No. 850,309. PATENTED APR. 16, 1907.

W. A. MATROLIS.

PERMUTATION LOCK

APPLICATION FILED MAY 3, 1905.

4 SHEETS—SHEET 1.

Fig. 1.

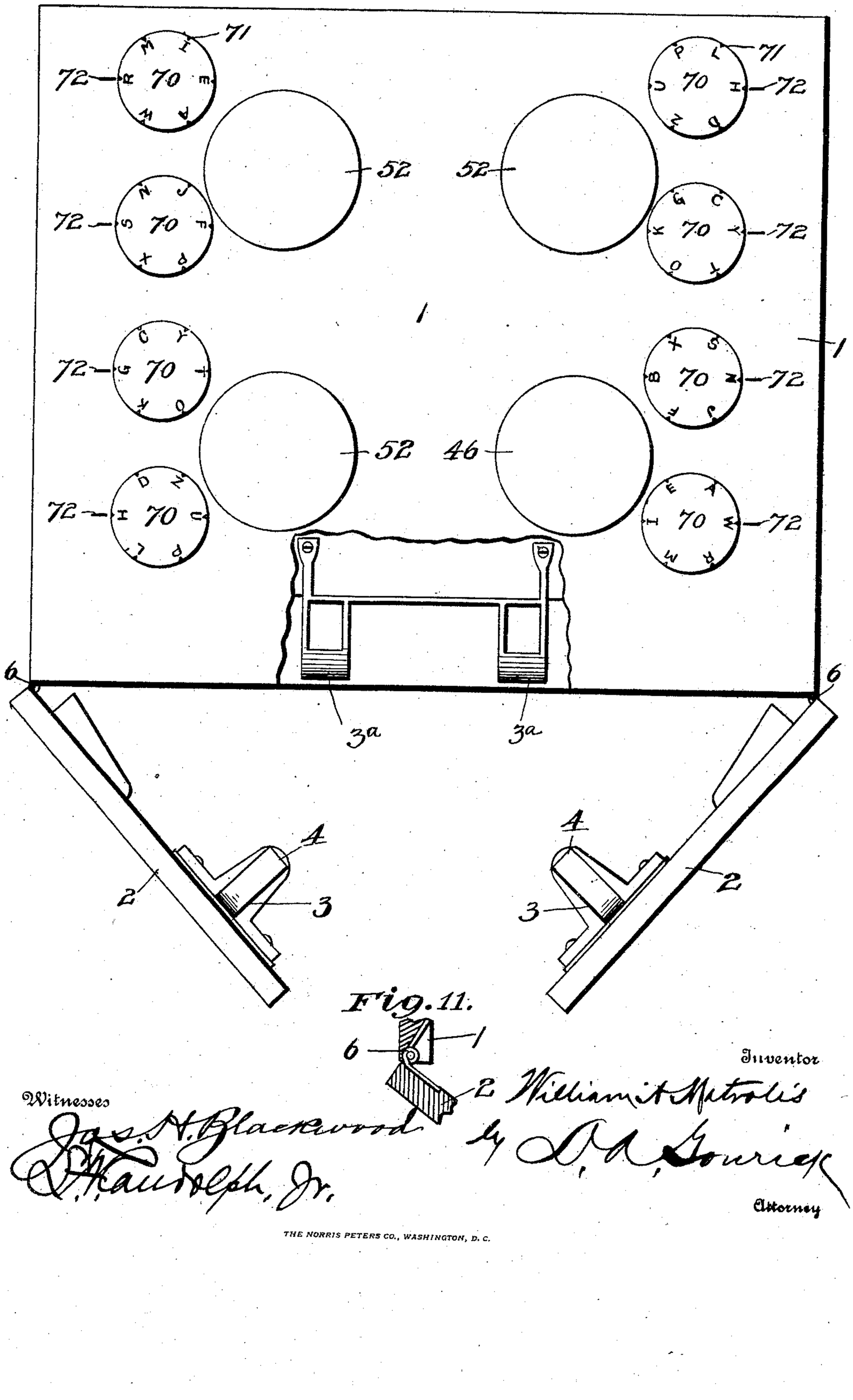

Fig. 11.

Witnesses

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THE NORRIS PETERS CO., WASHINGTON, D. C.

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4 SHEETS—SHEET 2.

Fig. 2.

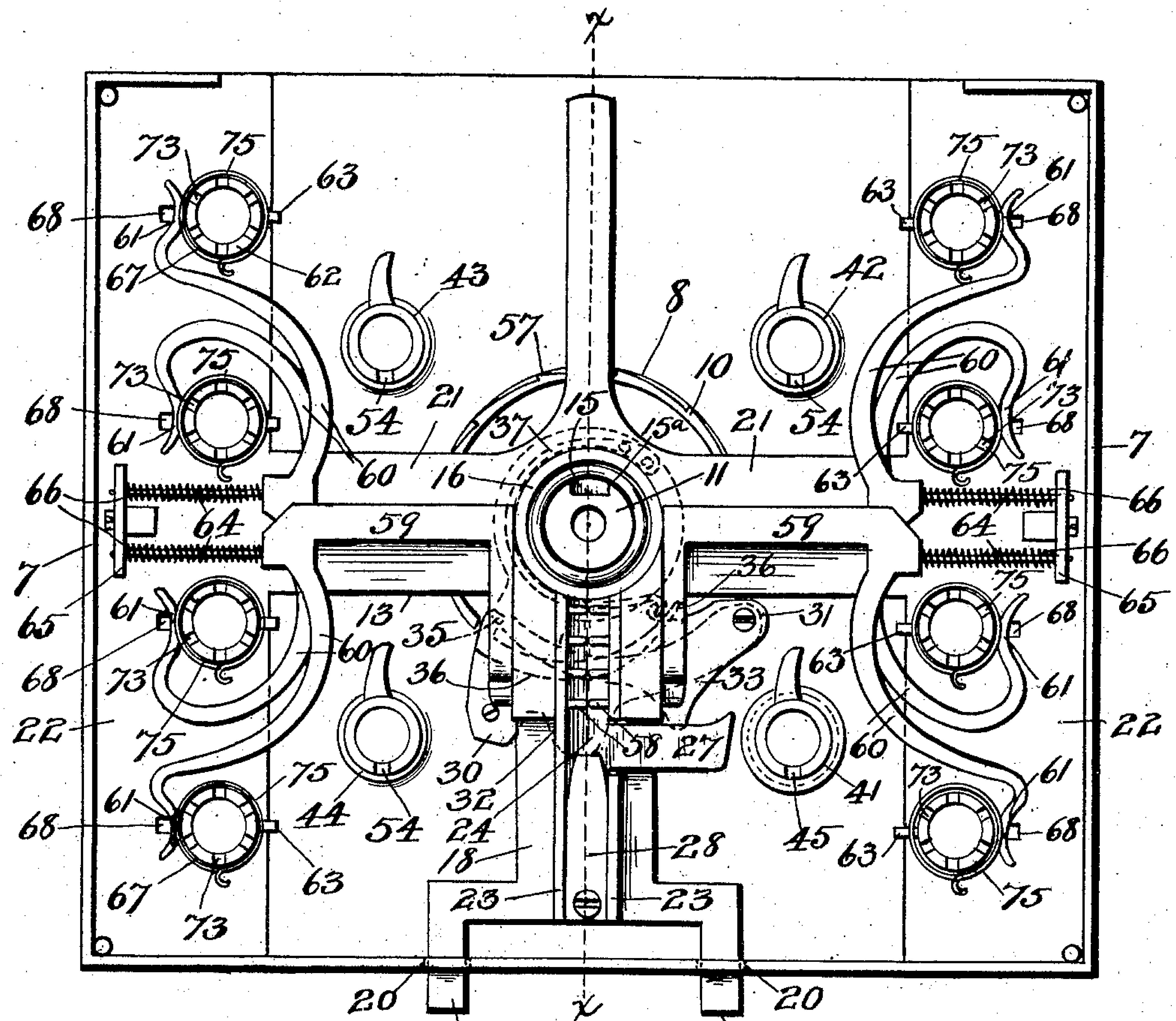
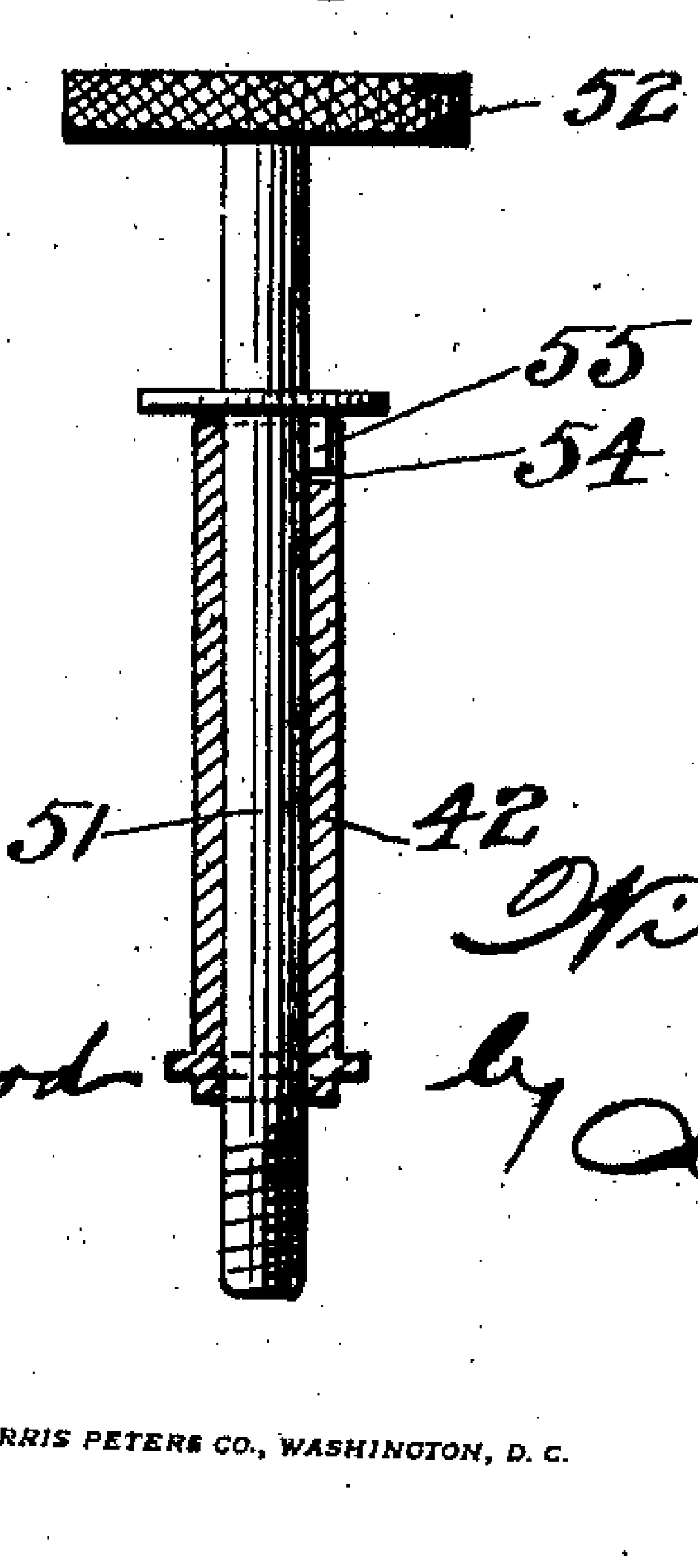


Fig. 7.



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4 SHEETS—SHEET 3.

Fig. 3.

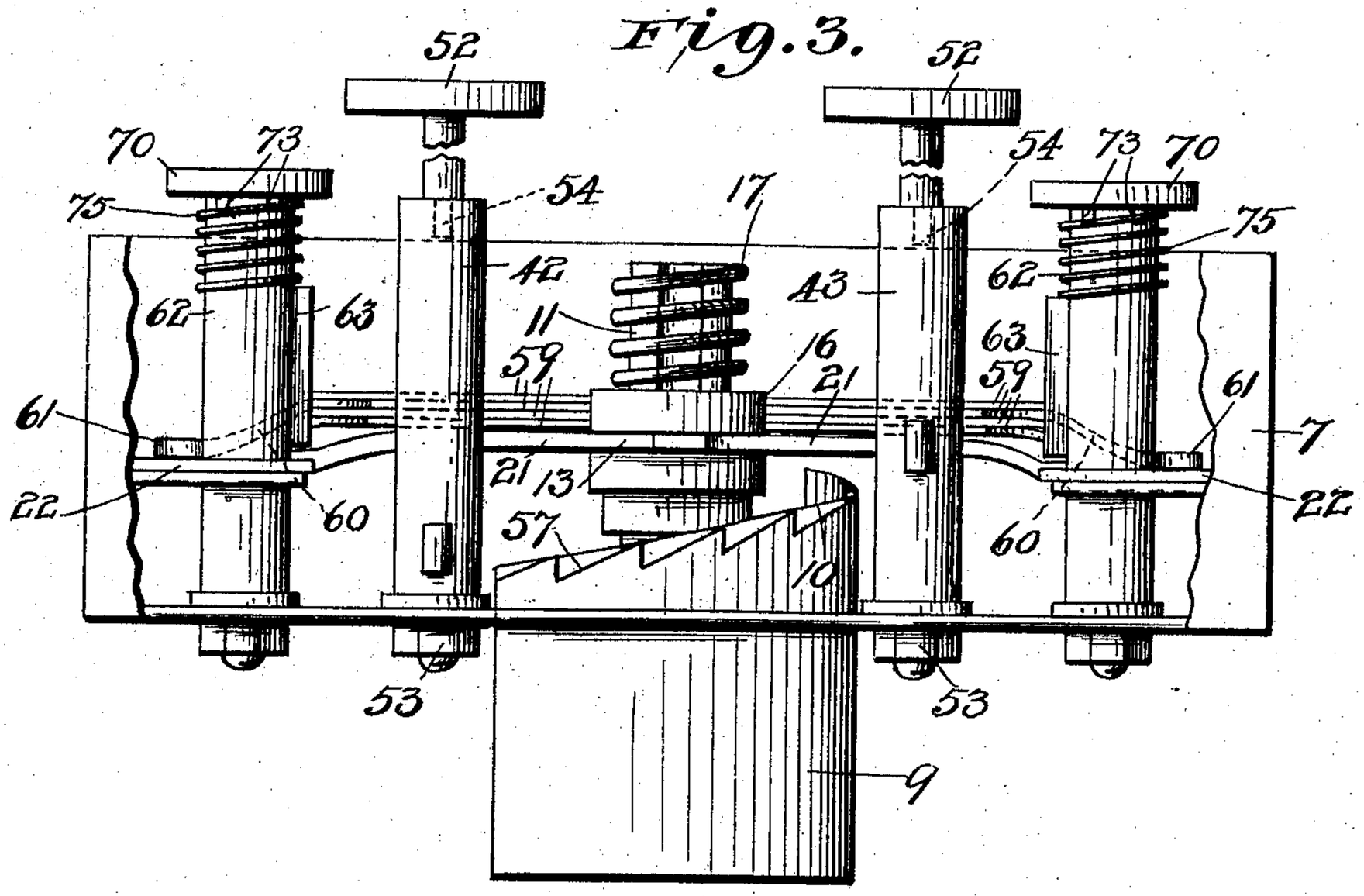
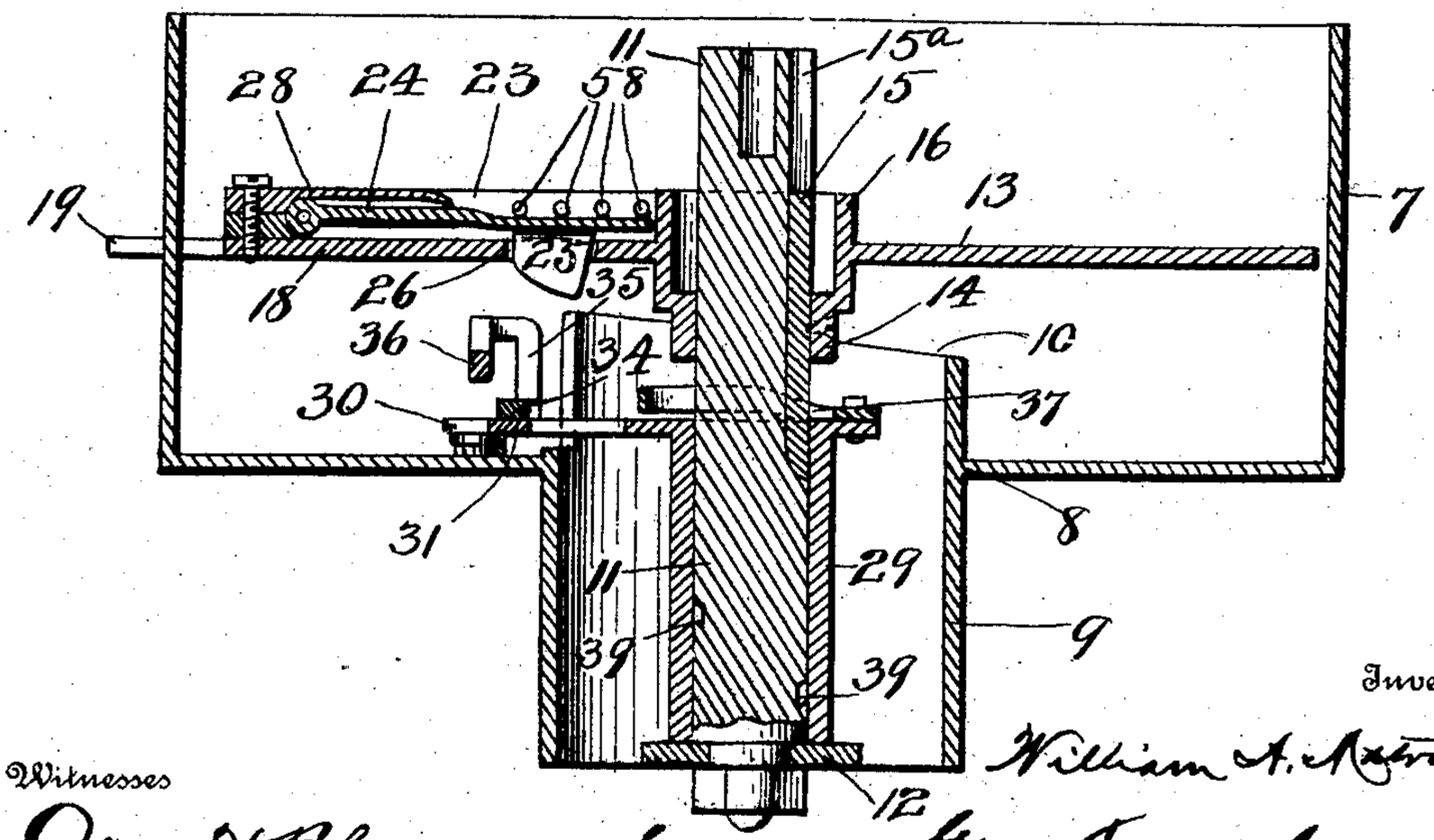


Fig. 4.



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4 SHEETS—SHEET 4.

Fig. 5.

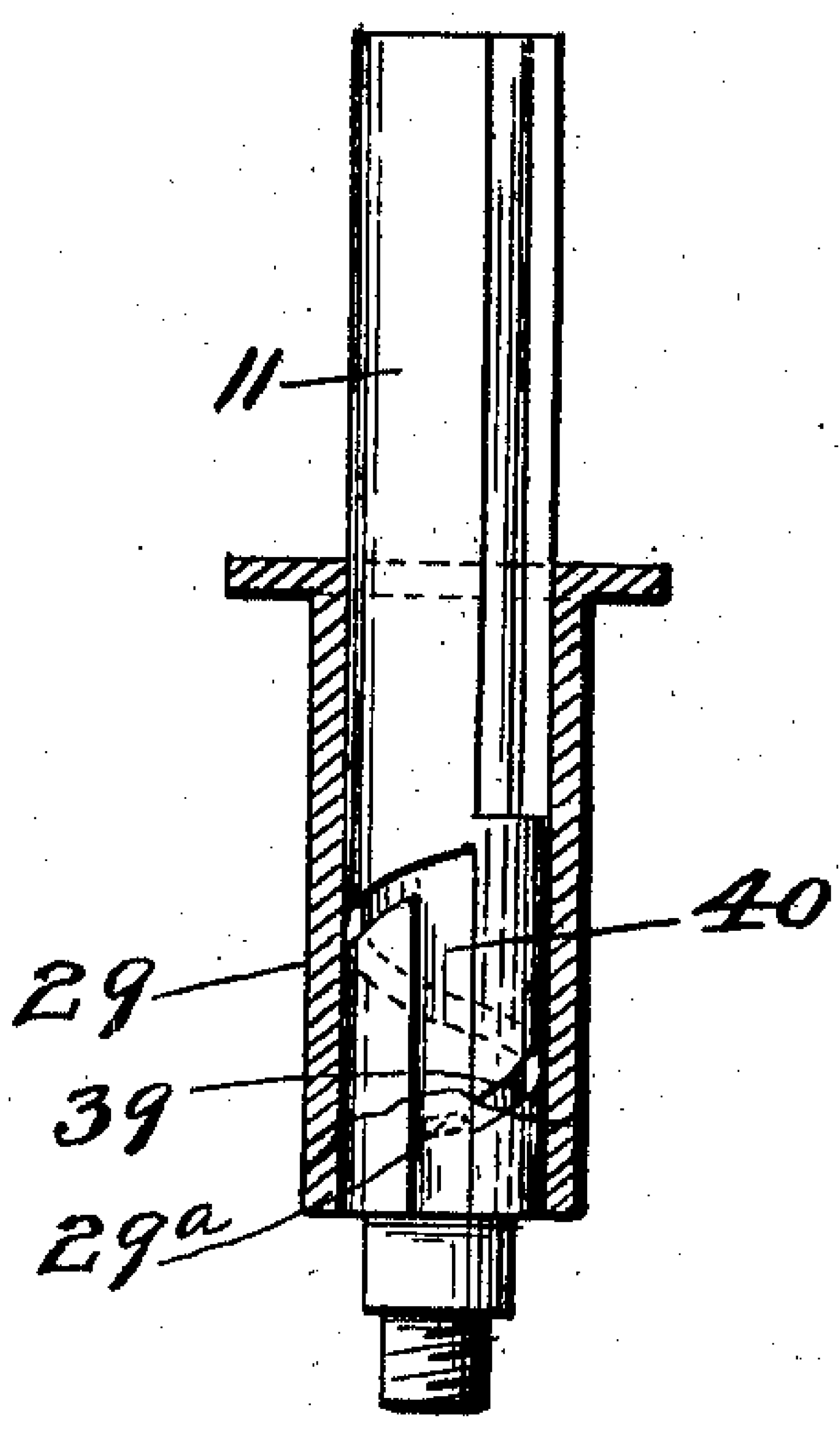


Fig. 6.

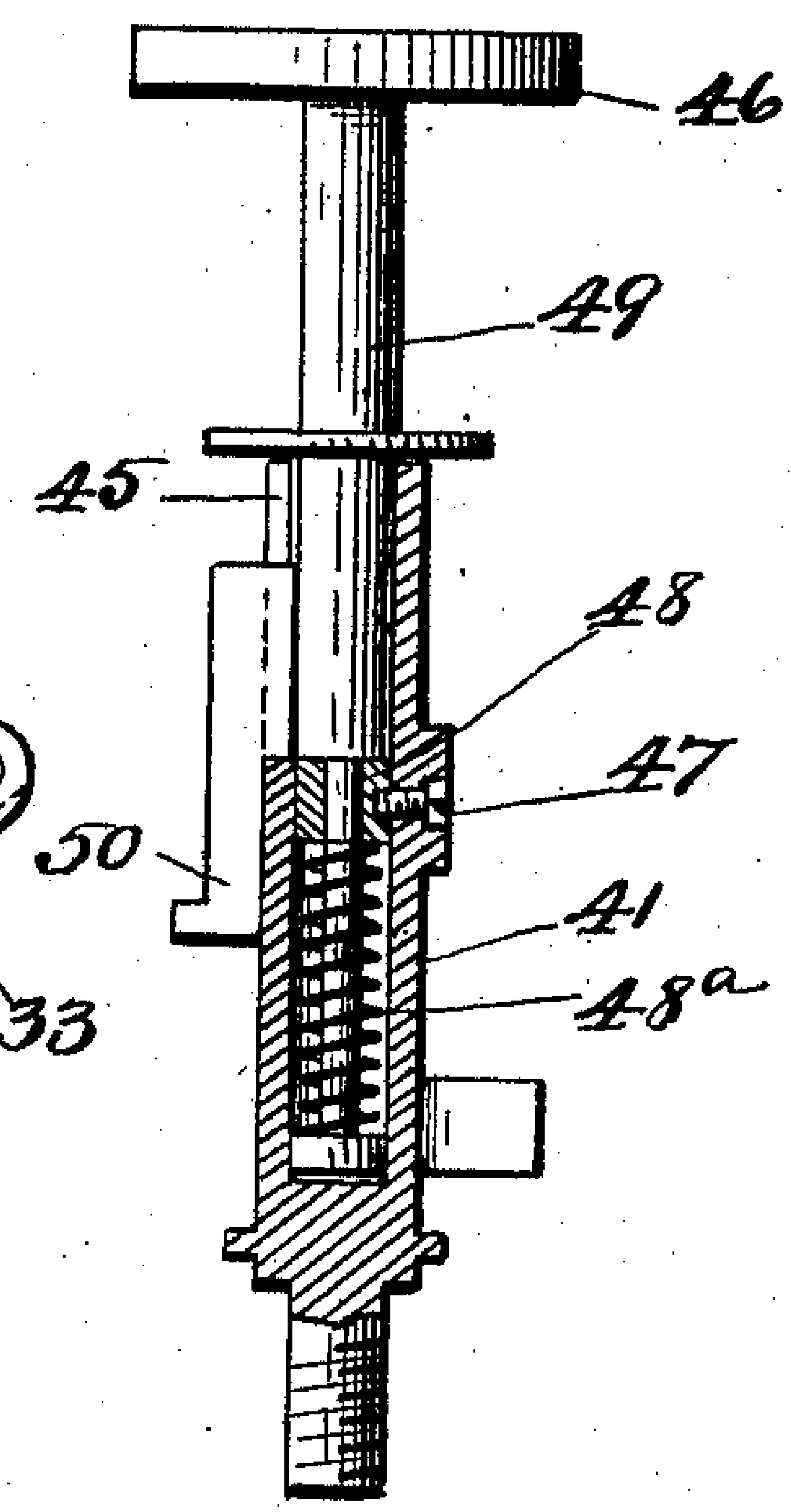


Fig. 10.

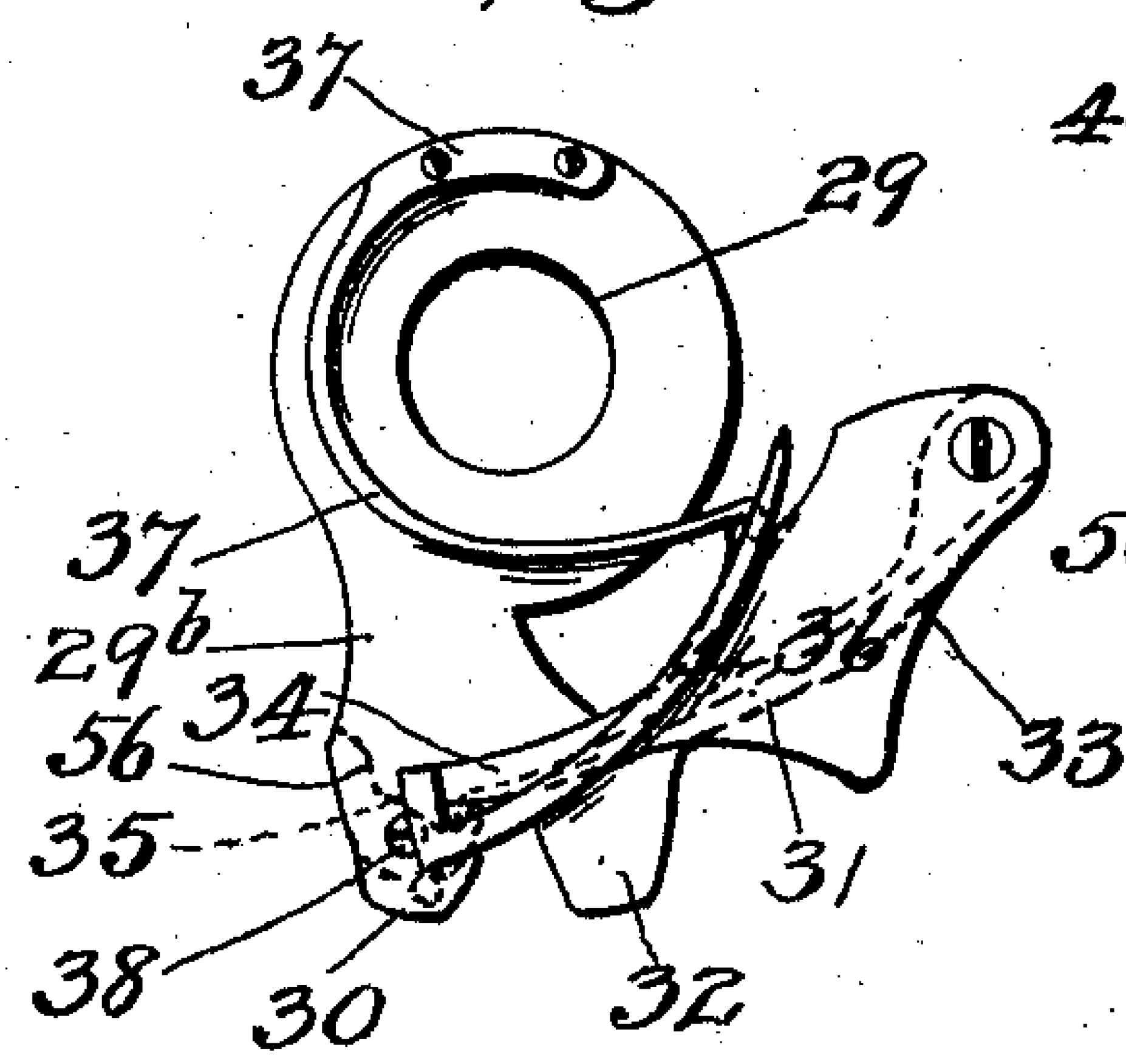
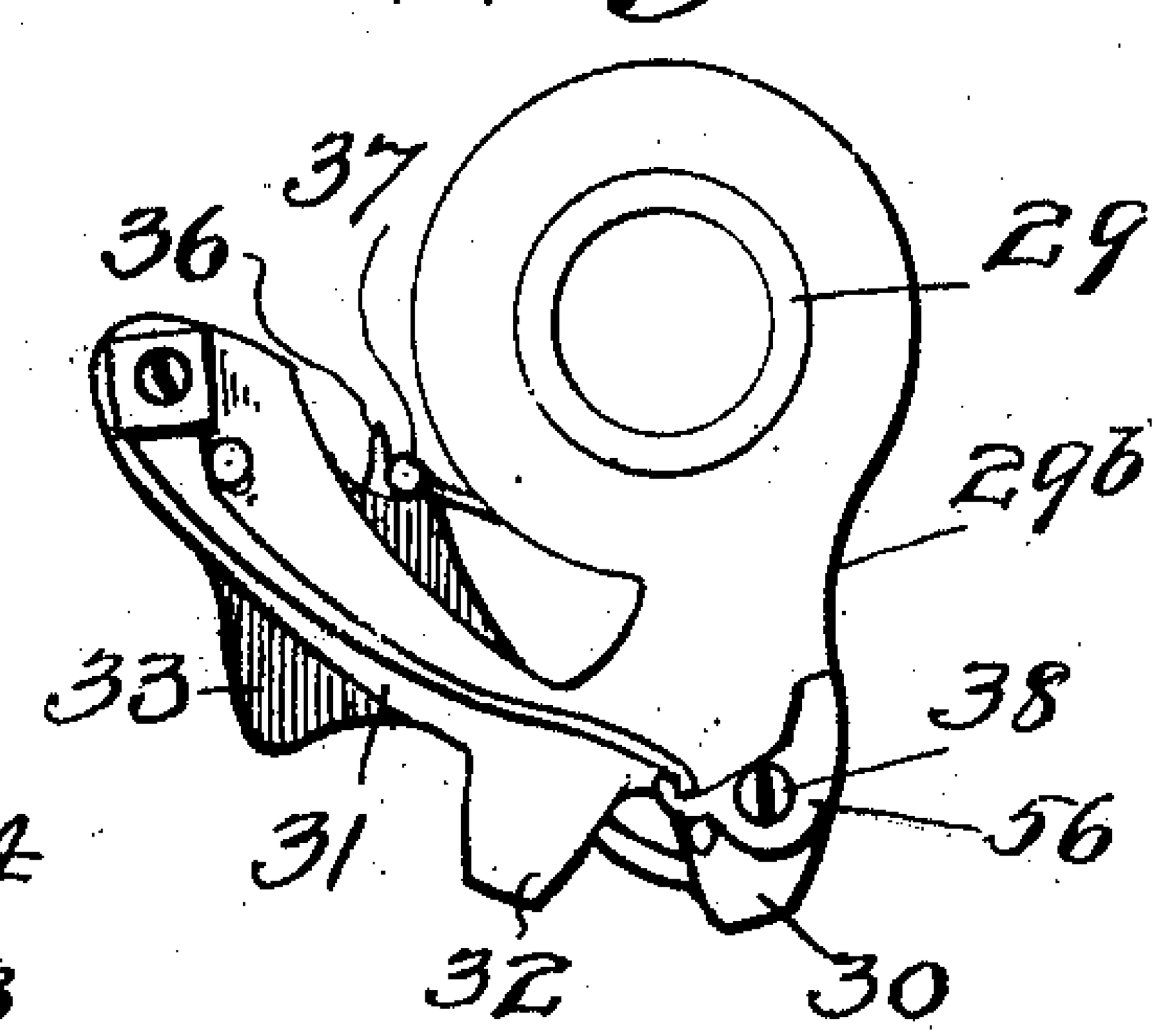


Fig. 12.



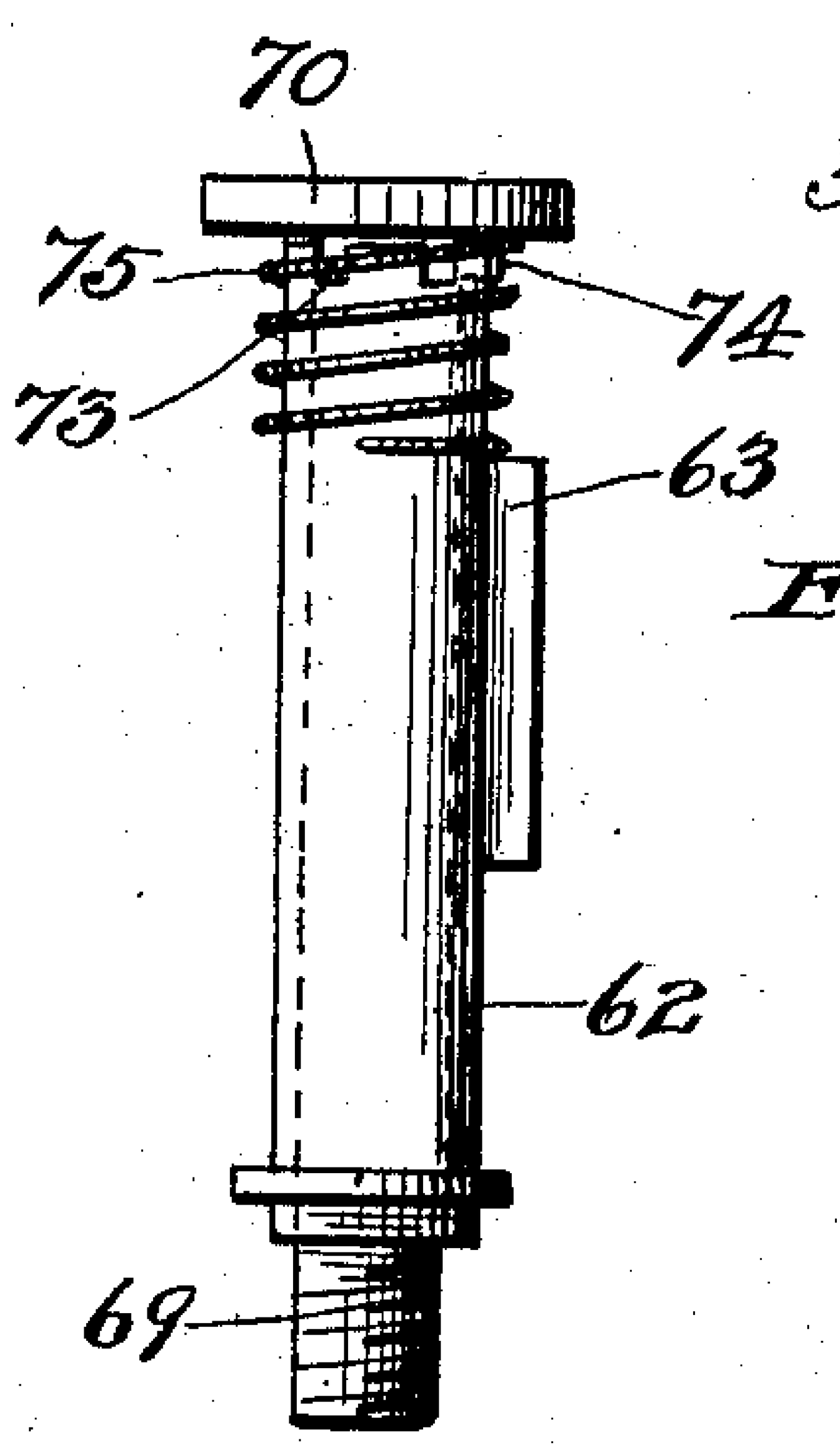


Fig. 8.

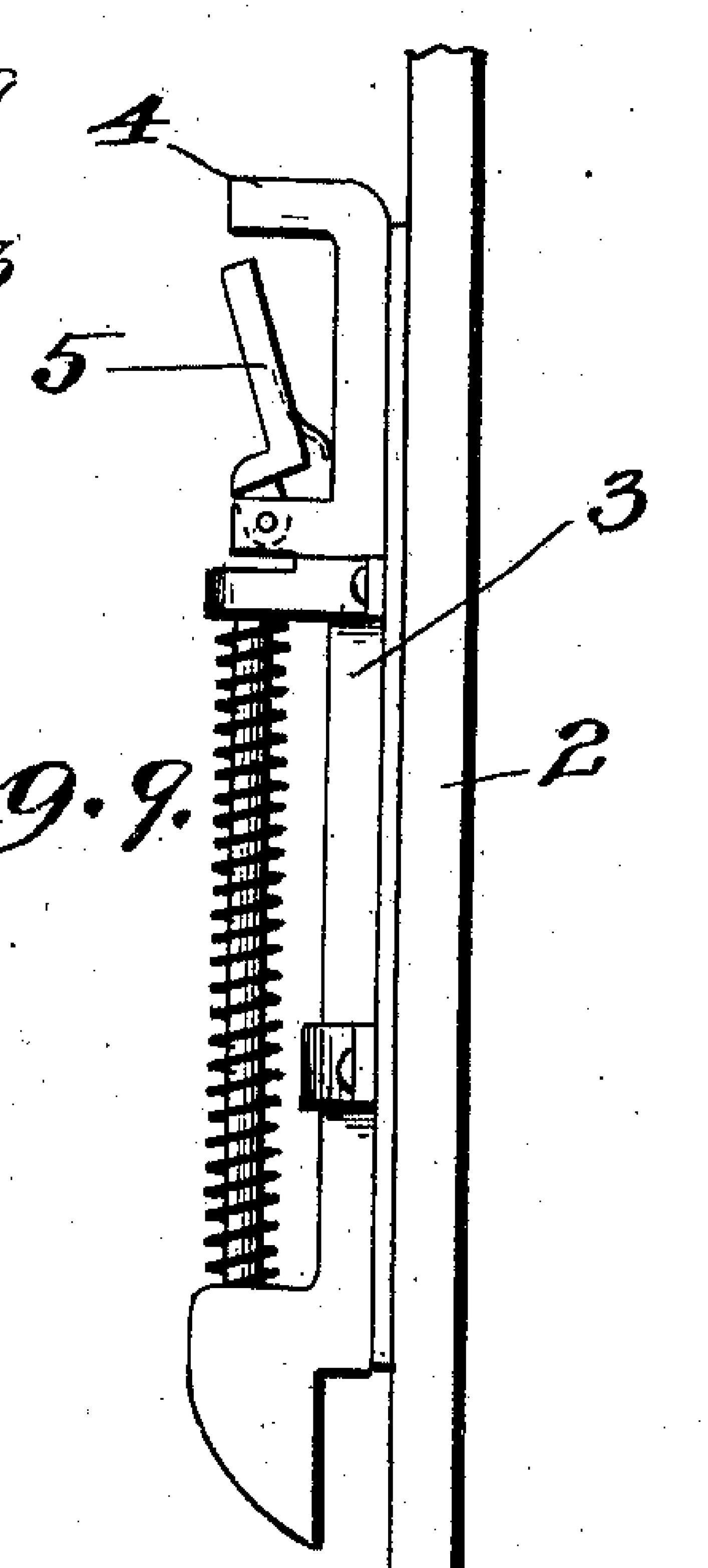


Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM A. MATROLIS, OF CUMBOLA, PENNSYLVANIA.

PERMUTATION-LOCK.

No. 850,309. Specification of Letters Patent. Patented April 16, 1907.

Application filed May 3, 1905. Serial No. 258,632.

To all whom it may concern:

Be it known that I, WILLIAM A. MATROLIS, a citizen of the United States, residing at Cumbola, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Permutation-Locks, of which the following is a specification.

My invention relates to permutation-locks for safes, strong-boxes, &c., and consists of a casing adapted to be secured in the top of the safe or strong-box and in which is mounted a vertically-movable plate mounted on an upright post and having lugs or projections to engage spring-actuated bolts that hold the doors closed and as it is raised withdraw the bolts and unlock the doors. The vertically-movable plate is actuated by means of a lifting device comprising a lifting-sleeve mounted to swing on the upright post and travel on a tube having an inclined upper edge secured to the casing, said dog being given a step-by-step movement by means of a series of rotatable shafts having thereon sleeves carrying lugs to engage the teeth on the lifting-sleeve.

When the device is locked, a spring-actuated dog pivotally secured to the lifting-sleeve is held from engagement by the lug on the first of said rotatable sleeves by means of a spring-actuated pawl. This spring-actuated pawl is prevented from disengaging itself from the spring-actuated dog by means of a number of pins that engage said pawl any one of which while engaging the pawl will prevent movement thereof. Each of these pins is secured to a bolt and the bolts are operated separately by means of spindles which must be rotated to assume a predetermined position for such purpose.

My invention also contemplates the employment of a novel construction of locking-bolt for the doors having a projection to engage a lug on the vertically-movable plate and a spring-actuated tongue pivoted on said bolt and adapted to engage the other side of said lug or projection so as to prevent the bolt from being operated except when actuated by the lug or projection.

The construction and operation of my improved lock will be described in detail hereinafter and illustrated in the accompanying drawings, in which—

Figure 1 is a top view of a safe or strong-box in which my improved lock is installed; Fig. 2, a top plan view of the mechanism of the lock; Fig. 3, an end view; Fig. 4, a cross-section on the line $x\,x$ of Fig. 2; Fig. 5, a detail view of the spirally-grooved post, showing the sleeve for raising the locking-plate in section; Fig. 6, a detail view of the initial spindle for releasing the pivoted dog and rotating said sleeve; Fig. 7, a detail view of one of the other spindles and its operating means; Fig. 8, a detail view of one of the spindles for operating the pawl-holding bolts and its operating means; Fig. 9, a detail view of the locking-bolt; Fig. 10, a top plan view of the lifting-sleeve and the teeth secured thereto, showing the spring-actuated pawl in dotted lines; Fig. 11, a detail view of one of the springs for opening the doors, and Fig. 12 a view showing the reverse side of the lifting-sleeve from that shown in Fig. 10.

In the drawings similar reference characters indicate corresponding parts throughout the several views.

1 represents a safe or strong box, having the doors 2 hinged thereon, each door being secured by means of a bolt 3, having a lug 4 on its upper end and a spring-actuated tongue 5.

3^a represents keepers to receive the bolts 3 to hold the doors in a locked position.

6 represents springs to throw the doors ajar when the bolts are lifted by the mechanism hereinafter described.

The lock is placed in the top of the safe or box and is inclosed by a casing 7. 8 represents a central hole in said casing in which is secured a tube 9, having its upper edge 10 inclined, as shown, with its lowest part nearly opposite the side of the casing 7 toward the front of the safe or box.

11 represents a perpendicular post secured centrally of the tube 9 to a cross-bar 12, secured across its lower end.

13 represents the locking-plate, slidably mounted on post 11 by means of a central bearing 14, having secured thereto a feather 15, adapted to reciprocate in groove 15^a in the post. Above the bearing 14 is formed a thimble 16, surrounding the post 11, but leaving a recess around it in which is adapted to seat one end of a coil-spring 17, the other end bearing against the upper plate of the casing 7.

The plate 13 has three arms branching laterally from the thimble 16, arm 18 exending toward the front and having two angular lugs 19, that extend through slots 20 in the front of the casing 7 and adapted to seat under lugs 4 on the bolts 3, and an arm 21, ex-

tending toward each side of the casing, with a bar 22 on its end that extends along the sides of the casing 7.

23 represents a boxing on the upper side of arm 18, in which is secured a pivoted pawl 24, having a lug 25 on its end adapted to seat in a slot 26 in arm 18 and a laterally-extending tooth 27, that projects through a slot in the side of boxing 23. 28 represents a leaf-spring to normally depress said pawl.

Mounted on the post 11 is a sleeve 29, and on the upper end of the sleeve is a laterally-extending arm 29^b, having teeth 30 and 32 and a segmental bar 31 formed integral therewith, while on the end of the bar 31 is pivoted a dog 33, having a curved extension 34, and on the end of extension 34 a vertical portion 35, carrying a curved bar 36, adapted to engage the lug 25 when in a locked position, so as to hold the dog 33 from being engaged by the unlocking-spindles, to be hereinafter described. When the lug 25 is raised, the dog 33 is thrown outwardly by means of a leaf-spring 37, so that it is in line with the teeth 30 and 32, a pin 38 limiting the outward movement of said dog 33.

The arm 29^b rides on the inclined edge 10, and on the inside of sleeve 29 is secured a pin 29^a, that rides in the spiral groove 39 in post 11, 40 representing a vertical groove in the post connecting the upper and lower ends of the spiral groove 39, in which the pin 29^a rides when the sleeve 29 is returning from its highest to its lowermost position.

41, 42, 43, and 44 represent rotating spindles mounted in casing 7, each having thereon a lug adapted to engage dog 33 and the teeth 32 and 30 in succession and force the sleeve 29 to rotate, and as the tooth 30 rides on the inclined edge 10 and the pin 29^a in the spiral groove 39 it will be understood that the sleeve 29 is gradually raised, lifting with it the plate 13, on which are the lugs 19, which engage the bolts 3, raising them so that the doors 2 may be sprung open by the springs 6. The spindles 41, 42, 43, and 44 are arranged at equal distances apart around the post 11, and as the teeth 30 and 32 and dog 33 are arranged in an arc comprising a quarter of a circle it will be readily understood that three turns each of the spindles in succession, beginning with 41, will give the sleeve 29 and its appurtenances a complete rotation and unlock the doors.

Spindle 41 is secured for rotation to the casing 7 and has a slot in one side, as shown at 45. 46 represents the handle for turning the spindle 41, which is secured in the spindle by means of a screw 47, that engages collar 48 on the stem 49 of said handle, 48^a representing a spring bearing against said collar and the end of the stem 49. 50 represents a hook on said stem 49, that projects through slot 45 and is adapted to engage tooth 27 on pawl 24 and raise it when it is desired to release tooth 33, so that it may be engaged by the lug on spindle 41 and the lugs on the other spindles in succession. The spindles 42, 43, and 44 are tubular, and the stems 51 of handles 52 are inserted therein and are secured in place by means of nuts 53 engaging the screw-threaded ends of said stems. The tops of said spindles 42, 43, and 44 are notched, as shown at 54, to receive lugs 55 on the stems 51.

56 represents a spring-actuated pawl on the under side of tooth 30, that engages the ratchet-teeth 57, cut into the side of inclined edge 10 to hold the sleeve 29 in its successive positions while being rotated, as above described.

58 represents a number of pins slidably mounted in the sides of boxing 23 over the free end of pawl 24 and one or more of which will prevent lifting the pawl and the consequent releasing of the dog 33, as above described. Each one of the pins 58 is secured to a bolt 59, that is so shaped as not to interfere with the working of the other bolts and has an extension 60 thereon with a curved bearing-surface 61 on its extreme end, each of said bearings 61 being opposite a spindle 62, having a longitudinal flange 63, adapted to engage said bearing 61 and hold the pin on the bolt, to which it is attached, from interfering with the operation of pawl 24. Each of the bolts 59 has formed integral therewith a rod 64, slidably mounted in vertical plates 65, secured to bars 22, and coil-springs 66 are mounted on said rods 64 and bear against said plates 65 and bolts 59 to normally hold the pins 58 in position to interfere with the operation of pawl 24.

The spindles 62 are rotatably mounted in holes 67 in bars 22, which have offset notches 68 to receive the flanges 63, so that they do not interfere with the vertical movement of the plate 13 when being lifted, as above described, in unlocking the doors. Spindles 62 are operated by means of shafts 69, passed therethrough and secured by means of nuts engaging screw-threads on the ends of said shafts, the upper ends of said shafts being formed with knobs 70, having on their faces a number of notches 71 with a distinctive character, such as a letter or a numeral, opposite each notch. 72 represents lines on the top of the safe or strong-box 1 opposite each knob 70 to act as guides to correctly adjust the several knobs in arranging them so that the lock may be operated. The top of each spindle 62 is provided with a series of notches 73, and 74 represents a lug or projection on each knob 70 to engage one of said notches, it being understood that the lock may be secretly set by changing the position of the projection 74 relative to the flange 63. As it might be possible to feel the resistance caused by the flange 63 engaging the bearings 61, I provide a coil-

spring 75 on each spindle 62, which, bearing against the knob 70, serves to counteract the resistance made by coil-springs 66 and the weight of bolts 59, so that it is impossible to tell by the sense of touch when the spindle is in the correct position to withdraw the corresponding bolt.

In operation it will be understood that to unlock the safe or strong-box it is first necessary to turn the knobs 70 in position, as indicated by the notches 71 and lines 72, so that the pins 58 do not interfere with the operation of pawl 24. The handle 46 is then raised, and the hook 50, engaging tooth 27, the pawl 24 is lifted, thus releasing the spring-actuated pivoted dog 33. When pressure on the handle 46 is released, the spring 48^a returns it to its normal position. The handle 46 is then given three turns from left to right, causing the lug thereon to engage the dog 33 and the teeth 32 and 30 in succession and rotating the sleeve 29 one-fourth of the distance around the post 11. The handle 52 on spindle 42 is then turned three times, causing the lug thereon to engage said teeth, and so on for the other two spindles. As the sleeve 29 rotates it is understood that the plate 13 is gradually raised, and just before arm 29^b drops off the highest point of the inclined edge 10 the bolts 3 are withdrawn from their keepers, thus releasing the doors 2 to the action of springs 6. When the arm 29^b drops off of the highest part of inclined edge 10, the coil-spring 17 returns the plate 13 to its normal position, and the lug 25 on pawl 24 having engaged the curved bar 36 on dog 33 the lock is adapted to be set by indiscriminately turning the knobs 70.

Having thus described my invention, what I claim is—

1. In a lock, a horizontal plate mounted for vertical movement, step-by-step means for raising said plate, and sliding bolts actuated by said plate, substantially as shown and described.

2. In a lock, in combination with the casing, a post secured therein, a sleeve mounted on said post, a plate slidably mounted on the post and resting on said sleeve, and means to raise said sleeve, substantially as shown and described.

3. In a lock, in combination with the casing, a post, a sleeve adjustably mounted on the post, a plate slidably mounted on the post and resting on said sleeve, and means to rotate and elevate said sleeve, substantially as shown and described.

4. In a lock, in combination with the casing, a post, a sleeve adjustably mounted on the post, a plate slidably mounted on the post and resting on said sleeve and step-by-step means to rotate and elevate said sleeve, substantially as shown and described.

5. In a lock, in combination with the casing, a post having a spiral groove therein, a sleeve mounted on the post and having a pin to ride in said spiral groove, a plate slidably mounted on the post and resting on said sleeve, teeth secured to said sleeve, and a series of spindles having lugs to engage said teeth, substantially as shown and described.

6. In a lock, in combination with the casing, a post having a spiral groove therein, a sleeve mounted on the post and having a pin to ride in said groove, a plate slidably mounted on the post and resting on said sleeve, teeth rigidly secured to said sleeve, a spring-actuated dog pivotally connected with said sleeve, means to engage said teeth and dog to actuate said sleeve, and means to hold said dog in an inoperative position, substantially as shown and described.

7. In a lock, in combination with the casing, a tube set in the lower plate of the casing having its upper edge inclined, a post secured in said tube having a spiral groove therein, a sleeve mounted on said post and having a pin to ride in said spiral groove, means to rotate said sleeve, and a plate slidably mounted on said post and adapted to be raised by said sleeve, substantially as shown and described.

8. In a lock, in combination with the casing, a post secured therein and having a spiral groove in its surface, a tube surrounding said post having an inclined upper edge, a plate slidably mounted on said post, a sleeve mounted on the post and having a pin to ride in said groove, teeth secured to said sleeve and riding on the upper edge of said tube, and a series of spindles having lugs to engage said teeth, substantially as shown and described.

9. In a lock, in combination with a casing, a post secured therein having a spiral groove in its surface, a tube surrounding said post having an inclined upper edge, a plate slidably mounted on the post and having a pin to ride in said groove, teeth rigidly secured to said sleeve and riding on the upper edge of said tube, a spring-actuated dog pivotally connected with the sleeve, a series of spindles having lugs to engage said sprocket-teeth and dog, and means to hold said dog in an inoperative position, substantially as shown and described.

10. In a lock, in combination with a casing, a post secured therein, a sleeve adjustably mounted on the post, a plate slidably mounted on the post and resting on said sleeve, teeth rigidly secured to said sleeve, a spring-actuated dog pivotally connected with said sleeve, spindles provided with lugs to engage said teeth and dog, and a pawl pivotally mounted on the plate and adapted to engage said dog to keep it from engagement by said spindles, substantially as shown and described.

11. In a lock, in combination with a casing, a post secured therein, a plate slidably

mounted on said post, a sleeve adjustably mounted on the post, teeth rigidly secured to said sleeve, a spring-actuated dog pivotally connected with the sleeve, spindles provided with lugs to engage said teeth and dog, a pawl pivotally mounted on the plate to engage said dog, spring-actuated bolts having means to prevent said pawl from being actuated to release said dog, and means to actuate said bolts, substantially as shown and described.

12. In a lock, in combination with a casing, a post secured therein, a sleeve adjustably mounted on the post, a plate slidably mounted on the post and resting on said sleeve, teeth rigidly secured to said sleeve, a spring-actuated dog pivotally connected with the sleeve, spindles provided with lugs to engage said teeth and dog, a pawl pivotally mounted on the plate to engage said dog, spring-actuated bolts having pins integral therewith to engage said pawl, and spindles having means to actuate said bolts to hold said pins from engagement with said pawl, substantially as shown and described.

13. In a lock, in combination with a casing, a tube secured therein having an inclined upper edge, a post secured in said tube having a spiral groove in its surface, a plate slidably mounted on the post, a sleeve mounted on said post and having a pin to ride in said spiral groove, teeth rigidly secured to said sleeve and resting on the said inclined upper edge, a spring-actuated dog pivotally connected with said sleeve, spindles provided with lugs to engage said teeth and dog, a pawl pivotally mounted on the plate to engage said dog, spring-actuated bolts having pins integral therewith to engage said pawl, spindles rotatively mounted having flanges, and the ends of said bolts provided with bearing-surfaces to be engaged by said flanges, substantially as shown and described.

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

WILLIAM A. MATROLIS.

Witnesses:
THOMAS J. DEVLIN,
JOHN M. MCDONALD.