

No. 692,207.

Patented Jan. 28, 1902.

J. MCTAMMANY.
AUTOMATIC MUSICAL INSTRUMENT.

(Application filed July 19, 1898.)

(No Model.)

5 Sheets—Sheet 1.

FIG. 1.

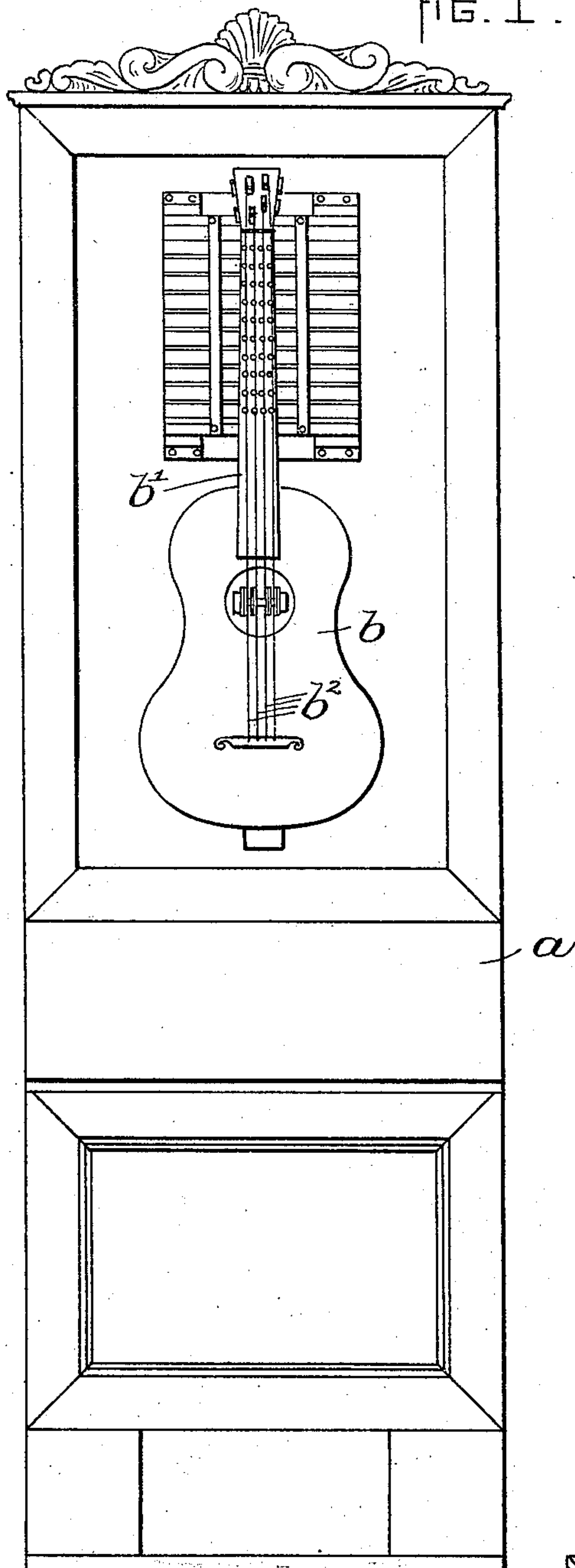
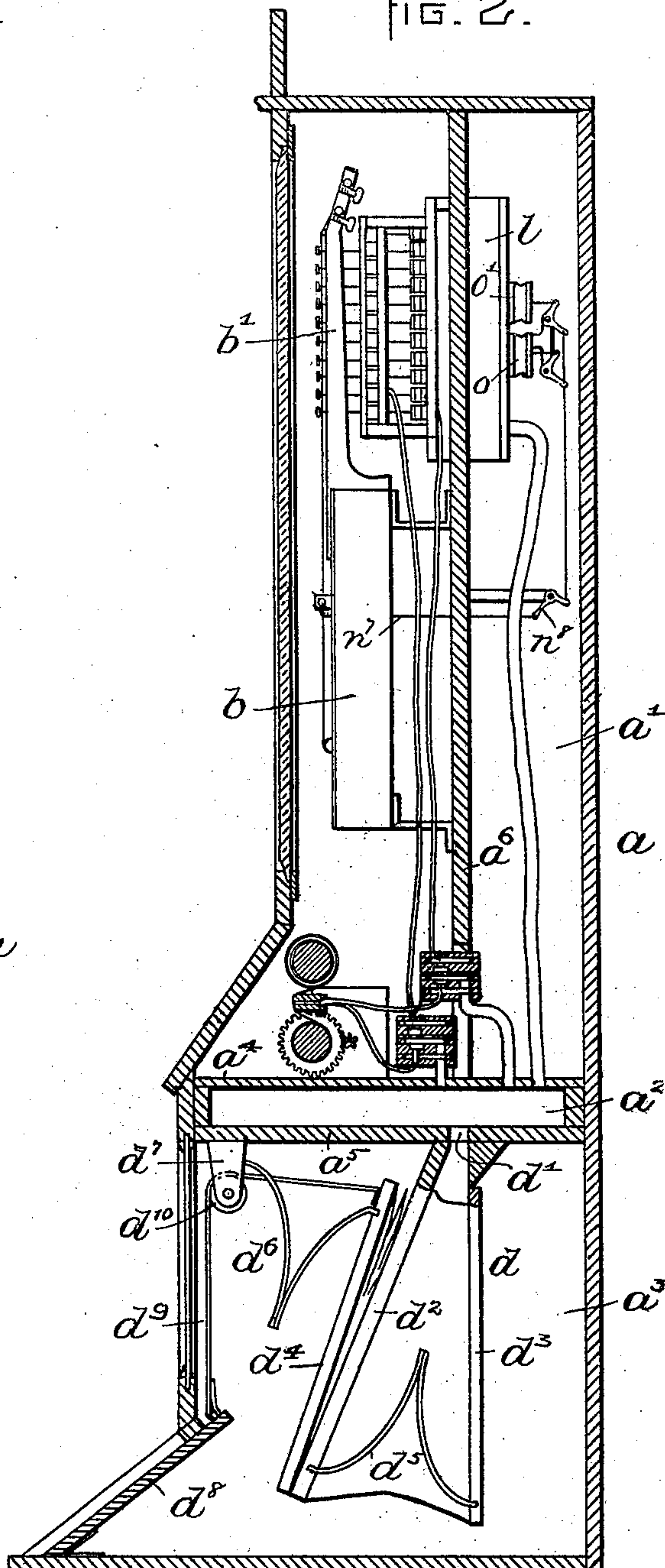


FIG. 2.



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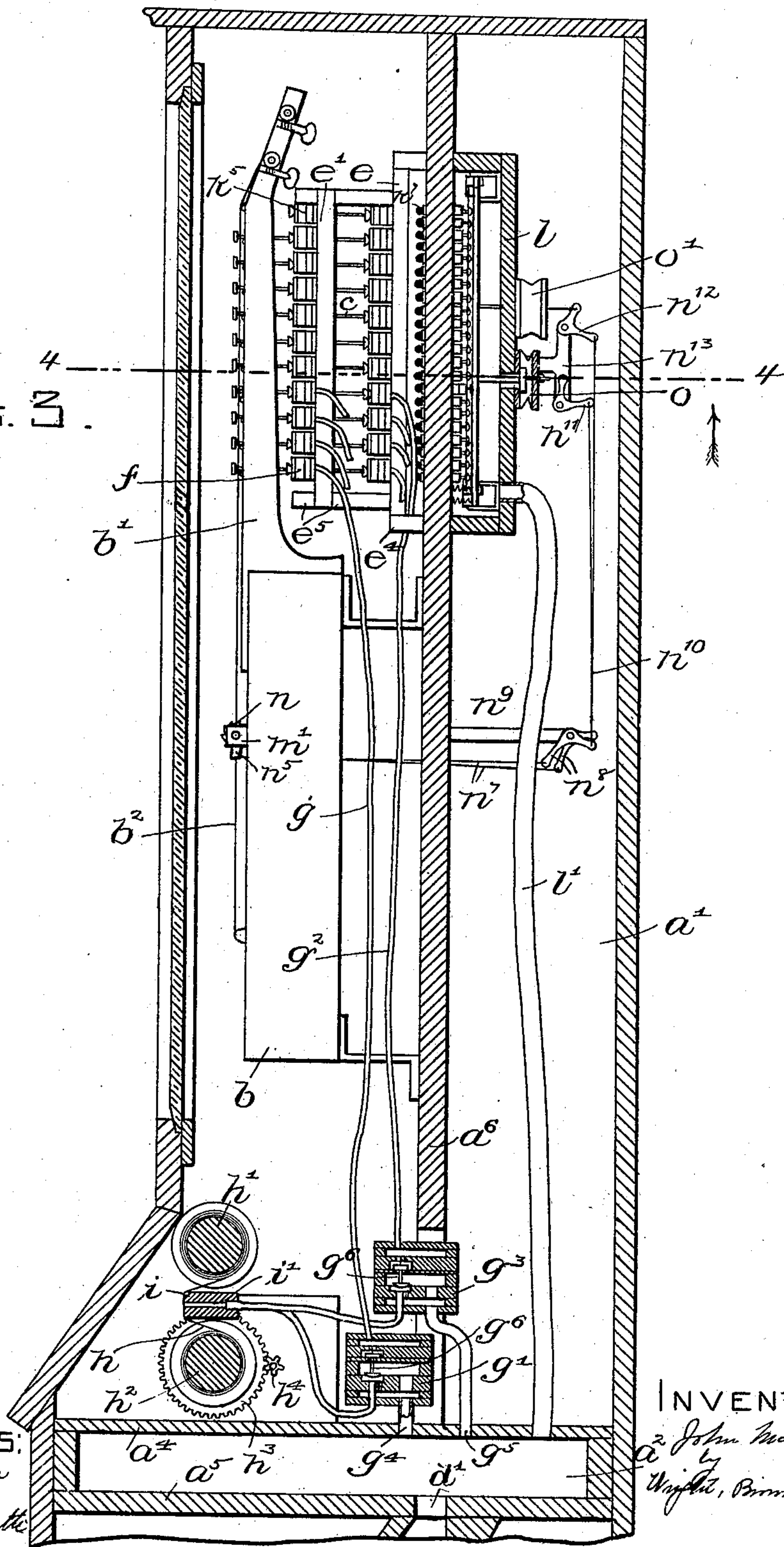
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(No Model.)

5 Sheets—Sheet 2.

FIG. 3.



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5 Sheets—Sheet 3.

FIG. 4.

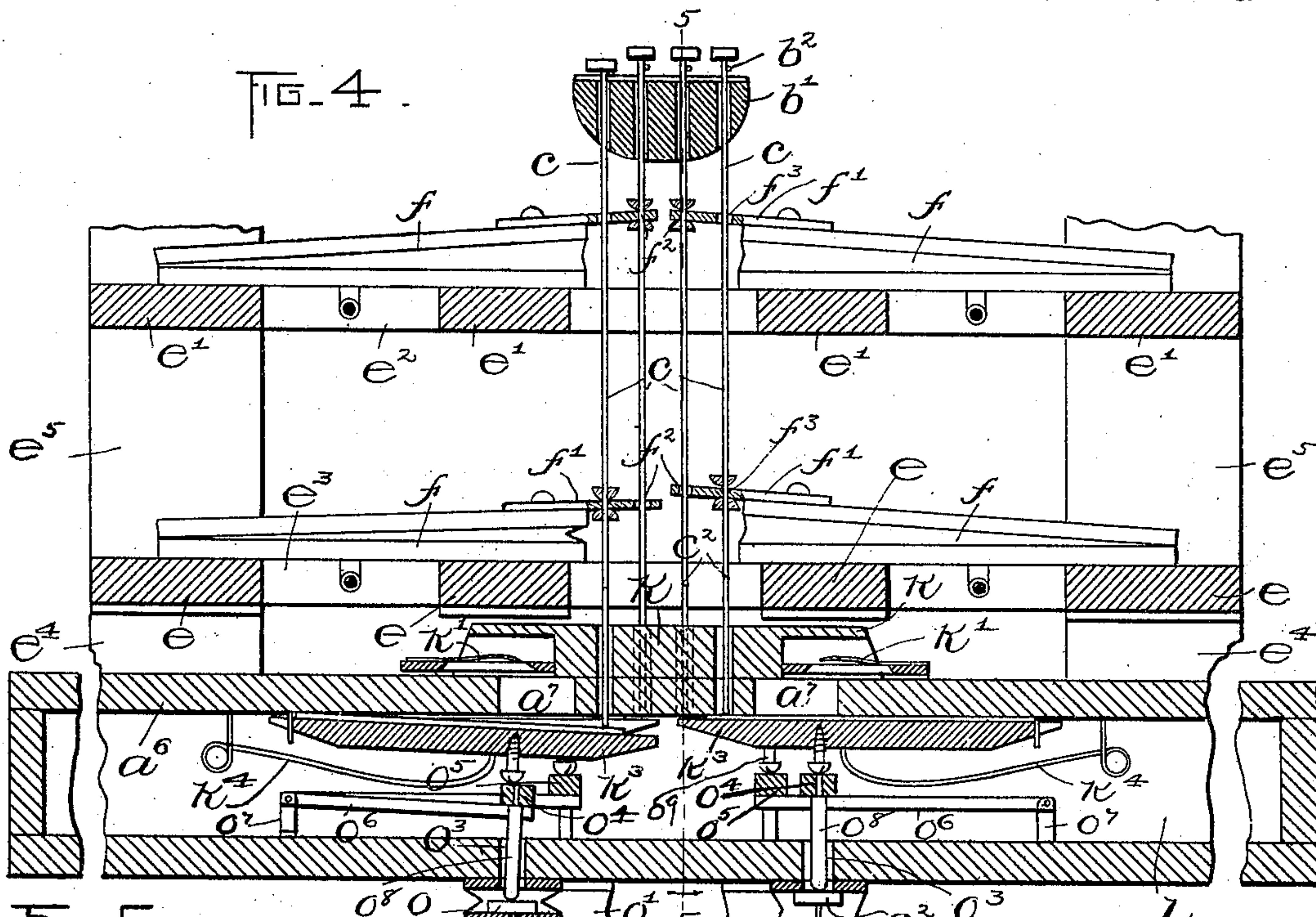
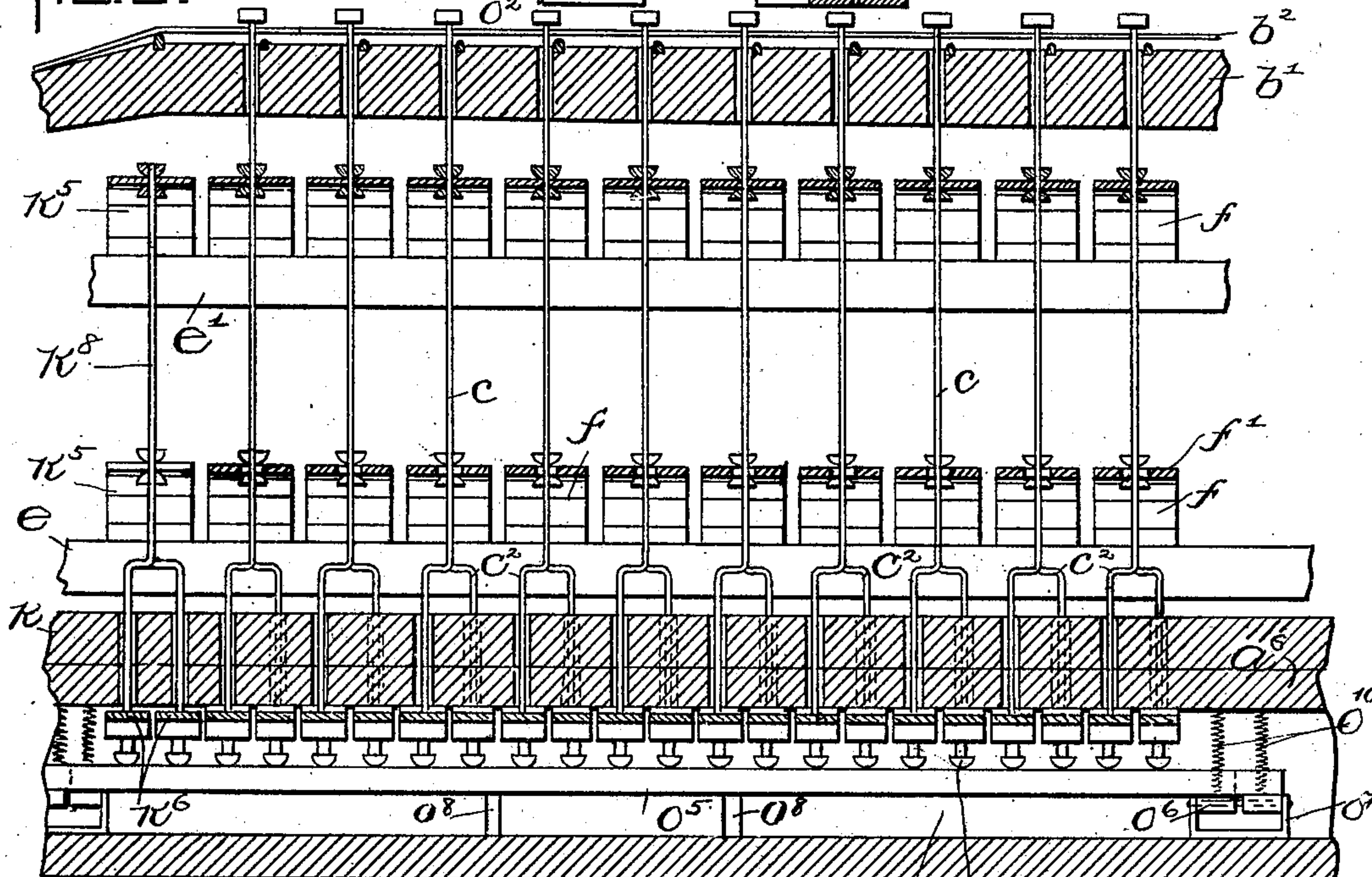


FIG. 5.



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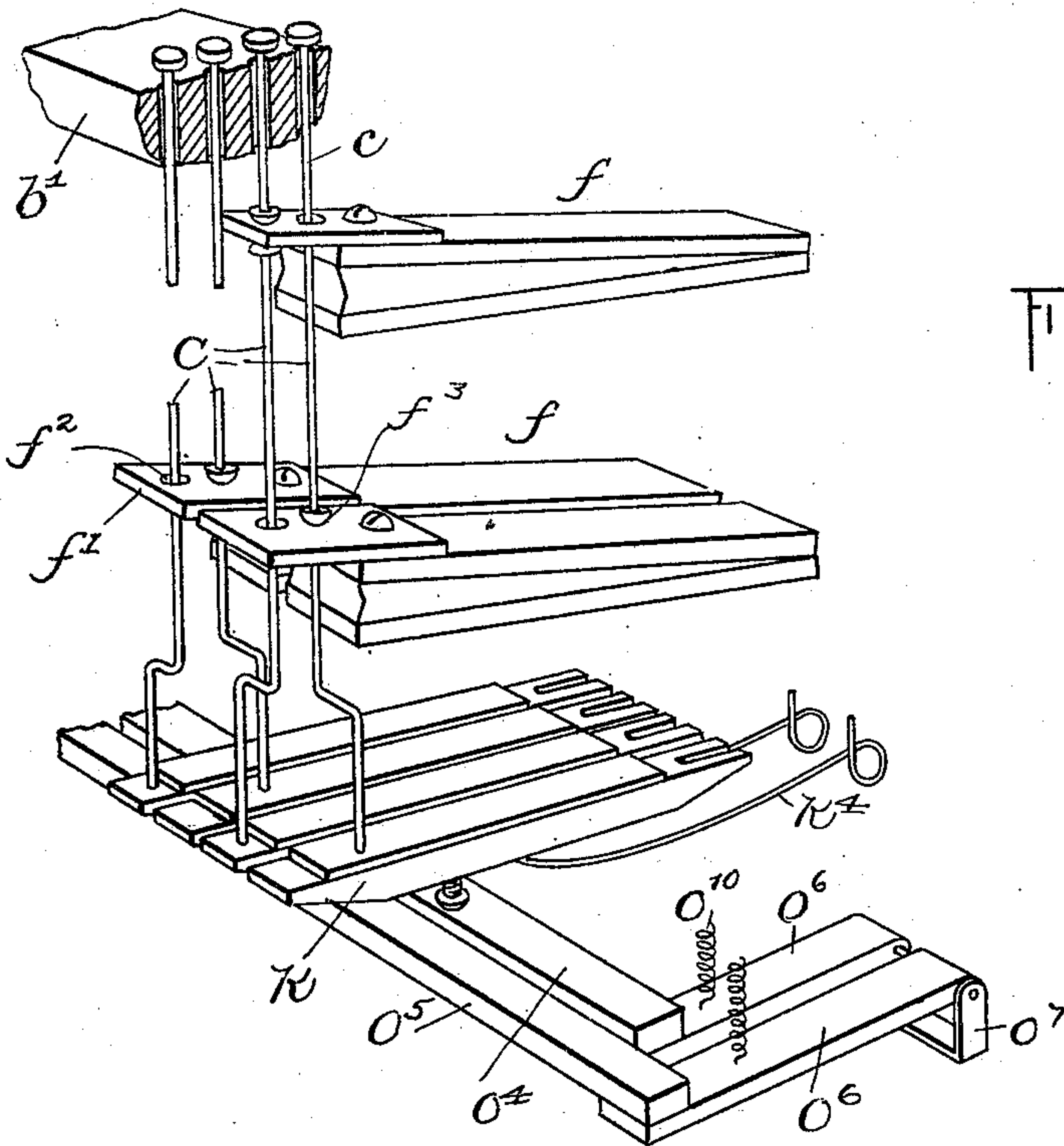


FIG. 6.

FIG. 7.

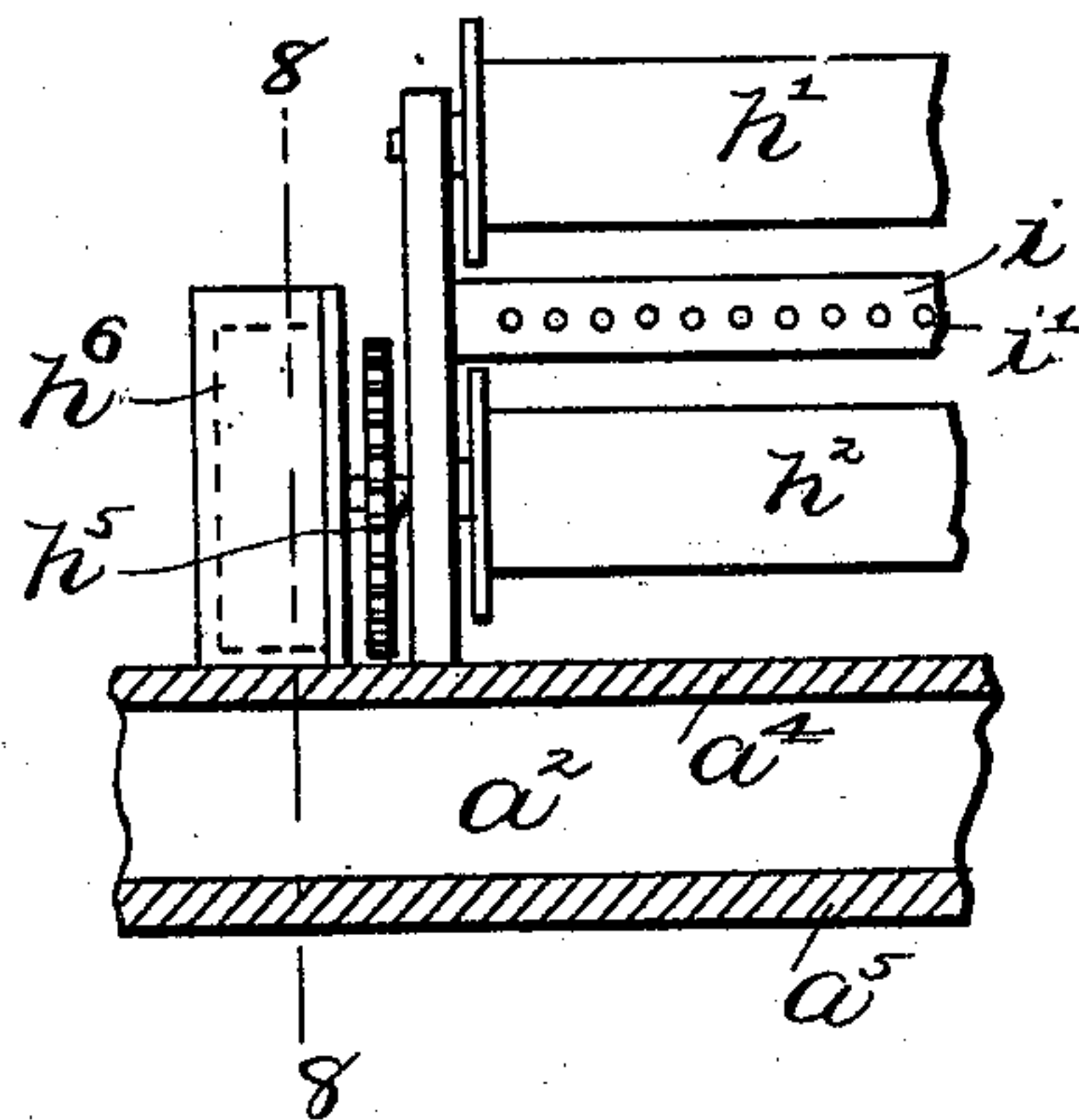
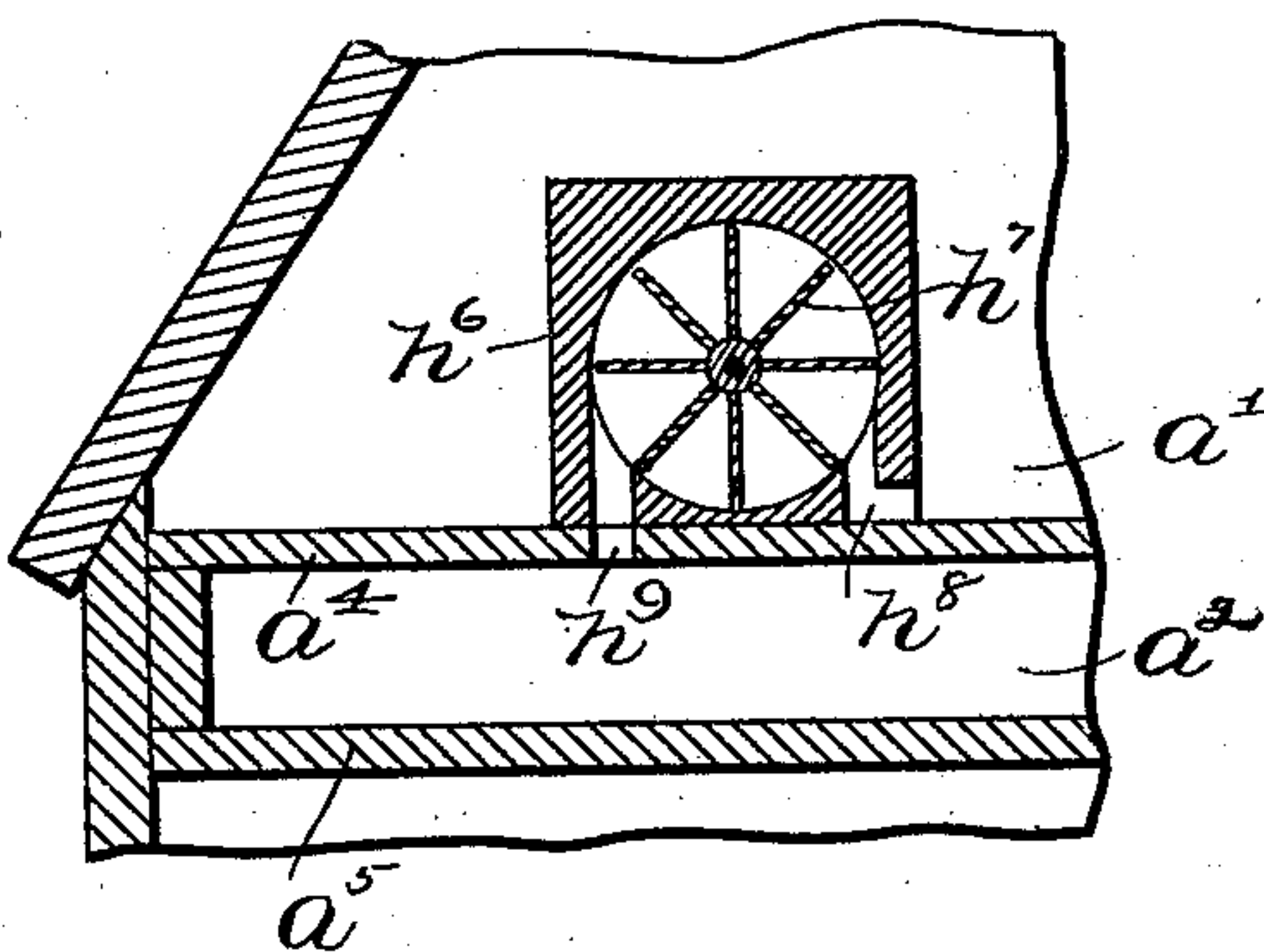


FIG. 8.



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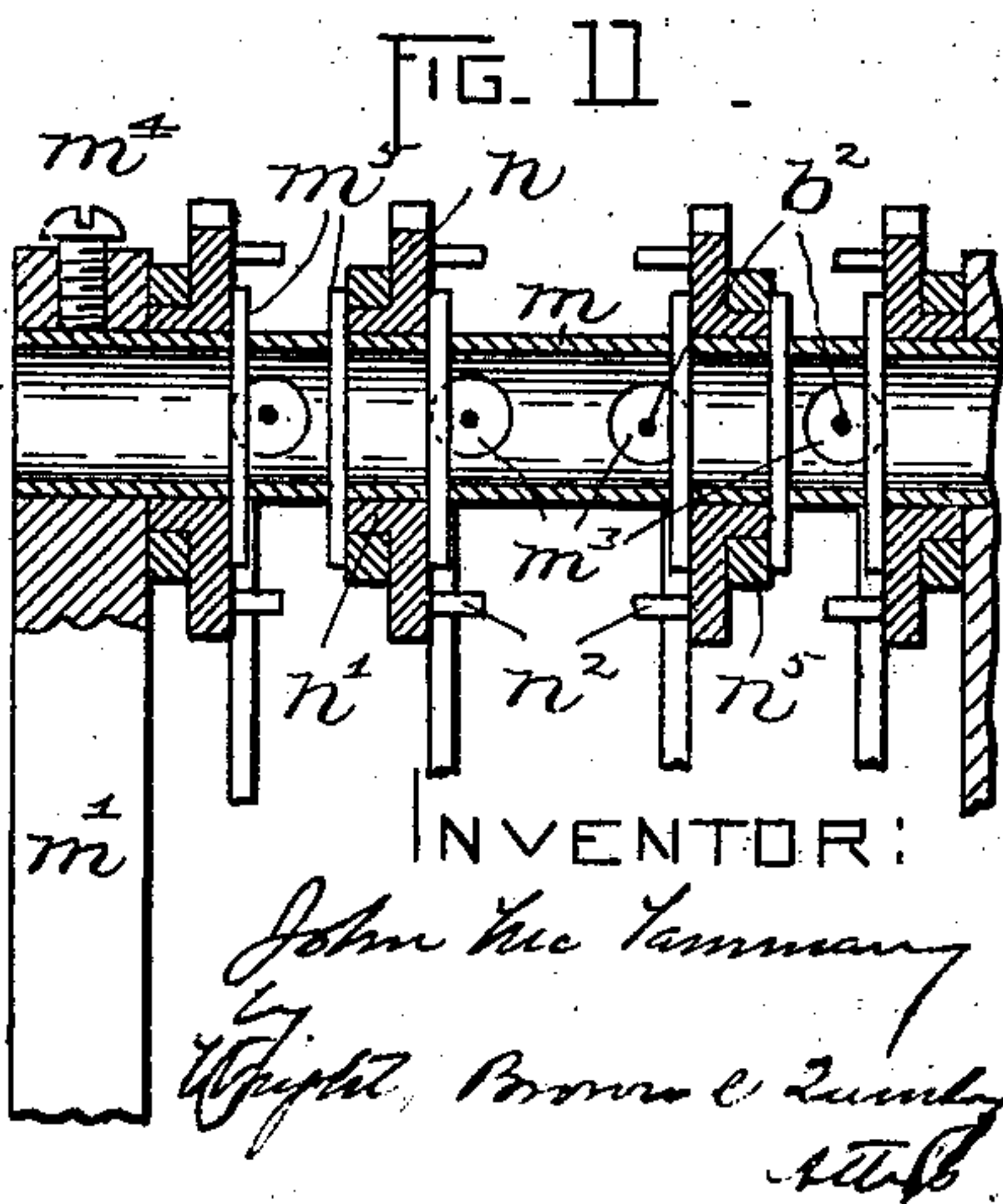
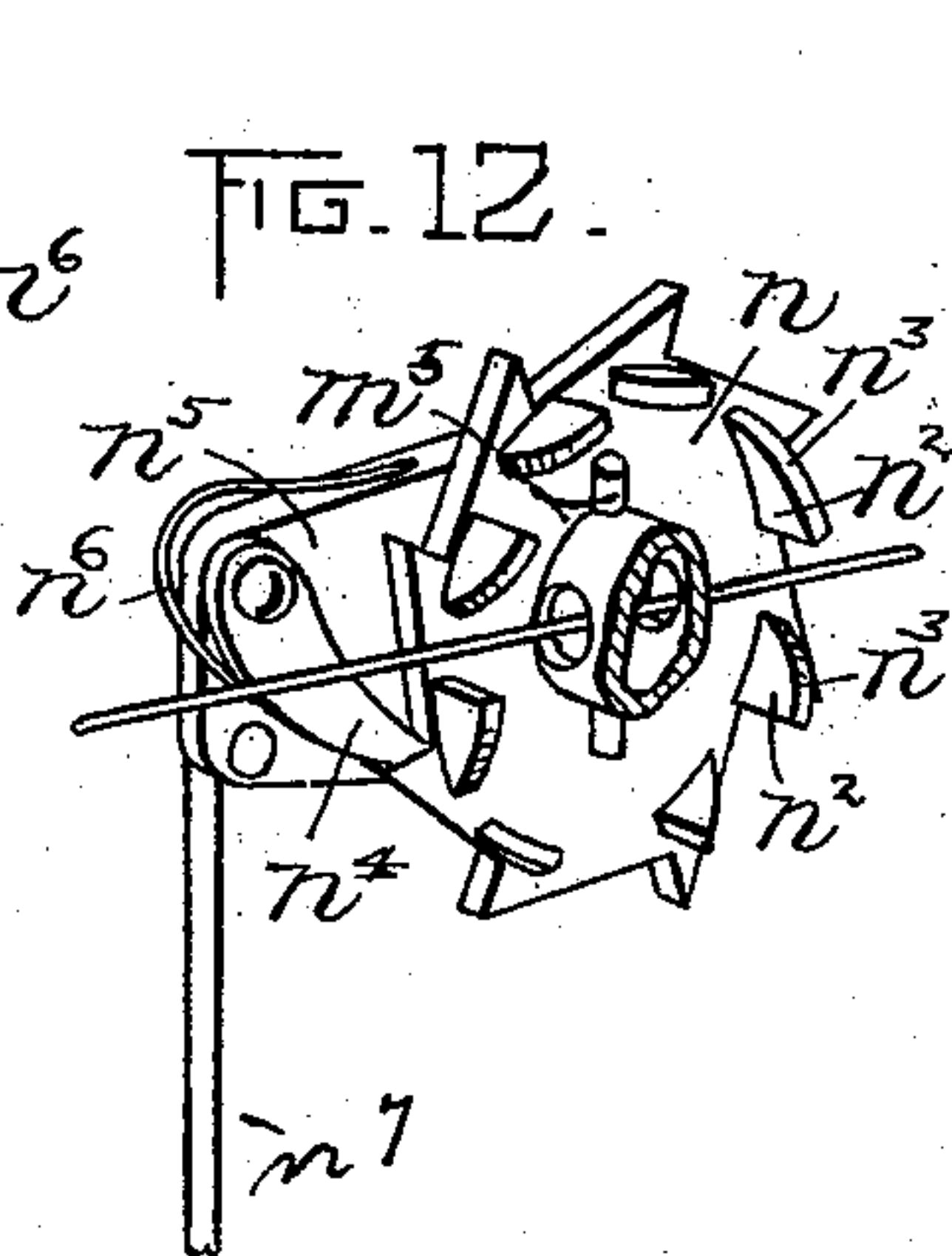
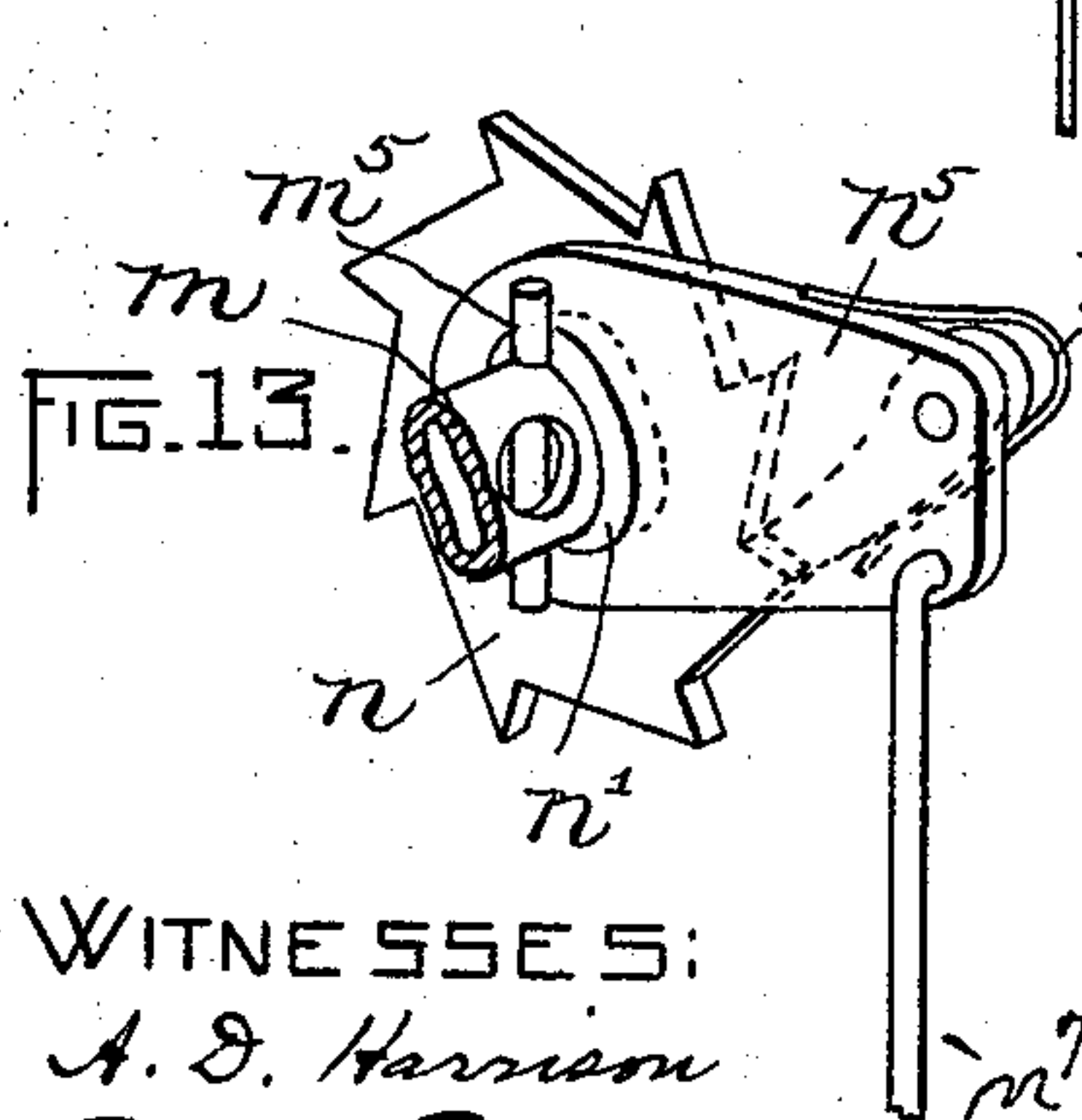
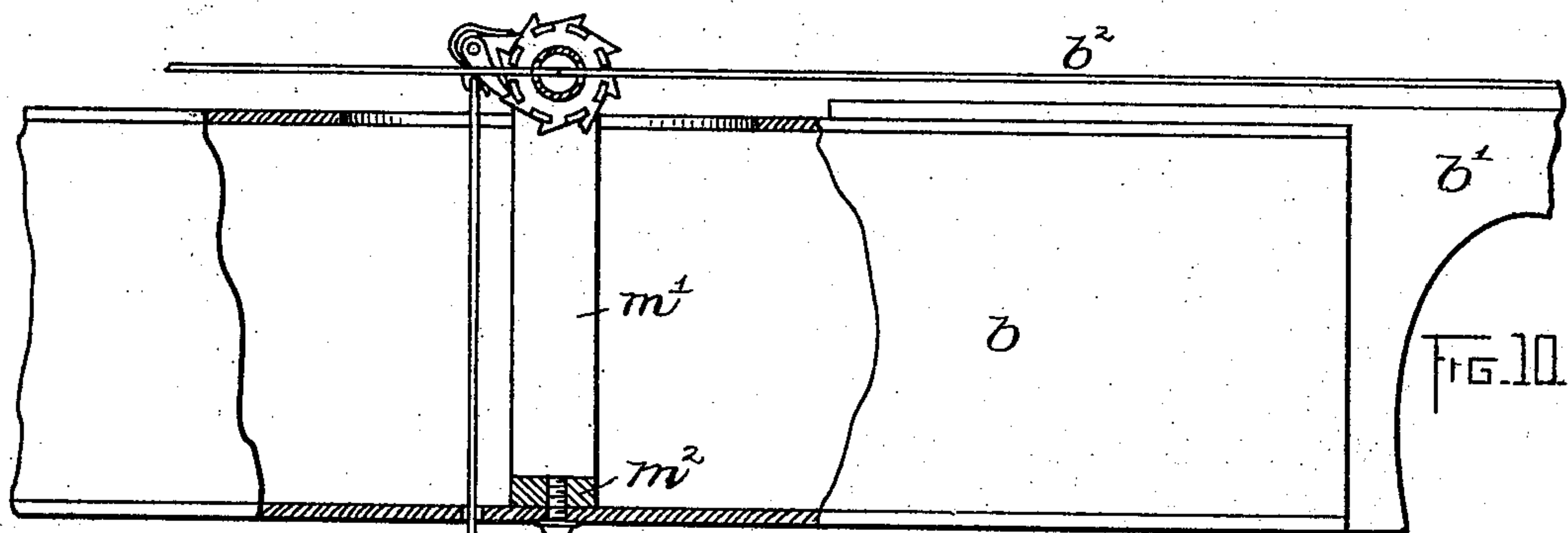
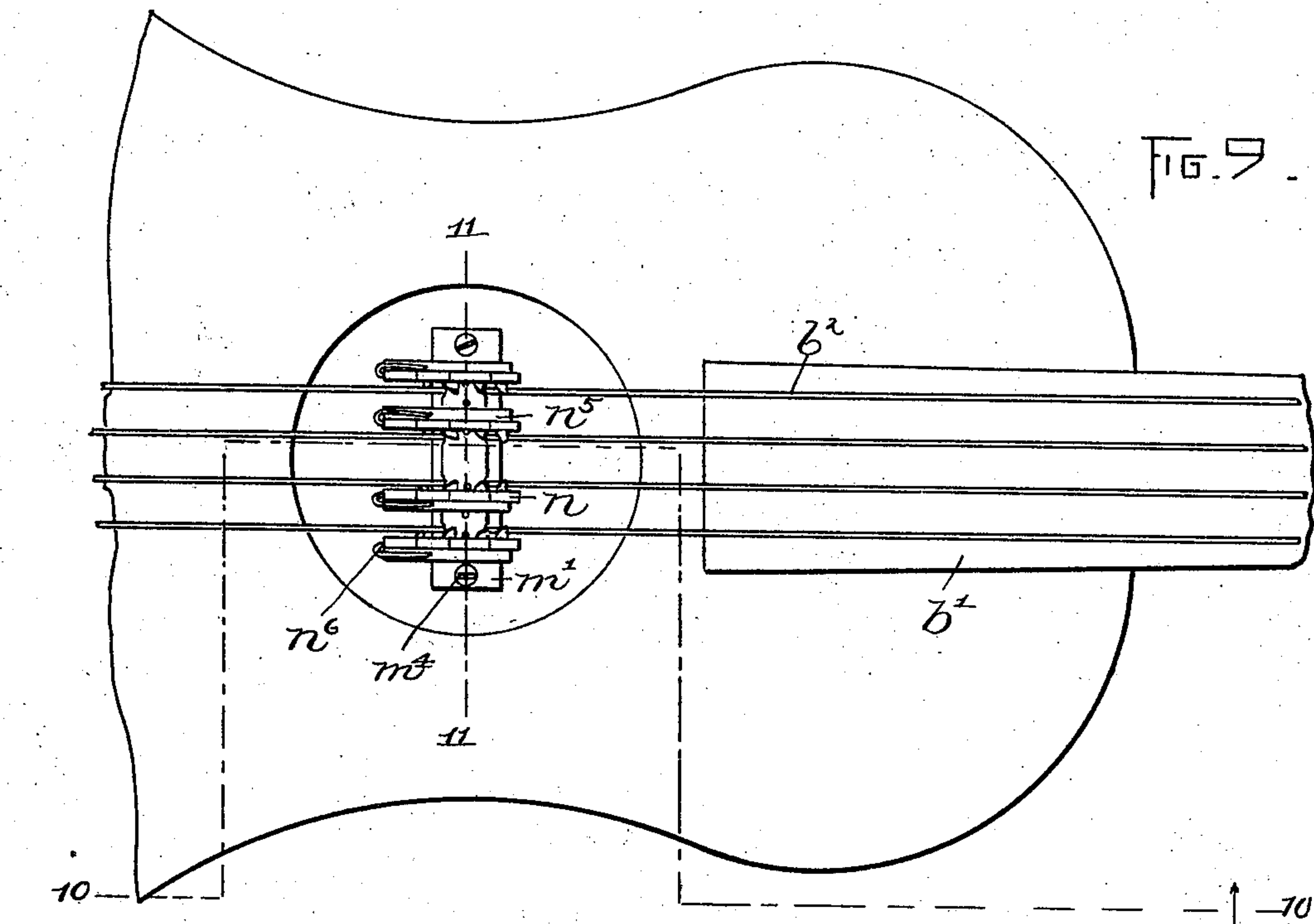
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(No Model.)

5 Sheets—Sheet 5.



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INVENTOR:
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UNITED STATES PATENT OFFICE.

JOHN MCTAMMANY, OF WORCESTER, MASSACHUSETTS.

AUTOMATIC MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 692,207, dated January 28, 1902.

Application filed July 19, 1898. Serial No. 686,352. (No model.)

To all whom it may concern:

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

This invention has relation to automatic stringed musical instruments—such as banjos, guitars, mandolins, violins, &c.—in which the strings are varied in effective or tone-producing length by string-controllers and are sounded by pickers, the said string-controllers and pickers being automatically governed by a selecting device, whereby they are actuated in groups or singly in a predetermined order to produce a musical composition indicated upon the selecting device, although in so far as certain features of the invention go it relates, broadly, to mechanical musical instruments of other classes, in which each tone-producer gives forth a note of a constant pitch.

There are numerous objects to be attained by this present invention, among which may be noted, first, to strengthen and increase in volume the tone given forth by the strings by the addition of auxiliary sound-producers, which may be operated either in unison with the strings or else in such way as to produce an accompaniment or any other desirable musical effect; second, to simplify the action of the instrument by placing the pickers under the control of the string-controllers, whereby I am enabled to dispense with a large number of parts and to simplify the selecting apparatus; third, to improve the construction of the pickers, and thereby increase the life of the strings, and likewise to provide an improved mechanism for operating them, whereby I am able to locate the pickers centrally of the instrument and to pass the said mechanism through the body thereof, and, fourth, to provide certain other improvements whereby the instruments are operated more accurately, the actuating mechanism is simplified and rendered more highly efficient, and the tones produced are more musical than heretofore.

To these ends the invention consists of the improvements which I have fully illustrated upon the drawings and shall now proceed to

describe and claim, it being understood that while I have shown my invention as embodied in an instrument with strings of variable pitch, yet some of the features thereof may be embodied in mechanical musical instruments of other different kinds.

Reference is to be had to the above-mentioned drawings, forming a part of this specification, and to the letters thereon, similar reference characters indicating like parts or features wherever they occur.

Referring to the drawings, Figure 1 represents in front elevation a musical instrument embodying the invention. Fig. 2 represents a vertical section through the same. Fig. 3 represents an enlarged vertical section through the upper portion of the instrument. Fig. 4 represents an enlarged horizontal section on the line 4 4 of Fig. 3. Fig. 5 represents a vertical section on the line 5 5 of Fig. 4. Fig. 6 represents a perspective view of the string-controllers and the means for operating the same. Fig. 7 represents a front elevation of the end of the rolls for receiving the selector and the pneumatic motor. Fig. 8 represents a section through the motor on the line 8 8 of Fig. 7. Fig. 9 represents an enlarged front view of the body of the instrument and the pickers. Fig. 10 represents a section on line 10 10, Fig. 9. Fig. 11 represents an enlarged section through the pickers and their support on the line 11 11 of Fig. 9. Figs. 12 and 13 represent perspective views of a picker and its actuator.

Referring to the drawings, a indicates the case of the instrument, which is divided into three compartments a^1 , a^2 , and a^3 by two horizontal partitions a^4 a^5 , of which the former constitutes a sounding-board. A vertical transversely-arranged partition a^6 is placed in the compartment a^1 to serve as a support for the instrument to be automatically played and the actuating mechanism therefor, the compartment a^3 receiving the bellows and the foot-pedals, and the compartment a^2 forming a main wind-chest. The front of the upper portion of the casing is glazed to reveal the instrument and is ornamented to suit the particular taste of the user or purchaser.

As previously indicated, any stringed instrument may be employed; but I have

thought best to illustrate the invention as being utilized in connection with a guitar *b*, secured to the vertical support by metal brackets and having a fretted neck *b'* and four strings *b²*, whose effective or tone-producing length may be varied by pressing them against the frets. Any number of strings of variable pitch may be used; but I have found that four are sufficient for all general purposes.

Each of the strings is depressed against the frets by a series of string-controllers consisting of fingers or trackers *c*, passed through apertures in the neck *b'* and having enlarged string-engaging heads or ends. The four controllers for each fret are arranged in a transverse row, there being as many in each longitudinal row as there are frets. These controllers are operated pneumatically and control the pickers, which I shall subsequently describe. The mechanism for actuating the controllers and the selectors is also pneumatic and receives its initial power manually. The suction-bellows *d* communicates with the main wind-chest through the duct *d'* and depends from the partition *a⁵*, having the stationary board *d²* and the movable boards *d³* *d⁴*, the latter and that at *a²* being valved. The boards *d²* *d³* are normally held apart by a V-spring *d⁵*, while the board *d⁴* is held shut by a similar spring *d⁶*, secured to a bracket *d⁷*.

The pedal *d⁸*, which is hinged to the bottom of the casing in an inclined position to receive the feet of the operator, is connected with the upper end of the board *d⁴* by a cord *d⁹*, passing over a pulley *d¹⁰* in the bracket *d⁷*.

The motors or pneumatic actuators for the string-controllers are supported in a frame attached to the front of the partition, said frame consisting of two pairs of parallel vertical strips *e e'* *e' e'* on each side of the neck, secured to suitable cross-bars *e²* *e³* and forwardly-projecting carrier-bars *e⁴* *e⁵*.

As the spaces between the frets are so small the actuators are arranged two on both sides of the neck, one in front of the other, the forward ones being attached to the frame-bars *e' e'*, while those in the rear are secured to the bars *e e*. Each actuator *f* is a small suction bellows or motor, and its movable board is provided with a finger *f'*, having two apertures *f²* *f³* to receive two of the trackers *c c*, the fingers of the two pairs of actuators projecting toward the neck. The controllers for the inner strings *b²* are wedged tightly in the apertures *f²* in the fingers *f'* of the front actuators by india-rubber or other washers, while the two outer controllers are similarly wedged in the apertures *f³* of the rear actuators, the outer controllers passing loosely through the apertures *f³* of the front actuators, and the inner controllers passing loosely through the apertures *f²* of the actuators at the rear.

The front actuators are separately connected by rubber or other tubes *g* with a valve-casing *g'*, having a separate chamber for each

tube, while the rear actuators are connected in a similar way by tubes *g²* with a valve-casing *g³*. These two casings are connected by ducts *g⁴* *g⁵* with the main wind-chest, so that a partial vacuum is maintained therein, there being a valve *g⁶* interposed between each tube *g* and the duct *g⁴* and each tube *g²* and the duct *g⁵*, so that the actuators are normally cut off from the wind-chest.

The selector which governs the passage of air from the actuators to the main wind-chest consists of an elongated flexible sheet *h* of suitable material wound upon the roll *h'* and adapted to be drawn therefrom by the winding-roll *h²*, which has a large gear *h³*, intermeshing with and driven by a pinion *h⁴* on the shaft *h⁵* of the wind-motor *h⁶*. (See Figs. 7 and 8.) The motor consists of a casing having a suitable wind-wheel *h⁷*, wind entering the open duct *h⁸* in the casing and passing through the escape duct or orifice *h⁹* to the main wind-chest, although any approved type of pneumatic motor may be employed in its stead.

The sheet *h* is provided with a plurality of rows of elongated slots (not shown) equal in number to the total number of the actuators and is drawn past a channel-board *i*, having a channel *i'* for each row. The channels communicate alternately with the valve-casings, so that each time a slot in the selector registers with a channel it permits a movement of the valve *g⁶* which corresponds thereto and allows air to be sucked through the tube *g* or *g²* for the operation of the actuator and a consequent depression of the string by a controller. Hence by properly forming the slots in the selector in accordance with a predetermined plan the controllers may be actuated in groups or singly to depress the strings just as a performer would in playing upon that particular instrument.

Before proceeding to describe the pickers for sounding the strings, as an explanation thereof would logically follow a description of the controllers and their actuators, I will describe the means which I have invented for augmenting and filling out the tone and volume of sound produced by the strings as the said means intervenes between the actuators and the picker-operating devices.

As has been previously suggested herein, the tone produced by a stringed instrument when operated automatically is frequently, if not always, flat and thin, and hence it is greatly desirable to increase the volume of sound and render the tones round and full. It is likewise desirable at times to produce a harmonic or other effect or to provide mechanism for playing an accompaniment for the air being produced by the strings. Consequently I employ a set of reeds and control them by the actuators. A reed-board *k*, having two vertical rows of reeds *k'*, is secured to the partition *a⁶*, there being an aperture *a⁷* in the partition in the rear of each reed lead-

ing into an auxiliary wind-chest l , secured to the rear of said partition and connected by a tube or air-duct l' with the main wind-chest, whereby a partial vacuum is maintained therein.

The mutes k^3 are hinged inside the auxiliary wind-chest and are held yieldingly against the partition a^6 to normally close the apertures a^7 and render the reeds inoperative by springs k^4 . The trackers c of the controllers extend loosely through the reed-board and the partition and abut against the ends of the mutes, which are arranged in groups of fours to correspond with the four controllers and actuators at each fret, the ends of the trackers being offset, as shown at c^2 , for that purpose. Each time, therefore, that a string is pressed against a fret a mute is moved to permit a corresponding reed to sound in unison therewith, and the reed continues to sound until the string is released, the sounding of the reed being caused by the air rushing into the wind-chest to fill the partial vacuum therein.

As the controllers just described are employed only when a string is depressed and as the strings are sounded frequently when entirely open, it is necessary to provide for sounding reeds for the open strings, and I therefore employ four more actuators k^5 than there are string-controllers and an equal number of mutes k^6 and their reeds and connect the actuators with the mutes by trackers k^8 , there being four additional channels in the channel-boards connected with the actuators by additional wind ducts or tubes.

The pickers are governed by the mutes, and consequently by the string controllers and actuators. They are shown in detail in Figs. 11, 12, and 13 and are mounted on a hollow shaft supported at its ends in the forwardly-projecting arms m' of a bracket m^2 , placed in the belly of the instrument and secured to the inner face of the back thereof. The bracket is in the hole in the belly of the guitar, and the shaft, which is secured in place by screws m^4 , is in the plane of the strings, being provided with apertures m^3 , through which the strings pass and which are large enough to permit the strings to vibrate without touching. The pickers are ratchet-wheels n , having hubs n' , and are held against axial movement by pins m^5 , passed through the shaft m . They are provided on the face nearest the string with a series of string-engaging teeth n^2 equal in number to the ratchet-teeth, each tooth being in the shape of a sector of a circle whose angle is ninety degrees, with the convex edge n^3 in front. When the picker is rotated with a step-by-step movement, the picker-tooth impinges upon a string which rolls upon the convex edge until the tooth travels far enough for the string to drop off from its apex or point, whereupon it vibrates, the picker pausing at a point in its rotation where the tooth frees

the string and does not impede its free vibration.

The pickers are rotated step by step by pawls n^4 , pivoted upon the crank-arms or pawl-carriers n^5 , the latter being journaled on the hubs n' and the pawls being held yieldingly in engagement with the ratchet-teeth of the pickers by springs n^6 .

Links n^7 , projecting through apertures in the back of the guitar, connect the pawl-carriers with the arms of bell-cranks n^8 , fulcrumed on a bracket n^9 , extending rearwardly from the upright partition a^6 , and similar links n^{10} connect the other arms of the bell-cranks with the arms of similar bell-cranks n^{11} n^{12} , fulcrumed in the ends of a T-shaped bracket n^{13} , the last-mentioned bell-cranks being arranged in the corners of a square—that is, two pairs, one pair above the other.

The bell-cranks n^{11} n^{12} are respectively connected with the movable boards of four pneumatic actuators o o' , similarly arranged and supported upon the back of the auxiliary wind-chest. These actuators communicate with the last-mentioned wind-chest, the ducts o^3 thereinto being normally closed by valves o^2 . There are four bars o^4 o^5 in the wind-chest, two on each side of the neck of the guitar, the bars of each pair having at their ends levers o^6 , pivoted in a bracket o^7 , and each bar has a pin o^8 , projecting through a duct or orifice o^3 and bearing against the valve o^2 therefor. All of the mutes corresponding to each string have screws or projections o^9 bearing against one of the bars, so that each time a string is depressed at any fret the controller operates a mute and the valve o^2 is opened to permit the operation of a picker-actuator, and the picker for that particular string is operated to simultaneously impart a vibration thereto and cause it to give forth a musical sound.

The four movable bars correspond to the four strings and are depressed as their respective strings are engaged by the controllers, whereby, although the said strings may be forced against any one of the frets, the corresponding pickers are simultaneously actuated. I term the devices or parts between the string-controllers and the pickers "intervening mechanism" or "power-transmitting mechanism" for obvious reasons.

Springs o^{10} hold the swinging bars o^4 o^5 yieldingly against the projections o^9 on the mutes, whereby they are alternately returned to position after being operated.

By the construction and arrangements of parts as hereinbefore described I have been able to secure a number of important results. First, the quality of tone produced by the instrument is superior to that of any other of the same class, and the volume of sound is greatly augmented, the sounding of the strings and reeds in unison or in harmony producing a most pleasing effect; second, the selector or tune-sheet is greatly simplified and is more

easily prepared, for by reason of the pickers being operated by the string-actuators or string-controllers I do not need to form slots therein to govern the action of the said pickers, and much laborious work and effort is thereby obviated and rendered unnecessary; third, the provision of a secondary pneumatic action governed or controlled by the string-controllers and their actuators enables a very compact arrangement of the parts; and a simplification of the mechanism; fourth, the addition or substitution of bellows, a wind-motor controlled thereby, and a pedal provides for the instrument being placed in private houses where an electrical current cannot be obtained; fifth, the life of the strings is greatly lengthened, as they are not engaged by the pickers violently, but are allowed to roll up on the curved inclined sides of the picker-teeth; sixth, the picker mechanism is greatly simplified and reduced in size, whereby it is rendered inconspicuous and occupies but little space, and, moreover, by being attached to the rear wall of the instrument and being arranged in the hole in the latter it does not affect the sound produced by the vibration of the strings, and, seventh, the instrument is rendered more satisfactory in operation and is enhanced in value.

Having thus explained the nature of my invention and described a way of constructing and using the same, although without having attempted to set forth all the forms in which it may be embodied or all the modes of its use, I declare that what I claim is—

1. An automatic stringed musical instrument having controllers for varying the pitch of said strings, a set of reeds and their valves, and intervening mechanism between said controllers and valve-reeds.

2. An automatic stringed musical instrument having controllers for varying the pitch of said strings, a set of reeds and their valves, intervening mechanism between said controllers and valve-reeds, and a selector for governing the action of the controllers and said intervening mechanism.

3. An automatic stringed musical instrument having controllers for varying the pitch of said strings, a set of reeds and valves, actuators for said valves, and devices governed by said controllers for picking the strings.

4. An automatic stringed musical instrument having string-controllers for varying the pitch of said strings, a set of reeds and valves, pneumatic actuators for said controllers and valves, pickers for the strings, pneumatic actuators for the pickers, and a single selector for governing all the said pneumatic actuators simultaneously.

5. A stringed musical instrument having string-controllers, and pickers governed by the said string-controllers.

6. A stringed musical instrument having string-controllers, actuators for said control-

lers, pickers, and operative connections between the actuators and the pickers.

7. A musical stringed instrument having string-controllers, pneumatic actuators for said controllers, and pickers governed by said actuators.

8. A stringed musical instrument having string-controllers, pneumatic actuators for said controllers, pickers, pneumatic actuators for said pickers, and operative connections between said actuators.

9. A stringed musical instrument having string-controllers, actuators for said controllers, pickers, actuators for said pickers connected to the first said actuators, and a selector for the first said actuators.

10. A stringed musical instrument having string-controllers arranged in rows equal in number to the strings, a picker for each string, and means governed by any controller in each row, for operating the picker for the string varied in pitch by the last said controller.

11. A stringed musical instrument having string-controllers arranged in rows equal in number to the strings, a picker for each string, an actuator for each picker, and means operated by any controller in each row, for governing a picker-actuator for the string varied in pitch by the last said controller.

12. A stringed musical instrument having string-controllers, pneumatic actuators for said controllers, pickers, pneumatic actuators for the said pickers, and a movable device for operating said picker-actuator, each device being operated by any of the controller-actuators for a single string.

13. A guitar or similar stringed instrument having the usual hole in its belly, and having a support mounted within the body, a plurality of strings outside said body, a series of pickers on said support, automatic devices extending through said hole for picking the strings whereby said usual hole is utilized to properly locate said devices, and means extending through the back of said instrument for actuating the said pickers.

14. A stringed musical instrument having a hollow body with an elongated neck, a shaft supported on the back of said body, a series of rotary pickers journaled on said shaft, and means extending through the said body, for actuating the pickers.

15. The combination with a string, of a rotary picker having sector-shaped laterally-projecting teeth.

16. The combination with a string, of a rotary picker having sector-shaped laterally-projecting teeth, and means for imparting an intermittent step-by-step movement to said picker.

17. The combination with a string, of a rotary picker having laterally-projecting teeth and also having a hub, a pawl for rotating said picker, and a pawl-carrier journaled on the hub of the picker.

18. A musical instrument having a plurality of strings, and rotary toothed pickers for said strings, said pickers rotating about an axis at a right angle to said strings, and having cam-shaped teeth.

19. A musical instrument having a plurality of strings, rotary toothed pickers for said strings, said pickers rotating about an axis

transverse to said strings, and a bearing for said pickers through which the strings pass. 10

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

JOHN McTAMMANY.

Witnesses:

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P. W. PEZZETTI.