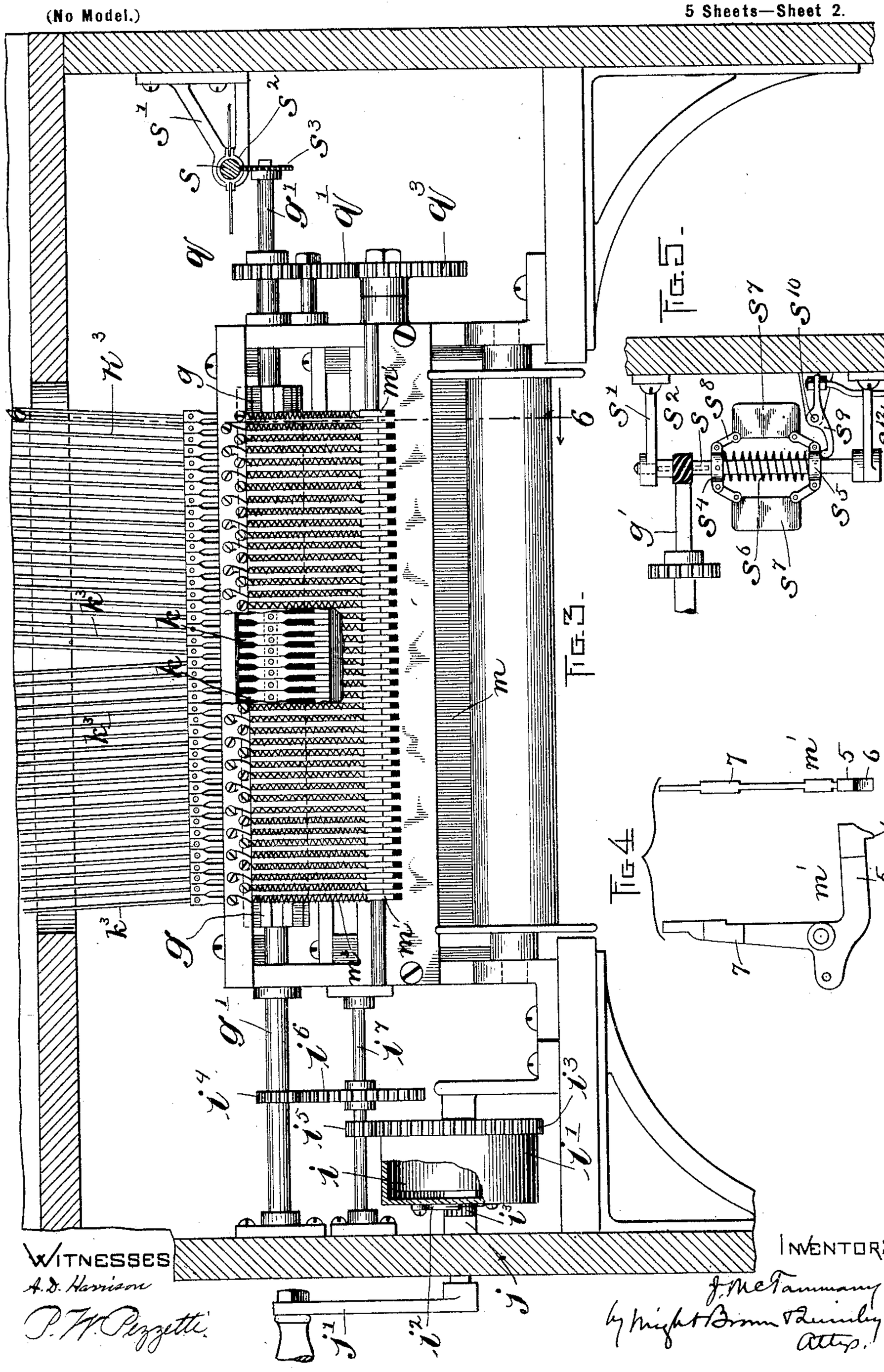
(No Model.) 5 Sheets—Sheet 2.



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(No Model.) 5 Sheets—Sheet 3.

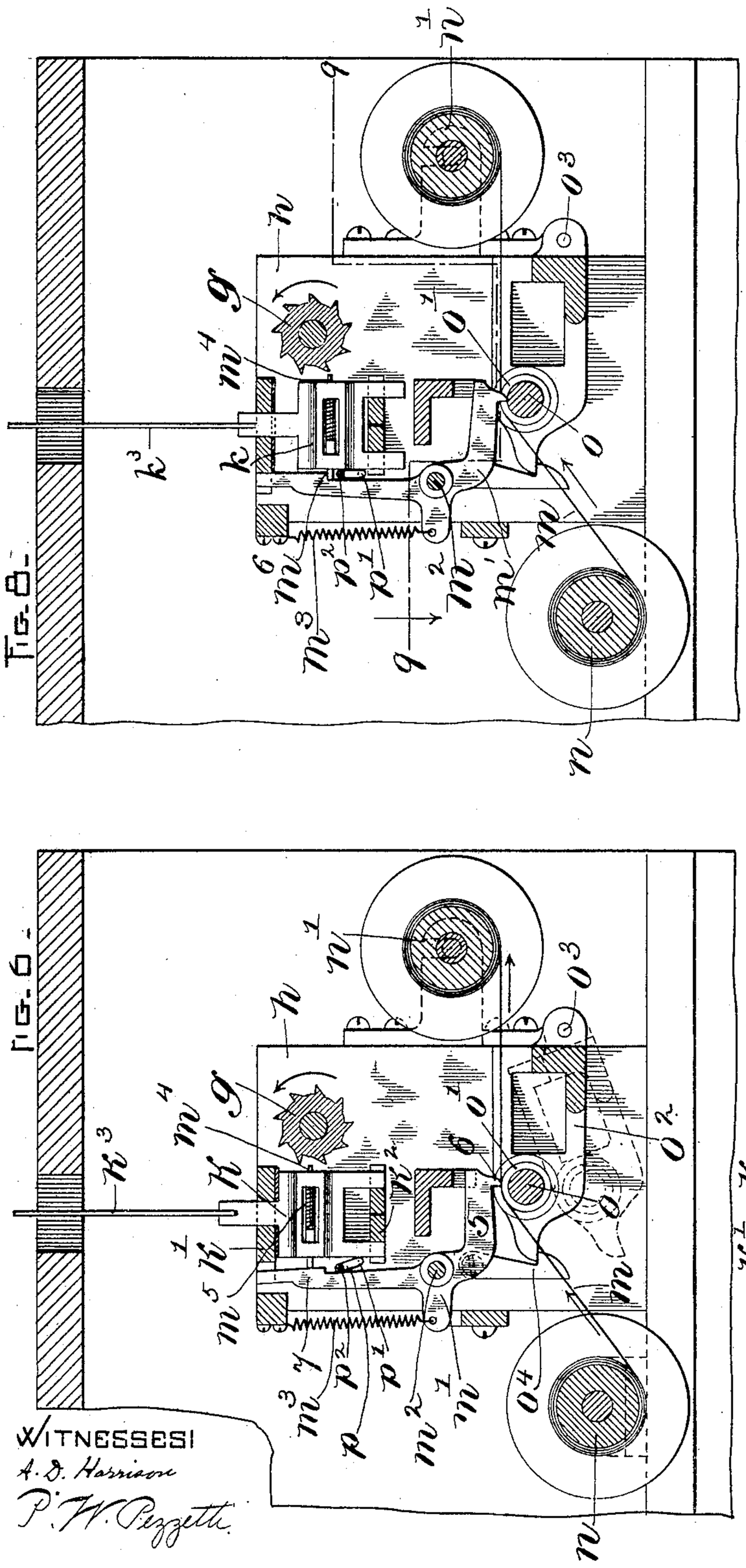

FIG. 8.

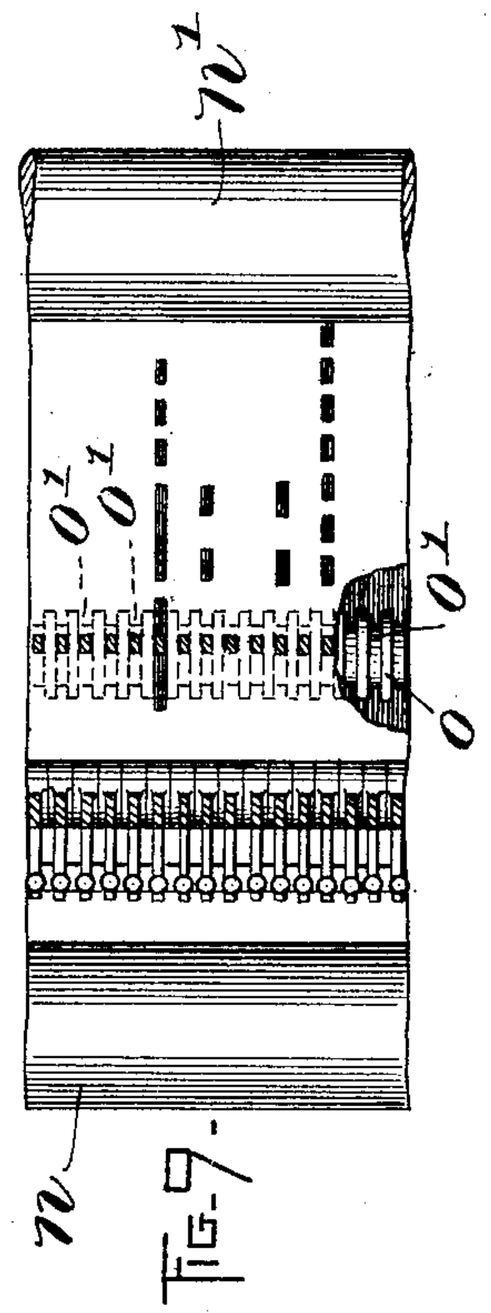

FIG. 7.

FIG. 6.

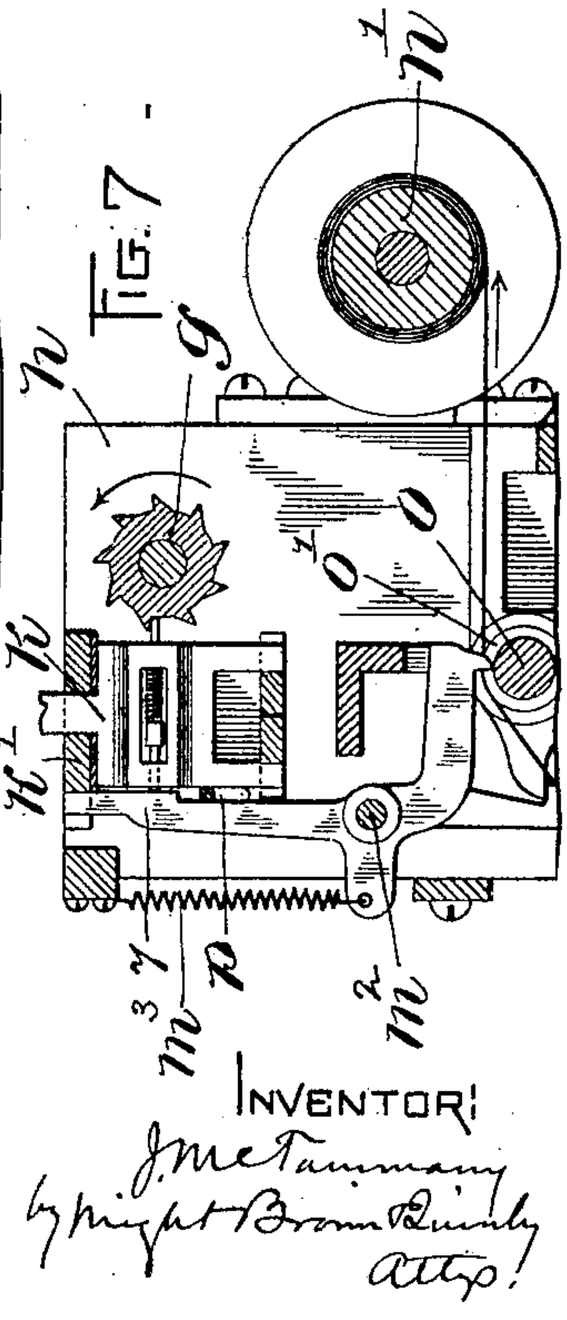

FIG. 7.

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MECHANICAL MUSICAL INSTRUMENT.

(Application filed July 9, 1898.)

(No Model.) 5 Sheets—Sheet 4.

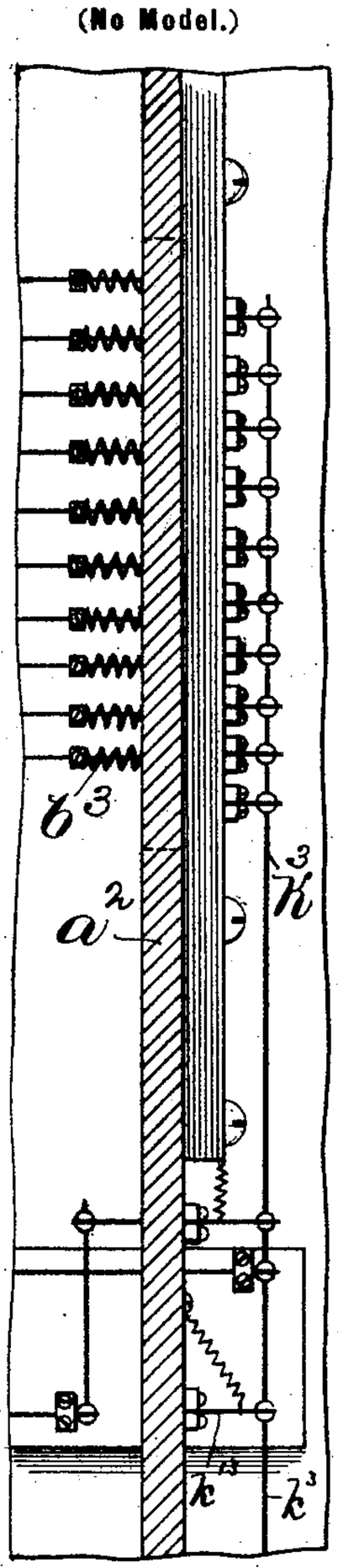

FIG. 11.

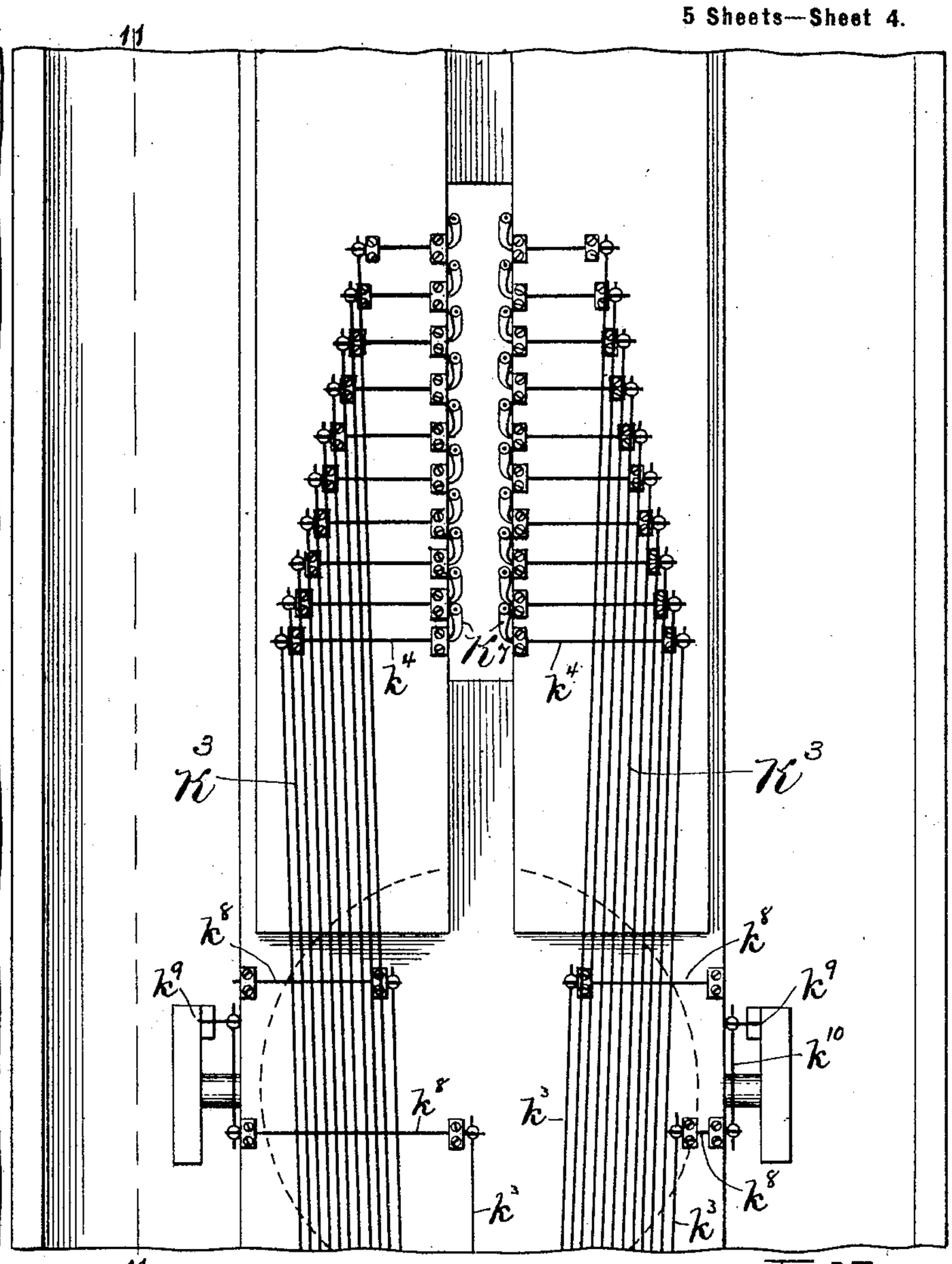

FIG. 14.

FIG. 10.

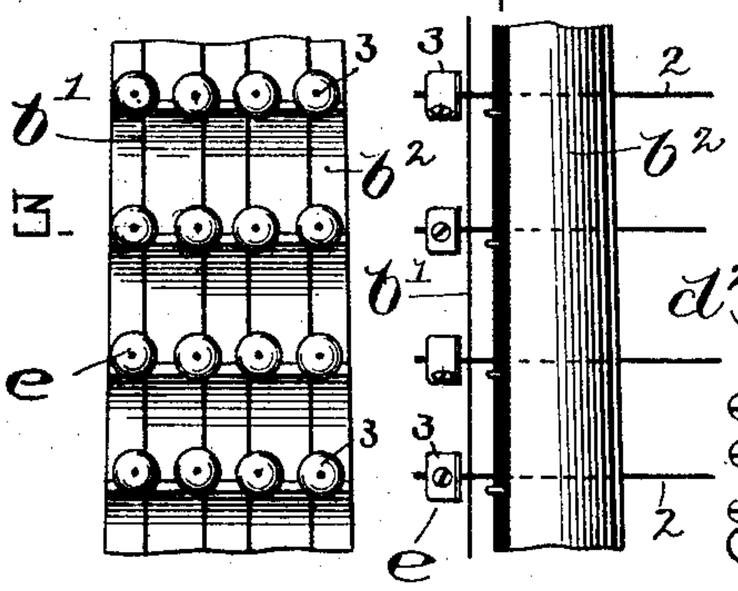

FIG. 13.

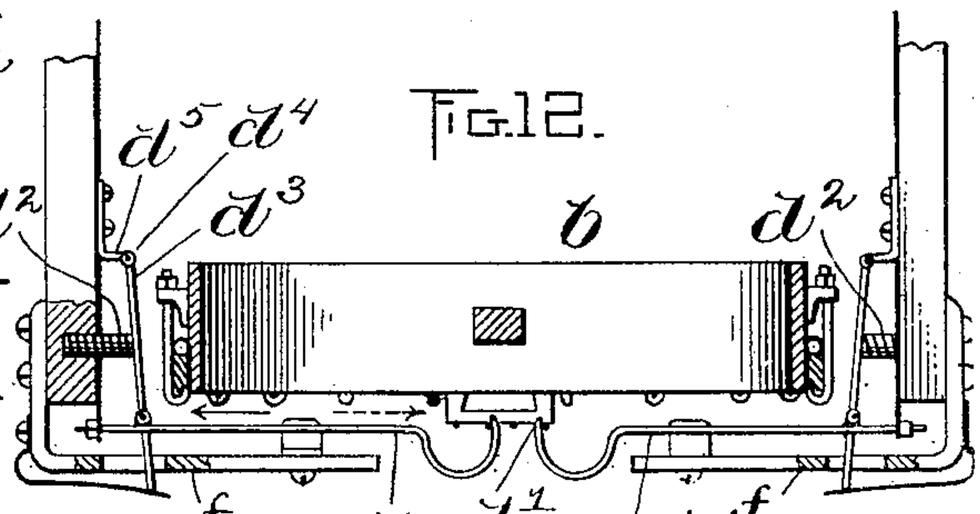

FIG. 12.

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MECHANICAL MUSICAL INSTRUMENT.

(Application filed July 9, 1898.)

(No Model.) 5 Sheets—Sheet 5.

FIG. 16.

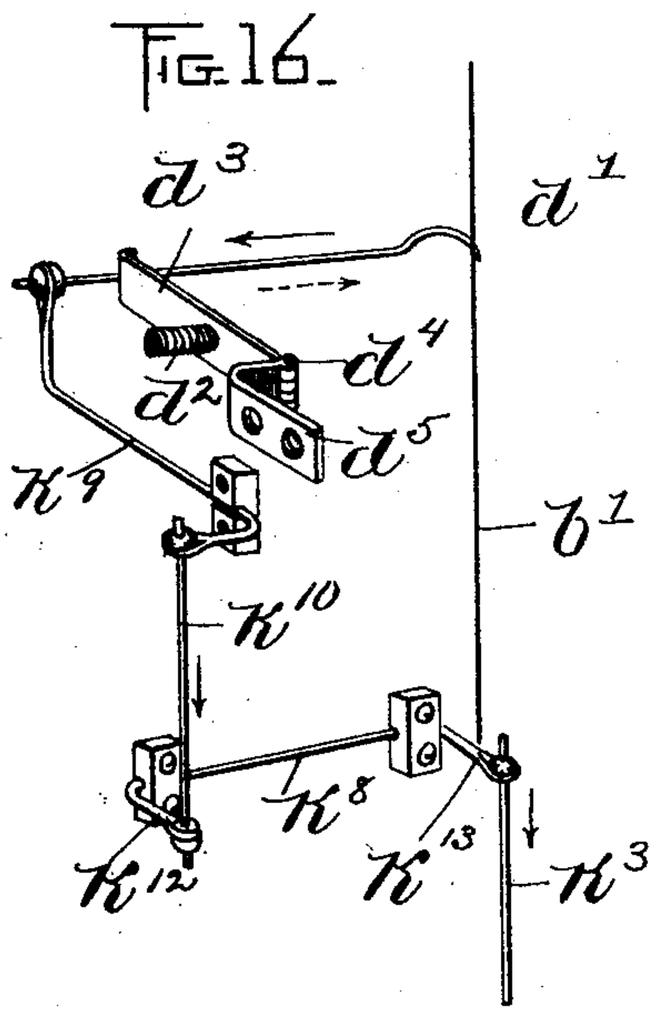
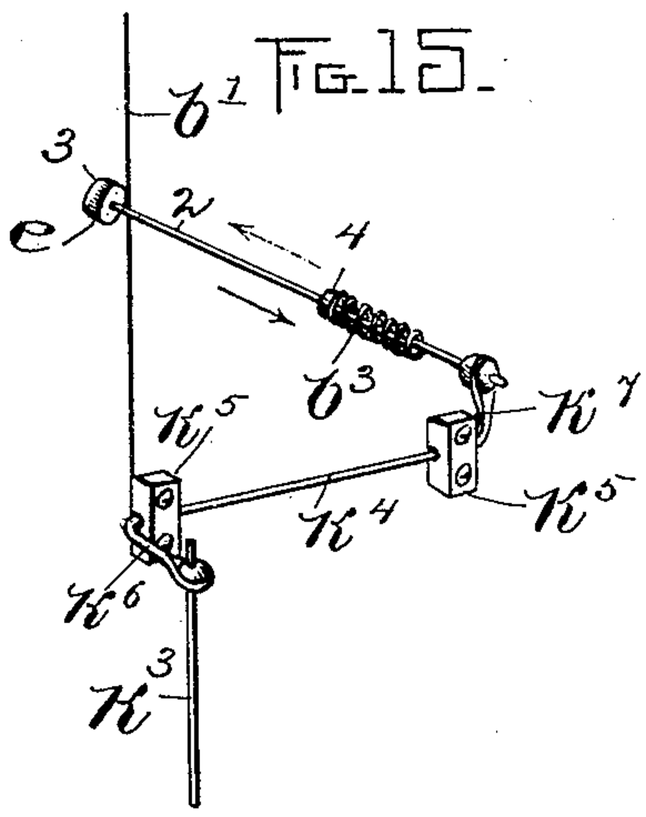


FIG. 15.



WITNESSES:
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UNITED STATES PATENT OFFICE.

JOHN McTAMMANY, OF SPENCER, MASSACHUSETTS.

MECHANICAL MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 705,952, dated July 29, 1902.

Application filed July 9, 1898. Serial No. 685,481. (No model.)

To all whom it may concern:

Be it known that I, JOHN McTAMMANY, of Spencer, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Mechanical Musical Instruments, of which the following is a specification.

This invention has for its object the improvement of that class of automatic stringed musical instruments having heads and fretted necks and in which the pitch of the tones is varied by automatically lengthening and diminishing the portions of the strings to be vibrated. This class includes such instruments as the guitar, violin, and mandolin, and examples of instruments belonging to it are illustrated and described in patents numbered 558,419, 565,739, and 488,520.

While my invention is designed more especially to apply to the class of instruments above referred to, nevertheless many of its features are applicable to mechanical musical instruments in general and unless specifically confined to one apply equally well to all.

In the patents referred to it will be observed that the motive power is electricity and that both electricity and pneumatics have been employed to control the action of the strings and pickers. My present invention contemplates the substitution of a spring or equivalent device as a motor, also a positive mechanical agency for controlling the action, together with certain improvements in the mechanism operated by the spring to actuate the instrument. My invention also contemplates the provision of improved means of feeding, winding, and guiding the perforated sheet and also the employment of new material for manufacturing the sheet and the mechanism which intervenes between the music-sheet and the strings and pickers, and, finally, various other improvements incidental to the purposes of my invention, all as hereinafter set forth. The novel points are described in detail in the annexed specification and pointed out in the claims.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a front elevation of the casing of a mechanical musical instrument embodying my invention, a banjo being represented in place in said casing. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents an enlarged section on line 3 3 of Fig. 2 looking toward the right. Fig. 4 represents in separate views one of the levers included in the selecting mechanism hereinafter described. Fig. 5 represents a top view of the adjustable fan-governor hereinafter referred to. Fig. 6 represents a section on line 6 6 of Fig. 3 looking toward the left. Fig. 7 represents a view similar to a portion of Fig. 6 at a different stage of the operation. Fig. 8 represents a view similar to Fig. 6, showing another stage of the operation. Fig. 9 represents a section on line 9 9 of Fig. 8. Fig. 10 represents a rear view of a portion of the machine. Fig. 11 represents a section on line 11 11, Fig. 10. Fig. 12 represents a section on line 12 12, Fig. 1. Fig. 13 represents a front view, and Fig. 14 an edge view, of a portion of the neck of the banjo shown in Figs. 1 and 2. Fig. 15 represents a perspective view of one of the string-shortening fingers and portions of the mechanism that operates it. Fig. 16 represents a perspective view of one of the pickers and portions of its operating mechanism.

The same characters of reference indicate the same parts in all the figures.

In the drawings, a represents a frame or casing, which may be of any suitable shape and is here shown as comprising an upper portion having a glazed front opening and containing a banjo b and a lower portion containing the mechanism for actuating the pickers d and string-shortening fingers e of the banjo. The banjo is here shown as attached to brackets a' a', which are attached to a vertical piece a^2, affixed to the casing a. The pickers d may be composed of wire rods suitably bent at their ends to form hooks d', adapted to engage the strings b' of the banjo, said pickers being suitably mounted upon fixed frames or holders f f, Fig. 1, projecting over the head of the banjo, said frames being provided with suitable means for guiding the pickers in their longitudinal movements and for giving the hooks d' a suitable outward and inward movement, so that when moving in one direction they will engage the strings and when moving in the opposite direction they will pass over the strings without engaging them, devices for this purpose being well known and forming no part of my

invention. The pickers are yieldingly held in position to engage the strings, as shown in Fig. 12, by means of springs d^2, which are arranged to exert pressure on the pickers in the direction indicated by the dotted arrows in Figs. 12 and 16, where said springs are shown as interposed between fixed parts of the frame, and swinging arms d^3, hinged at d^4 to fixed brackets or supports d^5, their swinging ends being engaged with the pickers d by nuts or buttons secured to the pickers and bearing on opposite sides of the arms d^3.

The string-shortening fingers e are composed of wire rods movable in holes formed for their reception in the neck b^2 of the banjo, and heads 3, of leather or other suitable material, attached to the outer ends of the rods 2 and formed to bear upon the strings b' when the fingers are moved in the direction indicated by the full-line arrow in Fig. 15. The fingers are yieldingly raised out of contact with the strings by means of springs b^3, interposed between the fixed parts of the frame and collars 4, affixed to the rods 2, the springs exerting pressure on the fingers in the direction indicated by the dotted arrow in Fig. 15. The fingers correspond in number and position to the frets on the neck of the banjo, and each finger when depressed presses the corresponding string against the adjacent fret.

g represents an actuator which is common to the series of pickers and fingers. Said actuator is here shown as an elongated fluted roll journaled in bearings in a frame h, which is supported on a shelf or bracket c in the lower portion of the casing a. This actuator is continuously rotated when the machine is in operation by means of a suitable motor, which is preferably a spiral spring i, (see Fig. 3,) which is coiled upon a shaft j, journaled in bearings in the frame h. The inner end of the spring is attached to said shaft, and its outer end is attached to a barrel i', which is free to turn loosely on the shaft j. The barrel is provided with a pawl i^2, which engages radial teeth i^3 on the shaft j, said pawl and ratchet-teeth being arranged to permit the free rotation of the barrel i' upon the shaft by the unwinding of the spring i and the winding of the spring upon the rotation of the shaft j, the latter having a crank j' for this purpose. The barrel i' has a gear i^3, which is connected with a gear i^4 on the shaft g' of the actuator g by means of intermediate gears i^5 i^6, mounted on the intermediate shaft i^7.

Between the actuator g and the pickers and fingers are interposed a series of normally inoperative couplings or mechanical connections adapted to connect the actuating device with the said pickers and fingers. Each of said couplings includes a slide k, which is located beside the actuator g and is movable in guides k' k^2, affixed to the frame h, a longitudinally-movable rod k^3, attached at one end to a slide k, and bent-wire connections between the opposite ends of the rods k^3 and the fingers and pickers, said connections being illustrated in Figs. 15 and 16, where the rods k^3 are shown as connected with the fingers by means of wire rock-shafts k^4, journaled in fixed bearings k^5 and having arms k^6 k^7 at their ends. The arm k^6 is engaged with nuts or buttons adjustably secured to the rod k^3, while the arm k^7 is engaged with similar nuts or buttons affixed to the finger e. The connection between the rods k^3 and the pickers illustrated in Fig. 16 includes two wire rock-shafts k^8 and k^9, journaled in fixed bearings like the rock-shaft k^4, and having arms at their ends. The said rock-shafts k^8 and k^9 are connected by a link k^{10}, one arm of the rock-shaft k^8 being connected with the rod k^3 and one arm of the rock-shaft k^9 to the picker d. When one of the described coupling devices is engaged, as hereinafter described, with the actuating device, the rotation of the latter causes a downward movement of the rod k^3, this movement resulting in a movement of either the picker or the finger connected with said rod in the direction required to make said picker or finger operative, as indicated by the full-line arrows in Figs. 15 and 16. Upon the disengagement of the coupling device from the actuator the picker or finger is restored to its normal position by its spring d^2 or b^3.

I provide a selecting device which is adapted to make the couplers operative by the actuator g in accordance with a predetermined plan or program. The selecting device as here shown comprises a perforated flexible sheet m and a series of levers m', which are fulcrumed at m^2 and have arms 5, provided with projections 6, which are held yieldingly against the strip m either by gravitation or, as I prefer, by means of springs m^3 and upwardly-projecting arms 7, which are in juxtaposition to the slides k and are arranged to act on dogs m^4, adapted to move in the slides k toward and from the actuator g. The dogs m^4 are normally retracted by springs m^5, so that they are out of the path of the teeth or projections of the actuator g, as shown in Fig. 6, this being the case when the finger 6 of the lever m' bears upon an imperforate portion of the strip m. When, however, a perforation or slot in the strip m coincides with the finger 6, the latter drops into the said perforation, and the arm 7 of the lever forces the dog m^4 toward the actuator, as shown in Fig. 7, thus causing the actuator to engage the dog and through the latter to depress the slide k and rod k^3, thus imparting motion to the string-controller—that is, either the finger or the picker—connected with the rod k^3. When a perforation or slot in the sheet passes away from the projection 6, the material of the sheet raises said projection, thus restoring the lever m' to the position shown in Fig. 6 and permitting the withdrawal of the dog m^4 from the path of the projections

of the actuator. When the projection 6 drops into a perforation of minimum length in the sheet m, it is quickly raised by the sheet, so that only one tooth or projection of the actuator g acts upon the coupling device, the slide k and the string-controller connected therewith being thus quickly operated and released. It is necessary, however, in many cases to hold a string depressed for a considerable length of time, the sheet m being provided with an elongated slot to accomplish this result, so that the lever m' remains in the position shown in Figs. 7 and 8 longer than when a slot or perforation of minimum length is employed. When the displacement of the lever m' from the position shown in Fig. 6 is thus prolonged, a detent or shoulder m^6 on the lever m' engages the outer end of the dog m^4, as shown in Fig. 8, when the dog and slide k have been depressed by the movement of the acting tooth of the actuator. The slide k is therefore interlocked with the lever m' and remains depressed so long as the lever is in its displaced position, thus preventing the teeth of the actuator from striking the dog m^4 and obviating needless wear of the dog and the teeth, the finger connected with the depressed slide being held continuously in contact with the corresponding string.

The strip m may, if desired, be in the form of an endless belt; but I prefer to make it as an elongated strip, one end of which is engaged with a supply-roll n and the other with a winding-roll n', said rolls being journaled in suitable bearings in the frame h. o represents an intermediate roll between the rolls n and n', said intermediate roll being arranged to deflect the sheet m between the rolls n and n', as shown in Figs. 6 and 8, the deflected portion of the sheet supported by the roll o being held in position to support the lever-arms 5. The roll o is provided with a series of peripheral grooves o', Fig. 9, which coincide with projections 6 on the levers m', said grooves receiving the projections 6 when the latter are permitted to drop by perforations in the sheet m, as shown in Figs. 7 and 8. The roll o is here shown as journaled in bearings formed in a swinging frame o^2, hinged at o^3 to the frame h, its swinging end being supported by a latch o^4 when the roll o is in its operative position. By disengaging the latch o^4 from the frame o^2 the roll o is permitted to drop, as shown in dotted lines in Fig. 6, thus separating the sheet m from the series of levers and permitting the sheet to be rewound upon the roll n after each performance.

Instruments of this character are used chiefly in public places, are kept in almost continuous operation, and are subjected to various atmospheric conditions. While it is quite practical to use a paper music-sheet in connection with my present invention, nevertheless it is desirable that some material be used which will be comparatively indestructible and unshrinkable. To this end I employ a thin flexible sheet of aluminium, which is sufficiently pliable to be easily wound and unwound from one roll to the other, while its edges are rigid enough to afford a guide to the sheet during its travel from one roll to the other, thus insuring the proper lateral position of the perforations in the sheet relatively to the levers m'. Since the music-sheet is unshrinkable, it follows that it must always register with the said levers regardless of atmospheric changes. In weight the aluminium sheet differs but little from one of paper, and the teeth of the levers m' do not wear the same at the ends of the slots in the normal operation of the instrument.

In Figs. 6, 7, and 8 I show means for simultaneously displacing all the levers m', so as to raise their projections 6 from contact with the sheet m, said means comprising a rod or bar p, extending across the frame between the series of slides p and levers m' and mounted to swing in bearings in the frame, its center of motion being shown at p' and its swinging edge at p^2. By turning the rod or bar p so that its swinging edge will move away from the slides k the levers m' will be displaced, so that their projections 6 will be raised from the sheet m. By moving the rod p in the opposite direction, so that its swinging edge will move toward the slides k, the levers will be free from interference with said rod.

The sheet m may be impelled by any suitable means, preferably by a connection with the actuator g, so that the sheet and the actuator will be driven by the same motor. To this end one end of the actuator-shaft g' may be provided with a gear q, which is connected by an intermediate gear q' with a gear q^3, affixed to the shaft of the winding-roll n'. (See Fig. 2.)

It is desirable that means be employed for varying the degree of power exerted by the spring, to the end that the movement of the sheet and actuator may be varied at will. For this purpose I employ the adjustable fan-governor next described, which is substituted for the ordinary fly-fan or fan-governor used in connection with spring-motors for various purposes.

Referring to Figs. 3 and 5, s represents the shaft of the fan-governor, which is journaled in bearings formed in brackets s', affixed to the supporting-frame. The shaft s is provided with a worm s^2, meshing with a worm-gear s^3 on the actuator-shaft g', so that the shaft s rotates with the shaft g' and with the winding-roll n'. s^4 represents a collar affixed to the shaft s, and s^5 a collar movable on said shaft. A spring s^6, interposed between the two collars, normally forces the collar s^5 away from the collar s^4. s^7 s^7 represent blades, of which there may be any desired number, preferably two or four. Said blades are connected by swinging links s^8 with the collars s^4 s^5.

s^9 represents a lever pivoted at s^{10} to a fixed support and connected with a rod s^{12}, which extends to the front of the casing and is provided with a knob or handle s^{13} (see Fig. 2) by which the rod s^{12} may be moved to vary the position of the lever s^9. It will be seen that a movement of the said lever in one direction will force the collar s^5 toward the collar s^4, thus swinging the links s^8 outwardly and moving the adjusting-blades s^7 radially from the shaft, this adjustment increasing the radius of the fan-governor and causing it to offer a greater resistance to the atmosphere, the result being a decrease of speed. A movement of the lever s^9 in the opposite direction permits the spring s^6 to force the collar s^5 away from the collar s^4 and causes an inward adjustment of the blades and a decrease in their resistance to the atmosphere, so that the speed is increased.

It will be seen, especially by reference to Fig. 3, that there are a series of levers m' corresponding to the total number of "string-controllers" (this term including both the fingers and the pickers) and a corresponding number of coupling devices, so that each string-controller is operated independently of each of the others. The fingers constitute a group of string-controllers adapted to vary the tone of the strings, while the pickers constitute a group of string-controllers adapted to vibrate the strings.

I do not limit myself to the details of construction and relative arrangement of parts above described, as the same may be variously modified without departing from the spirit of my invention.

It will be observed that aluminium as a material for the perforated sheet has the advantages of being flexible, of resisting wear, and of being practically non-absorbent, so that it cannot be affected by dampness in the atmosphere. Any other suitable wear-resisting and non-absorbent flexible material, such as celluloid, may be used instead of aluminium.

I claim—

1. In combination with the string of a musical instrument, an actuator, a string-controller, a coupler provided with a relatively movable dog resting in potential relation to the actuator, and an automatic selecting apparatus for projecting the dog into operative engagement with its actuator at the desired intervals.

2. The combination in a stringed musical instrument of a series of string-controllers, an actuator common to all the controllers, a series of couplers, each provided with a relatively movable dog arranged and resting in potential relation to the actuator, and an automatic selecting apparatus for projecting the dogs into operative engagement with the actuator.

3. The combination of a stringed musical instrument, a series of string-controllers, an actuator common to all the controllers, a series of couplers between the actuator and the controllers, each coupler including a slide in juxtaposition to the actuator, and a dog movable in the slide toward and from the actuator, and an automatic selecting apparatus adapted to operatively project the said dogs in a predetermined order.

4. The combination of a stringed musical instrument, a series of string-controllers, an actuator common to all the controllers, a series of couplers between the actuator and the controllers, each coupler including a slide in juxtaposition to the actuator, and a dog movable in the slide toward and from the actuator, a series of levers adapted to project said dogs, and a progressively-moving program device adapted to release and control said levers in a predetermined order.

5. The combination of a stringed musical instrument, a series of string-controllers, an actuator common to all the controllers, a series of couplers between the actuator and the controllers, each coupler including a slide in juxtaposition to the actuator, and a dog movable in the slide toward and from the actuator, a series of levers adapted to project said dogs, each having a shoulder arranged to engage the dog of the accompanying slide when the dog-projecting movement of the lever is prolonged, and a perforated sheet against which said levers bear yieldingly.

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

JOHN McTAMMANY.

Witnesses:
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A. D. HARRISON.