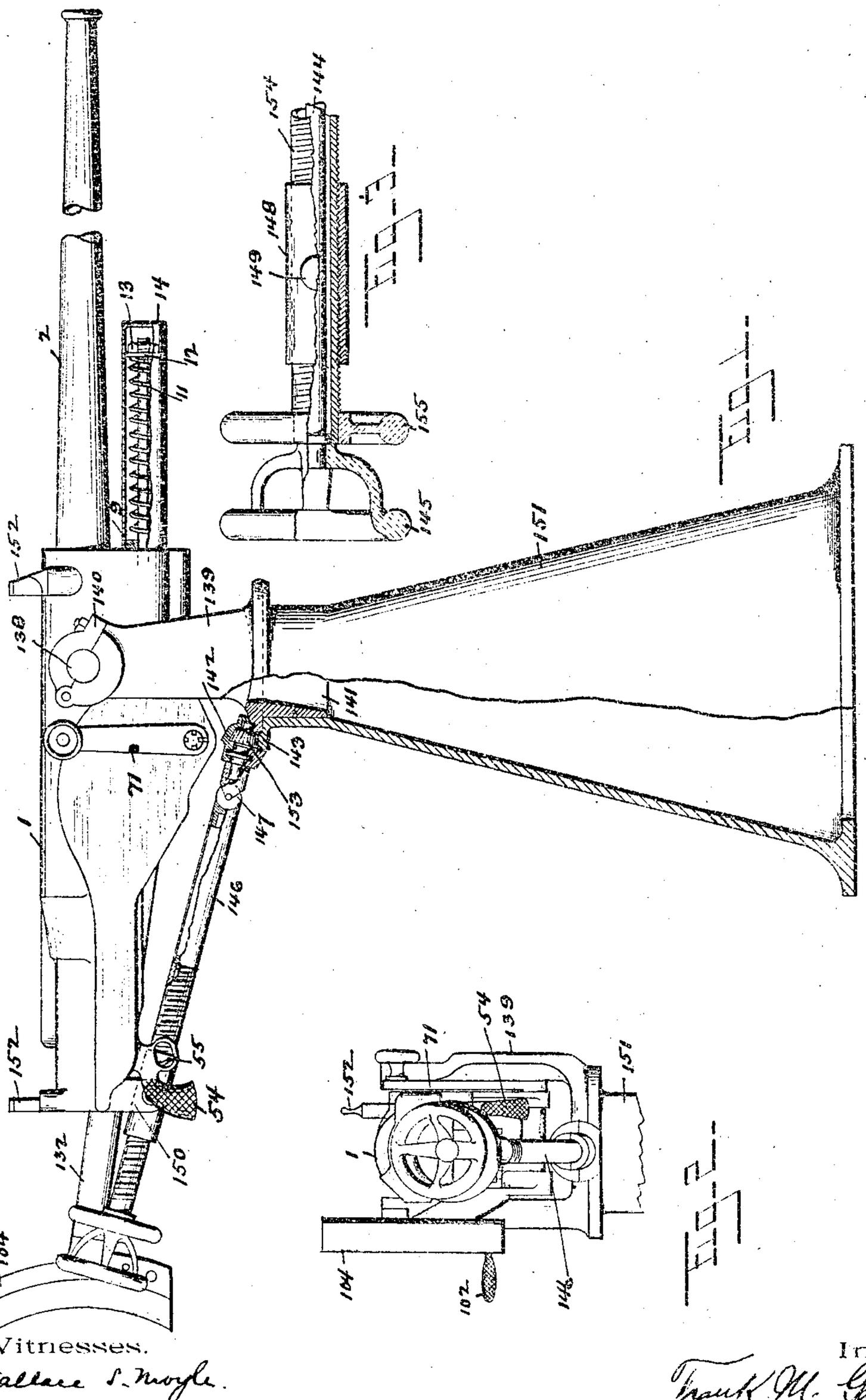
No. 669,236. Patented Mar. 5, 1901.

F. M. GARLAND.

AUTOMATIC MACHINE GUN.

(Application filed Feb. 16, 1900.)

(No Model.) 7 Sheets--Sheet 1.



Witnesses.
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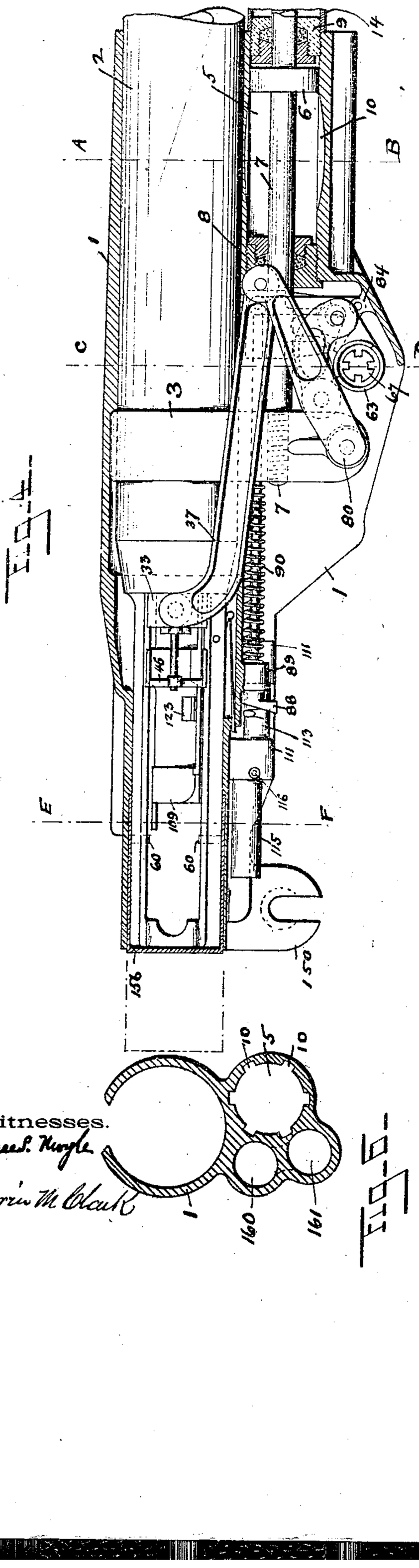

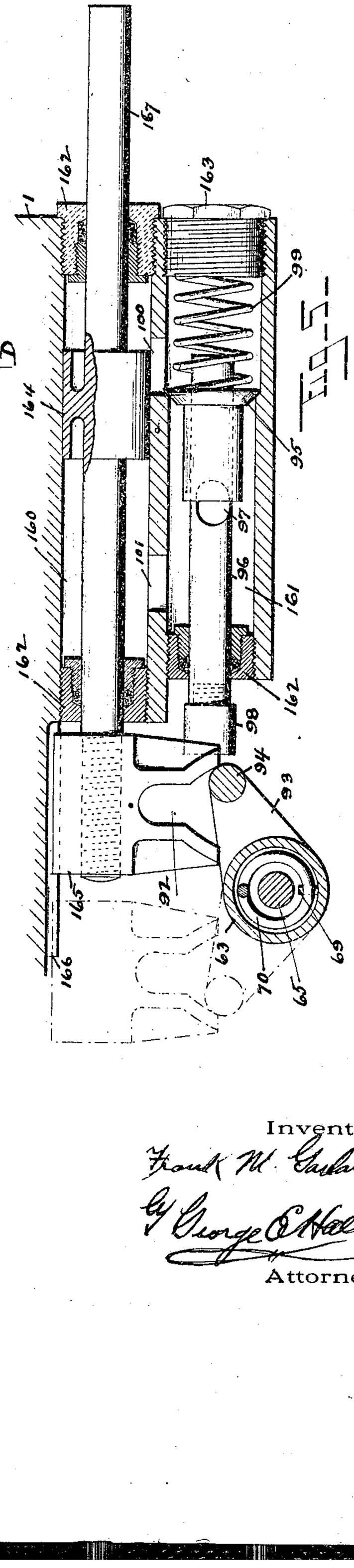

Witnesses.
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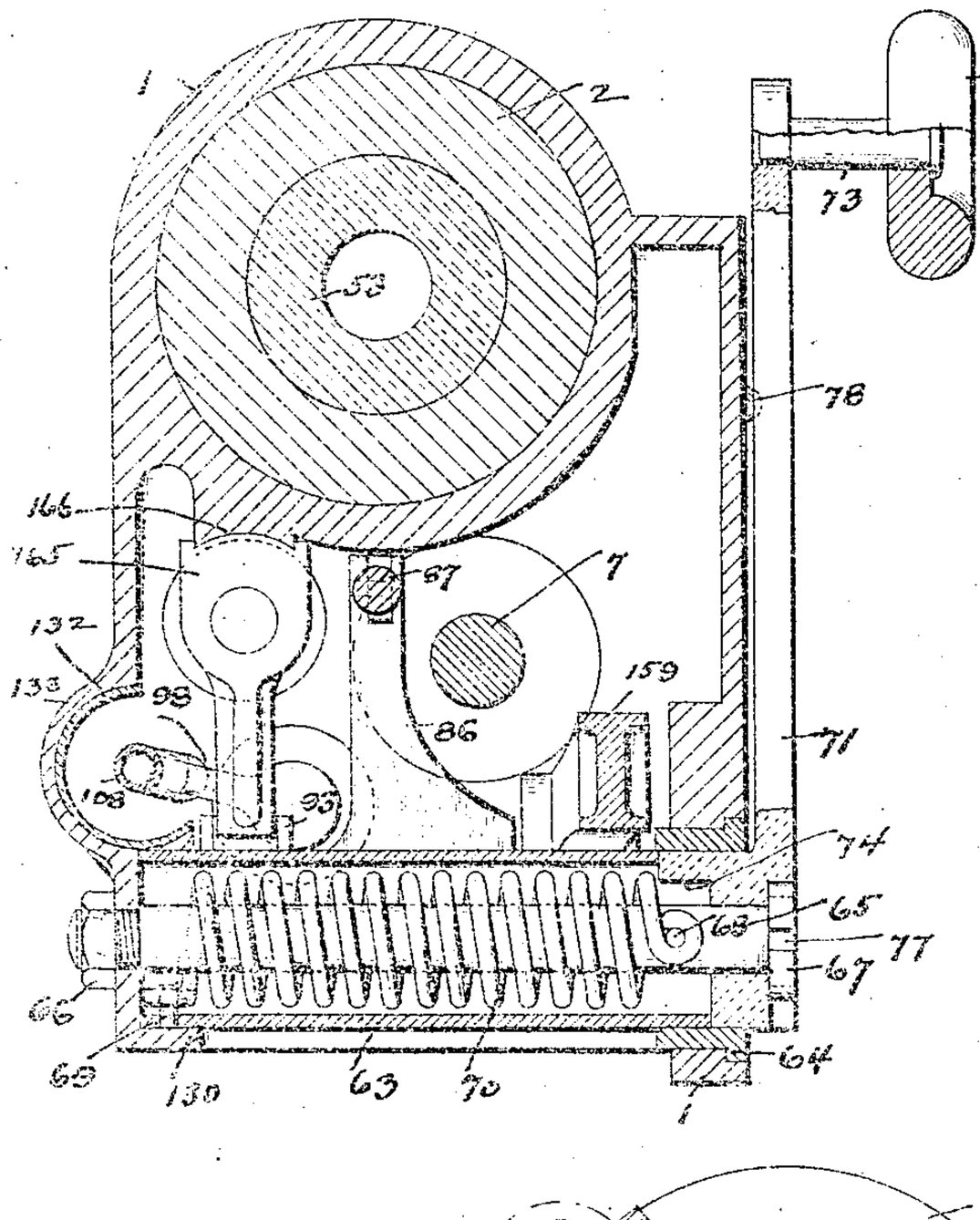

Fig. 1.

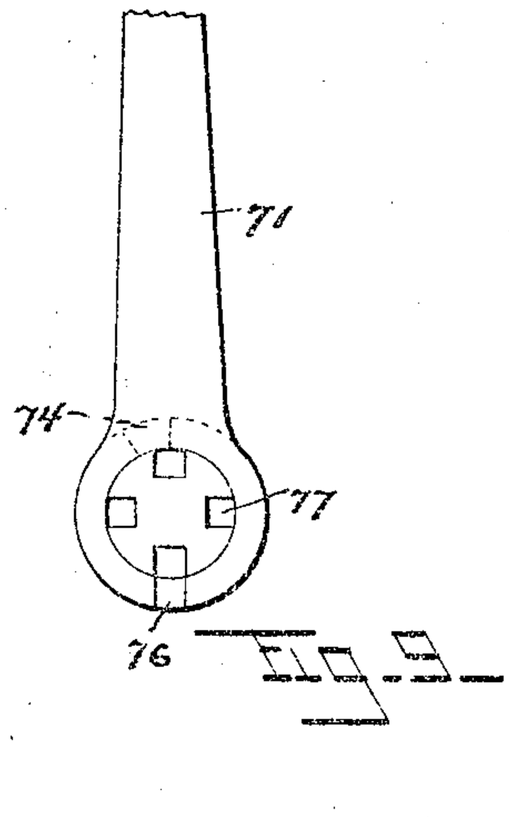

Fig. 3.

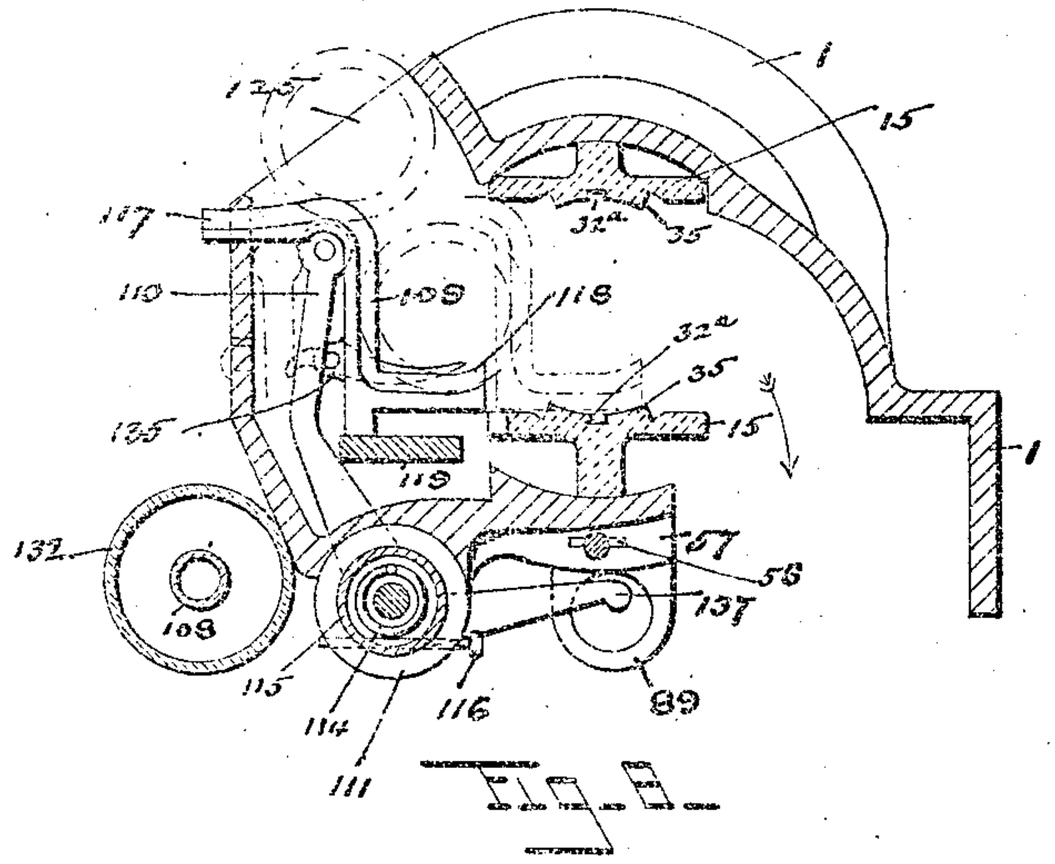

Fig. 2.

Witnesses.
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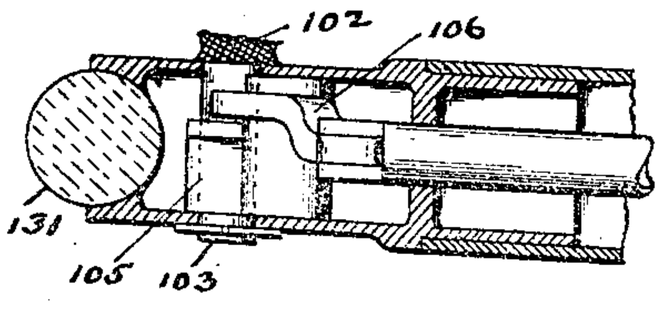
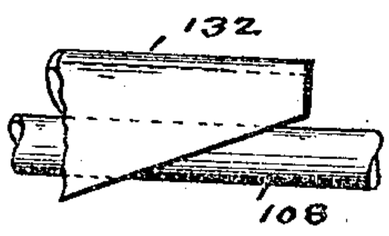
(No Model.) 7 Sheets—Sheet 4.

Fig. 14.





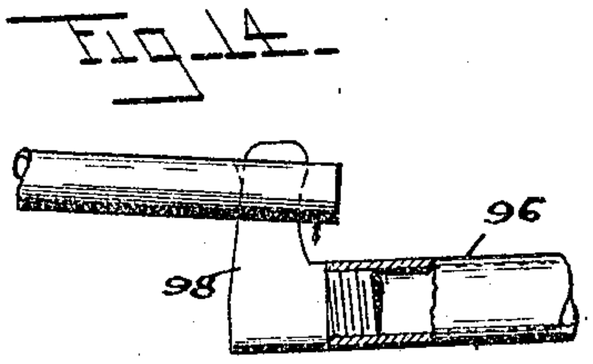


Fig. 10.

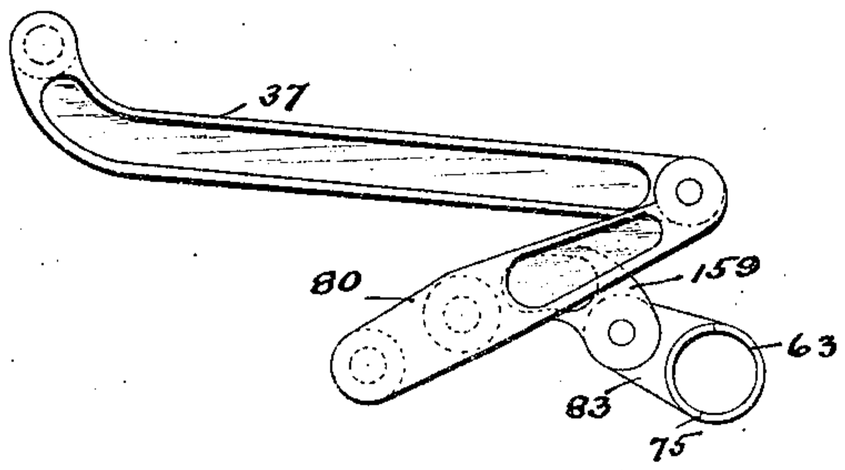
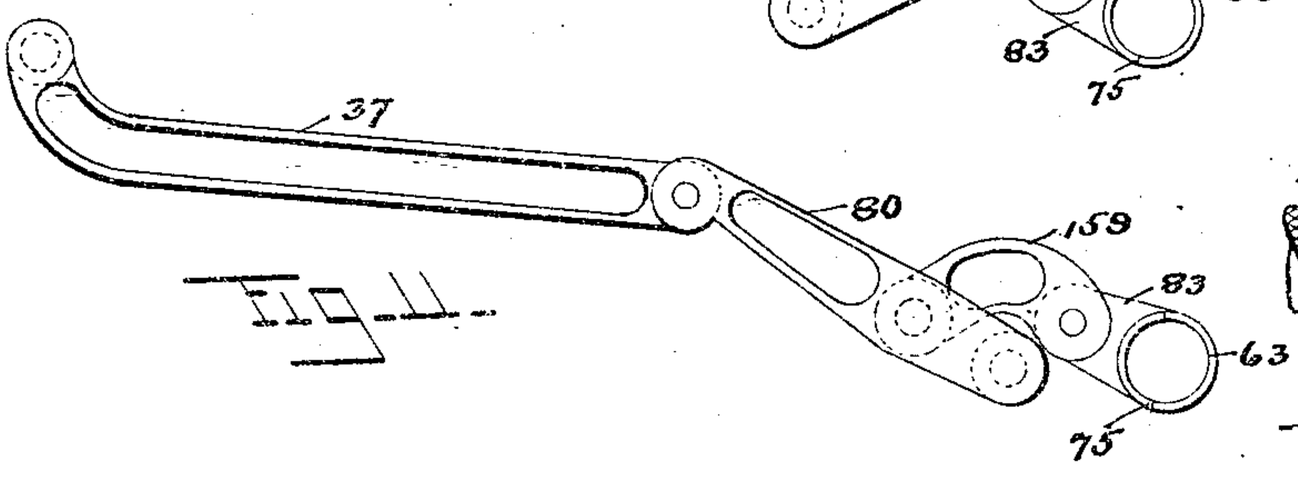


Fig. 11.



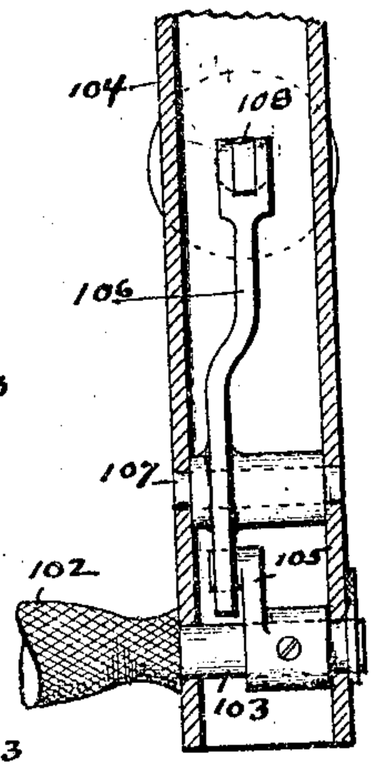


Fig. 15.

Fig. 12.

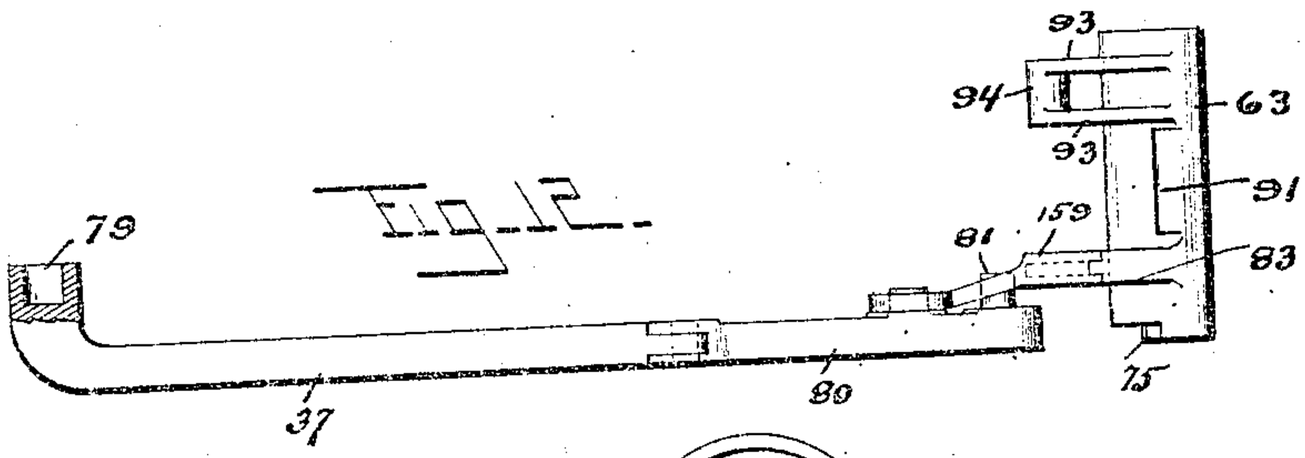
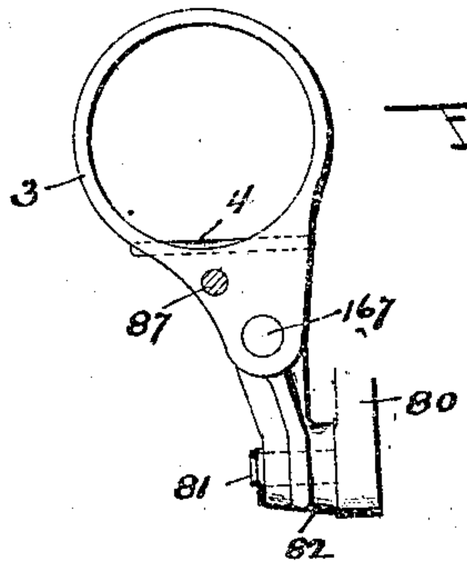


Fig. 13.



Witnesses.
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(No Model.) 7 Sheets—Sheet 5.

Fig. 16.

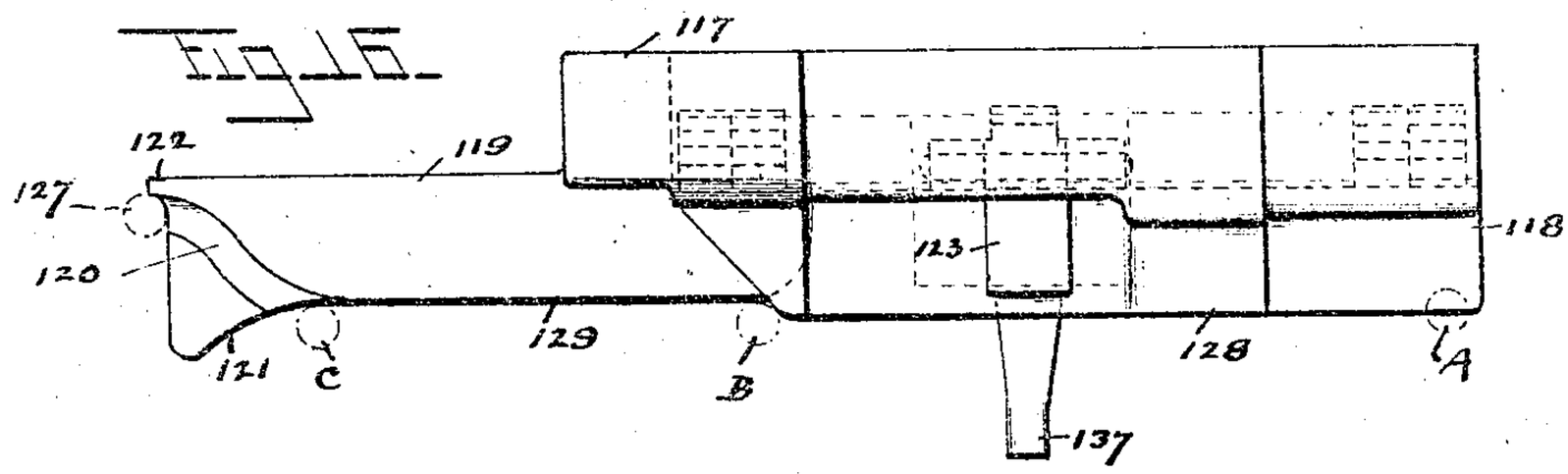


Fig. 18.

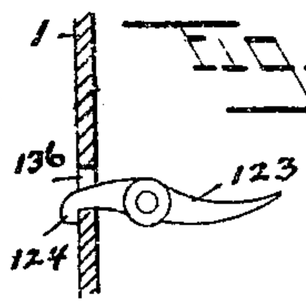


Fig. 17.

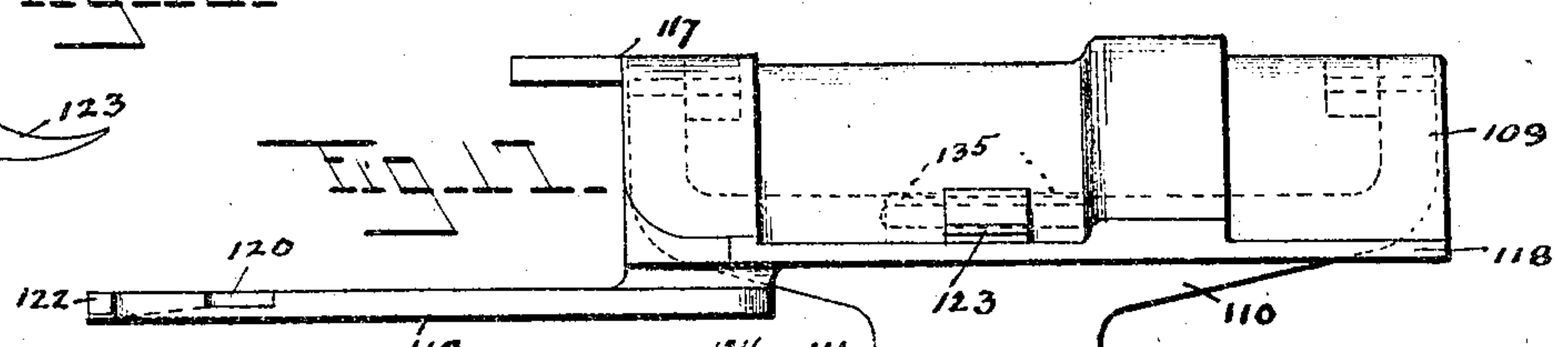


Fig. 19.

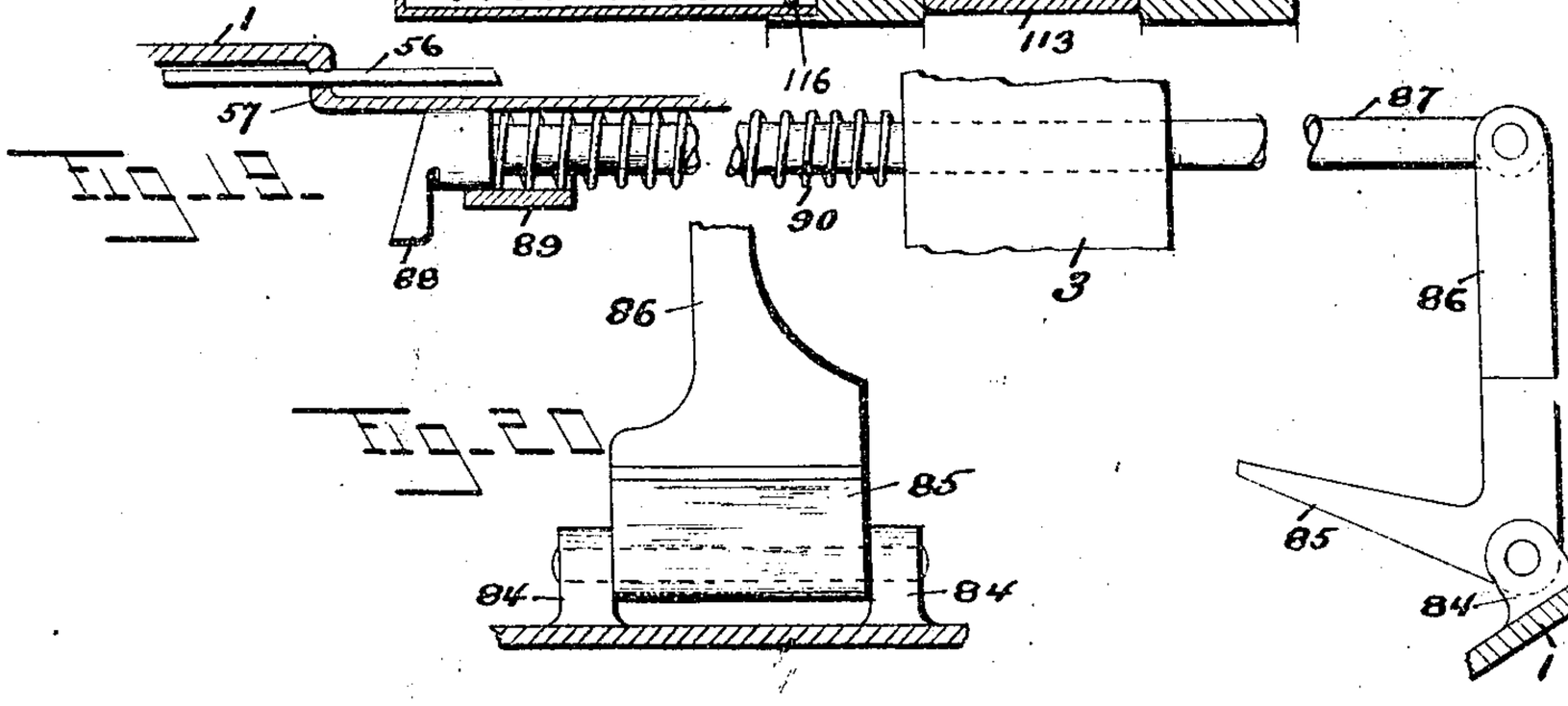


Fig. 20.

Fig. 21.

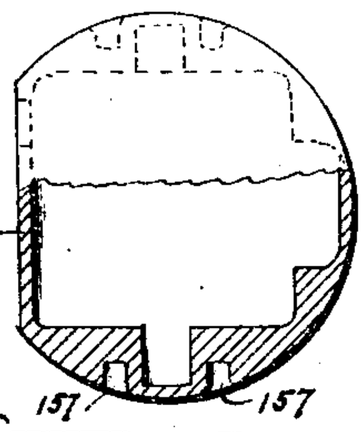
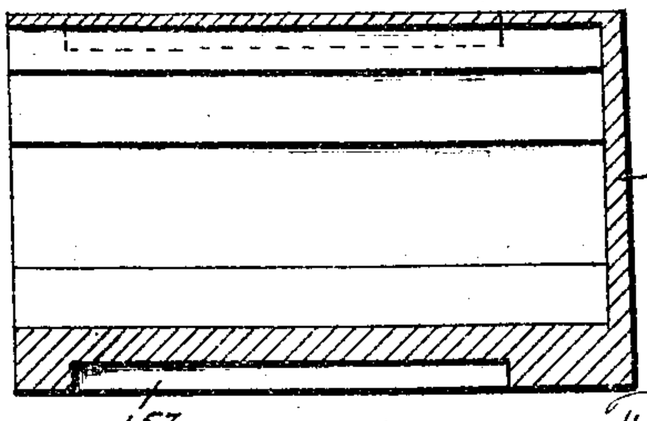


Fig. 22.



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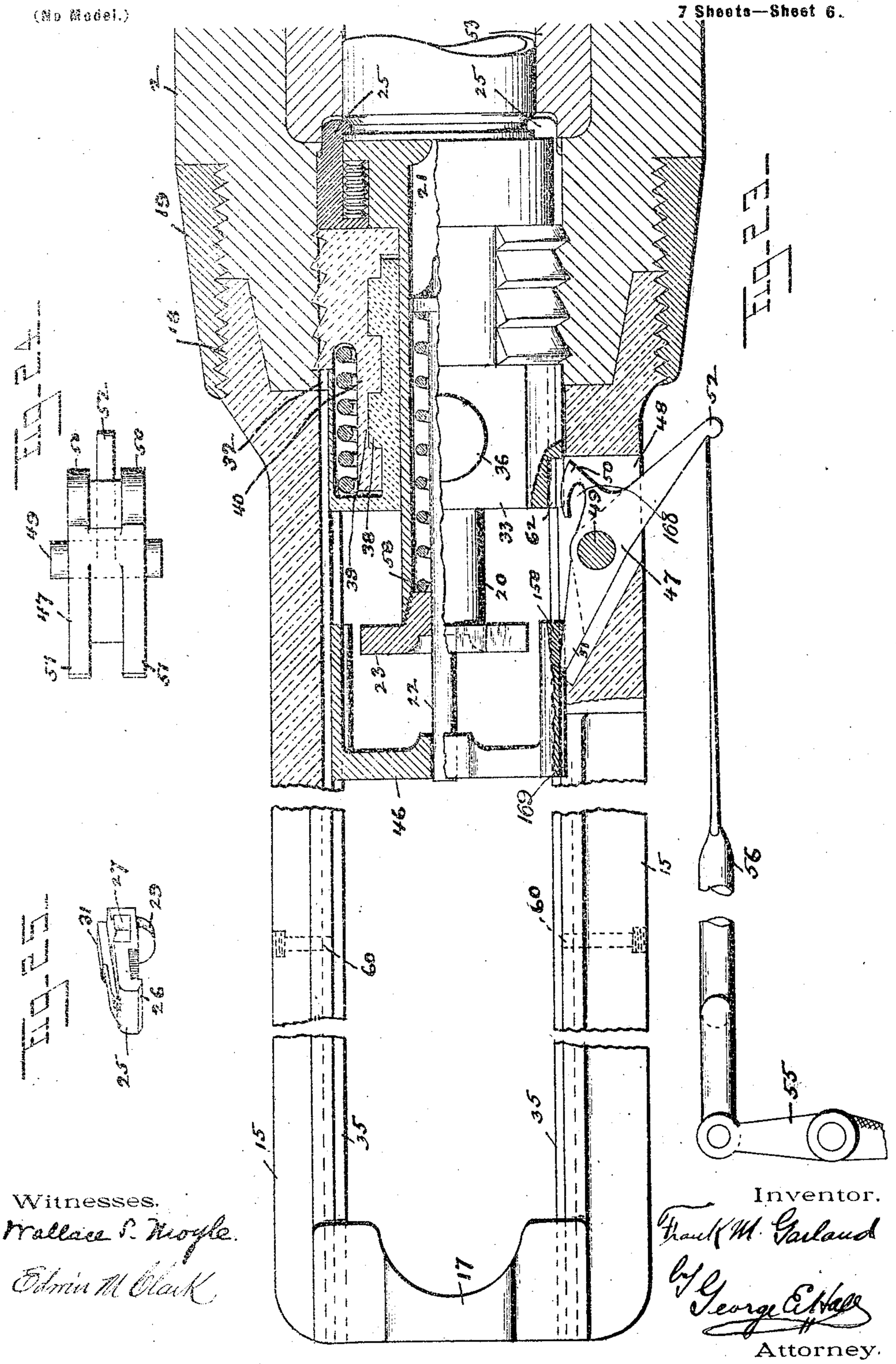

FIG. 22.

Witnesses.
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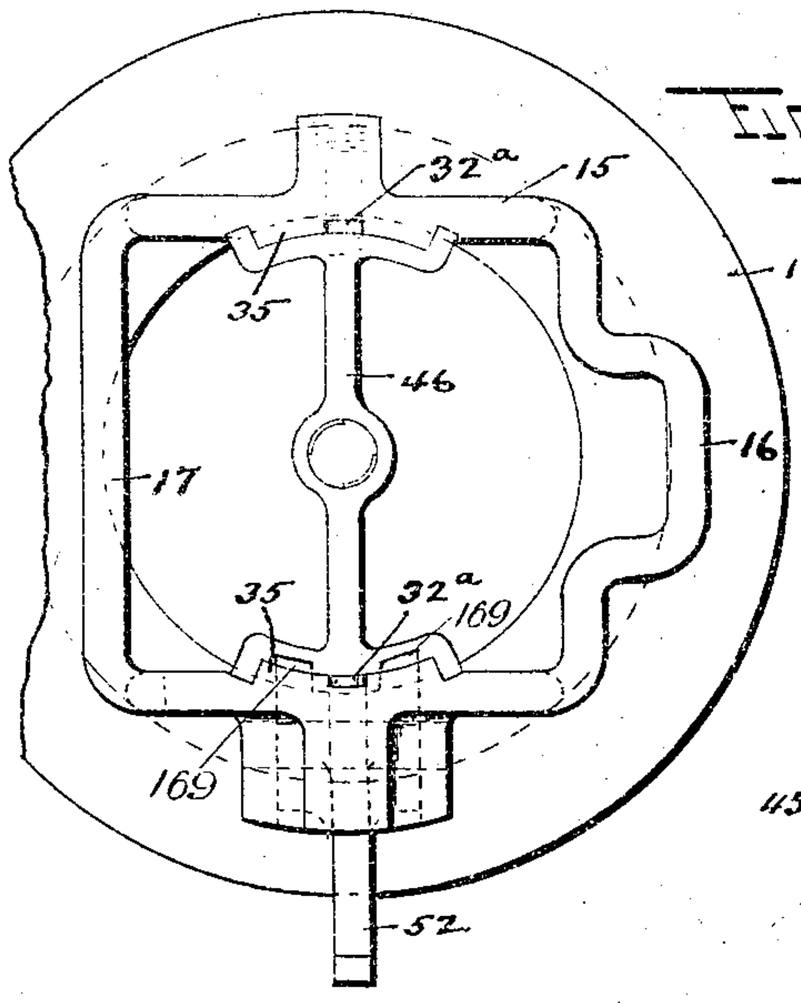


Fig. 27.

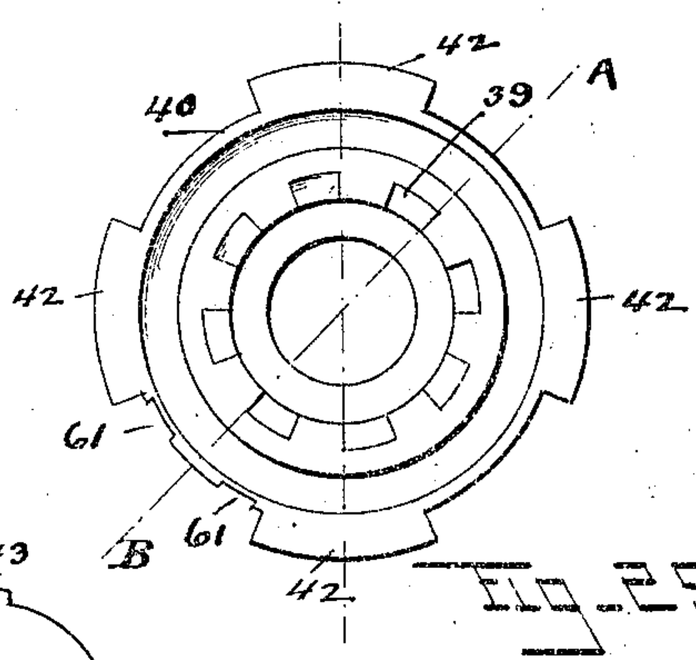


Fig. 29.

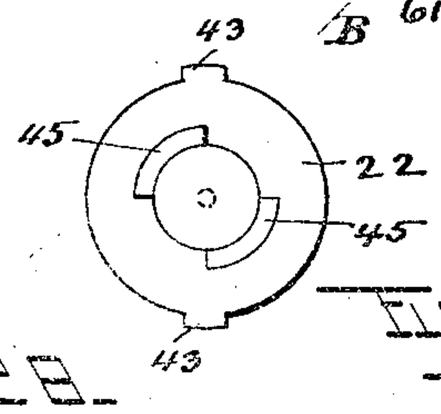
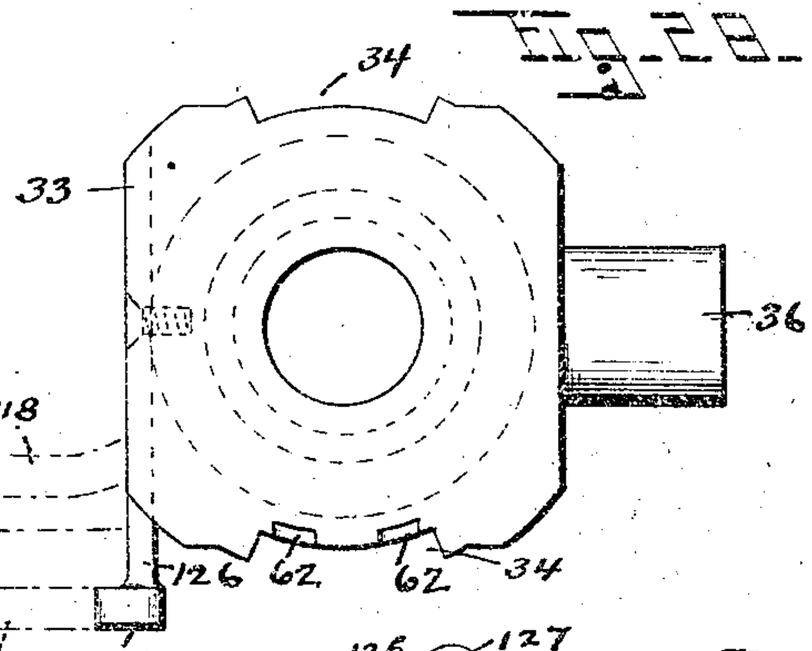


Fig. 31.

Fig. 28.



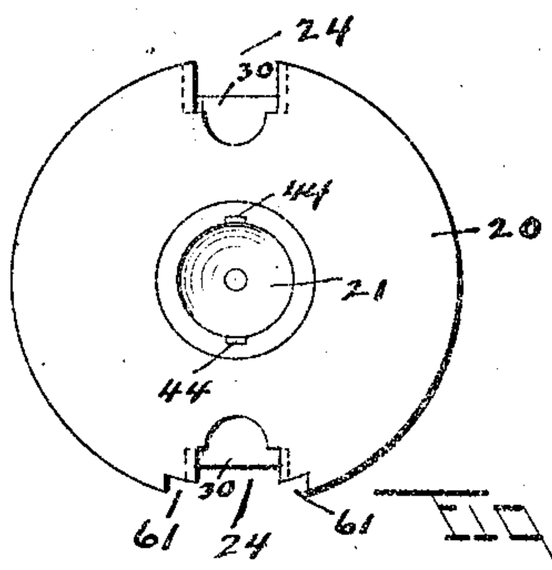


Fig. 30.

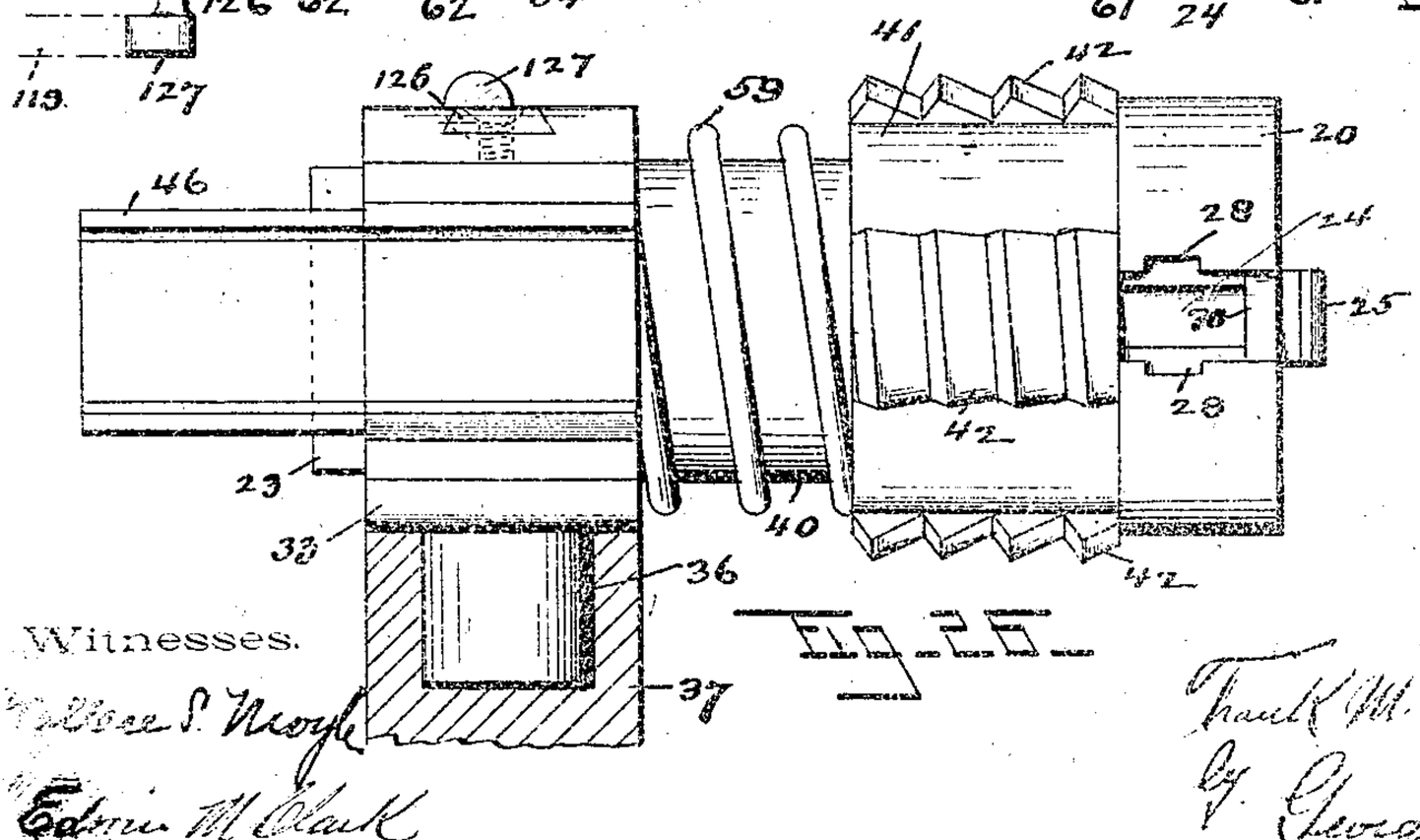


Fig. 26.

Witnesses.

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Inventor.

Frank M. Garland

By George B. Moore

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UNITED STATES PATENT OFFICE.

FRANK M. GARLAND, OF NEW HAVEN, CONNECTICUT.

AUTOMATIC MACHINE-GUN.

SPECIFICATION forming part of Letters Patent No. 669,236, dated March 5, 1901.

Application filed February 16, 1900. Serial No. 5,499. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. GARLAND, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Automatic Machine-Guns, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in automatic machine-guns, and has especial reference to that class of machine-guns in which the mechanism is actuated by the recoil of the barrel.

It is one object of my invention, among other things, to construct a gun of this character having variable means connected with the breech-block mechanism for regulating and controlling the speed of movement thereof, so that the cartridge may be pushed home and the gun loaded at any desired speed.

It is a further object of my invention to perform the necessary operations required with the fewest possible parts, which shall be so grouped as to occupy the smallest possible space and be designed so as to be economically constructed and readily assembled.

In the machine-gun hereinafter described the barrel is mounted in a case and connected with a piston which is movable within a fluid-chamber, the flow of fluid therein being controlled so that the barrel will recoil at a predetermined speed. Rotatably mounted within the case beneath the breech end of the barrel is a sleeve connected by lever mechanism with the breech-block. As the barrel recoils the breech-block mechanism is carried rearwardly therewith and through the said lever mechanism imparts a partial rotation to the said sleeve against the action of a spring inclosed therein. At the extreme rearward limit of movement of the barrel a pawl engages with a notch in said sleeve and holds it against a return movement. When the force of the recoil is spent, the barrel is moved forward again by a spring, which forward movement actuates the lever mechanism, so that the breech-block mechanism is moved rearwardly again to its rearmost position and while so moving withdraws the cartridge from the barrel. Pivotally secured within the case is a laterally-moving carrier which receives the cartridges from a magazine separably attached to the case and presents them to the breech-block mechanism. As the breech-block mechanism reaches substantially its rearmost position the carrier is forced outward a sufficient distance to admit a cartridge into the case, which drops upon a latch-lever secured to the carrier and releases the same. The carrier being now free is swung inwardly by a spring, and a new cartridge is pushed in between the extractor-fingers and is there held, at the same time forcing out the empty shell, which is disengaged through the case. The inward movement of the carrier actuates the pawl, before referred to, so that it is released from the sleeve when the new cartridge has been fixed in the extractor-fingers, and the spring then returns the said sleeve to its original position, which through the lever mechanism carries the breech-block forward and forces the cartridge home. Connected with the spring-sleeve is a piston movable within a fluid-chamber connected by parts with an auxiliary fluid-chamber. The speed of the return movement of the sleeve is determined by the flow of fluid from the fluid-chamber to the auxiliary chamber, and vice versa, the size of the part for the fluid control being variable by means of a device actuated from the rear end of the gun. The breech-block mechanism is self-locking and constructed so that it moves forward without rotation until a part thereof enters the breech end of the barrel, when through an interrupted screw connection the same is rotated and locked in the breech of the gun. This relieves the breech-block and lever mechanisms from the force of the explosion, and hence I am enabled to construct these parts of very light material, thereby greatly lessening the weight of the gun.

Referring to the drawings, in which like numerals designate like parts in the several views, Figure 1 is a side elevation of the gun, having a portion thereof broken away. Fig. 2 is a rear view without the mount. Fig. 3 is a side elevation of the rear end of the range-adjusting devices, being partly in section. Fig. 4 is a view of the interior mechanisms with the case shown in section. Fig. 5 is a detailed view of the fluid-chamber and the adjacent parts for controlling the speed of

movement of the breech-block mechanism. Fig. 6 is a transverse section of the case upon line A B of Fig. 4. Fig. 7 is a transverse section of the gun upon line C D of Fig. 4. Fig. 8 is a transverse section of the gun upon line E F of Fig. 4. Fig. 9 is a side elevation of the hand-lever and spring-bolt. Fig. 10 is a side elevation of the breech-lock levers, showing their relative positions when the barrel is in its rearmost position—that is, when it has made its full recoil. Fig. 11 is a side elevation of the breech-lock levers, showing their relative positions when the barrel has been moved forwardly after the recoil with the breech-block mechanism in its rearmost position. Fig. 12 is a plan view of the levers and the sleeve. Fig. 13 is a rear elevation of the barrel-strap. Fig. 14 is a fragmentary plan view of the shoulder-piece and the mechanism for varying the area of the port connecting the breech-block fluid-chambers. Fig. 15 is a fragmentary sectional view of the shoulder-piece looking from the rear, showing its interior mechanism. Fig. 16 is a plan view of the carrier. Fig. 17 is an elevation thereof looking from the center of the case and being partly in section. Fig. 18 is a side elevation of the latch-lever and a portion of the case. Fig. 19 is a fragmentary view of the pawl mechanism. Fig. 20 is a fragmentary elevation of the pawl. Figs. 21 and 22 are rear and side sectional elevations, respectively, of the extension-case. Fig. 23 is a side elevation, partly in section, of the breech end of the gun-barrel with the breech-frame attached thereto and the breech-block mechanism shown in its loaded position. Fig. 24 is a plan view of the sear and the pin upon which it is mounted. Fig. 25 is a perspective view of one of the extractor-fingers. Fig. 26 is a plan view of the breech-block mechanism, the parts being in the relative positions occupied by them while traveling lengthwise in the breech-frame, the upper extractor-finger being removed. Fig. 27 is an elevation of the breech-block frame looking from the rear end. Fig. 28 is a rear elevation of the rotator. Fig. 29 is a rear elevation of the locking-bolt. Fig. 30 is a rear elevation of the face-bolt, and Fig. 31 is a rear elevation of the firing-pin.

In the drawings the numeral 1 designates the case, which in cross-section is substantially an inverted-U-shaped shell at the rear end and within the forward end of which the barrel 2 is movably mounted, the rear end containing the feeding, loading, and firing mechanisms. The exact shape or contour of the case is immaterial, as it is possible to make it of any desired form within my invention. Attached to the barrel near its breech end by the pins 4, Fig. 13, is a strap 3, and movable in a fluid-chamber 5 within the case 1 is a piston 6, the rear end of the piston-rod 7 connected therewith being threaded in the strap 3. The ends of the fluid-chamber 5 are closed at either end by suitable packing-glands 8 and 9, of any preferred construction, to prevent the escape of the fluid. Extending longitudinally in the sides of the bore of the chamber 5 are a plurality of channels 10 of varying depths and terminating near the ends of the chamber and through which the fluid passes from one side of the piston to the other as it moves within the chamber. The forward end of the piston-rod 7 is surrounded by a spring 11, which abuts at one end against the collar 12, held upon the said piston-rod by the nut 13 and the other end of which abuts against the packing-gland 9, the whole being inclosed by a casing 14. As the barrel recoils by the force of the explosion the piston is drawn rearwardly within the chamber 5 and the fluid passes from the rear side of the piston to the front side through the channels 10, permitting the barrel to recoil at a speed which is determined by the size and area of these channels. As the channels 10 do not extend to the ends of the chamber, (see Fig. 4,) the fluid in advance of the piston does not enter the said channels when the piston covers the channel ends as it does when nearing the limit of its movement, so that a portion of the fluid will always be left in the chamber and against which the piston cushions. This prevents any shock or jar upon the parts being transmitted by the recoil of the barrel. The channels 10 are deepest midway between the ends of the chamber. Hence more fluid passes from one side of the piston to the other when the stroke of the piston is about one-half completed, and during the last part of the stroke, as less and less fluid is forced from one side of the piston to the other, the speed of the barrel is checked until the piston reaches the ends of the channels, when it is brought to a full stop against a fluid cushion. As the barrel recoils the piston-rod 7 is drawn rearwardly and the spring 11 is compressed; but as soon as the force of the recoil is spent the expansion of the spring 11 moves the piston 6 forward again and through the strap 3 the barrel is returned to its original position.

Secured rigidly to the rear end of the barrel 2 is the breech-block frame 15, which is so constructed with two parallel arms which extend horizontally in rear of the barrel, being joined at their ends by the tie-bars 16 17.

The method of attaching the breech-frame to the barrel is not material to my invention; but the particular method illustrated by me comprises a circular head 18 upon one end of the breech-block frame fitted over the breech end of the barrel and having screw-threads around the outside corresponding with a number of screw-threads around the breech end of the barrel and an interiorly-threaded sleeve 19, surrounding both the head 18 and the breech end of the barrel.

Movable longitudinally between the parallel arms of the breech-block frame 15 is the breech-block mechanism, which includes a face-bolt 20, having a central bore 21 there-

through and within which the firing-pin 22 is actuated, the rear end of the bore being closed by a plug 23, having a tapered threaded body in engagement with an interior thread in the said bore.

Through the head portion of the face-bolt from front to rear are the two slots 24 24, carrying the extractor-fingers 25 25. The extractor-fingers (see Fig. 55) are provided with a lip 26, which projects in front of the face-bolt, an ear 27 upon either side, which enters a recess 28 in the face-bolt, a spring-shield 29, between which and the shoulder 30 upon the face-bolt are a plurality of "Belleville" springs, and a lip 31, which projects from the outside of the said extractor-fingers into a recess or spline 32 in the barrel and a corresponding recess or spline 32^a in the arms of the breech-frame, both of which splines are in line with each other and form a continuous unbroken recess. The engagement of the lip 31 with the recesses 32 32^a holds the face-bolt against rotation.

Surrounding the shank of the face-bolt and movable lengthwise thereon is a rotator 33, having recesses 34 34 in the top and bottom thereof and into which project the guideways 35 35 upon the opposing faces of the arms of the breech-block frame. A stud 36 projects laterally from one side of the rotator and is engaged by the socket 79 in the breech-block lever 37.

Upon the shell of the rotator a male thread 38 is cut, having a long easy pitch of, say, about one turn to eight inches, which engages with the female thread 39 in the bore of the locking-bolt 40.

Between the head of the face-bolt 20 and the rotator 33, being supported at its forward end by the shank of said face-bolt, (see Fig. 23,) is the locking-bolt 40, having a hollow shank portion with an interior thread 39 of the same pitch as the thread upon the rotator, and a head portion 41, upon the outside of which is a plurality, preferably four in number, of threaded projections 42, corresponding with a like number of threaded projections in the breech end of the gun-barrel.

The numeral 22 designates the firing-pin, the head of which is of substantially the same diameter as the bore 21, it being held against rotation therein by the ears 43 43, which project into the splines 44 44 in the face-bolt. An interrupted exterior thread 45 upon the shank of the firing-pin admits of a quick and a locked engagement of the firing-pin in the firing-pin head 46, which has a corresponding interrupted interior thread within the central hub thereof. The firing-pin head 46 is provided with recesses in the top and bottom thereof, which have a sliding engagement with guideways 35 35. A sear 47 is secured within an opening 48 in the lower arm of the breech-block frame upon a pintle 49 and is provided with rocker-arms 50, cut away at 168 to permit a yielding movement of the upper parts thereof, catch-arms 51, and an operating-arm 52. Fixed to the rear end of the case 1 is a pistol-grip 54, and pivotally secured therein is the finger-lever 55, to the upper end of which is attached the sear-bar 56, which is flattened and drawn out very thin at its forward end, where it abuts against the operating-arm 52 of the sear. The sear-bar 56 is supported near its front end by the wall 57 of the case 1. (See Figs. 8 to 19.)

In Fig. 23 the breech-block mechanism is shown in its closed or firing position, with the firing-pin held by the sear preparatory to firing. In this position the front face of the rotator 33 is flush with the rear face of the head of the locking-bolt 40 and the front of the face-bolt is flush with the rear face of the bore-tube 53 within the barrel, the threaded projections 42 upon the locking-bolt having engagement with the threaded projections in the breech end of the barrel. By pressing the finger-lever 55 the sear-bar 56 is pushed forward and the sear is rocked upon the pintle 49 and the catch-arms 51 released from the notches 158 in the firing-pin head. The coil-spring 58, surrounding the shank of the firing-pin, which has been held in a compressed position by the sear, is now released, and its expansion carries the firing-pin forward, the point of which strikes the primer of the cartridge and discharges the same. After the gun has been fired the rotator is drawn to the rear by the lever mechanism through its connection with the stud 36, moving between the guideways 35 and sliding over the shank of the face-bolt 20. The backward movement of the rotator, which it will be remembered is held against rotation, imparts a slight rotary movement to the locking-bolt about its axis and disengages the threaded projections 42 upon the locking-bolt from the threaded projections in the breech of the barrel, permitting the locking-bolt and rotator to move backwardly together, the extractor-fingers withdrawing the cartridge-shell from the barrel. The head of the plug 23 forms a stop for the rotator, and therefore limits the amount of rotation that can be given to the locking-bolt. All of the parts excepting the rotator remain stationary while the locking-bolt is being unscrewed from the breech of the gun and until the rotator strikes the head of the plug 23, when all of the parts move in unison. When unscrewed, the projections 42 upon the locking-bolt are opposite the recesses between the projections in the breech of the gun, and vice versa, the line A B of Fig. 29 being then vertical. The firing-pin head 46 is also pushed rearwardly by the plug in its backward movement. A plan view of the parts in their relative positions when moving in the breech-block frame is shown in Fig. 26. Between the rotator and locking-bolt a coil-spring 59 is inserted which normally thrusts the same apart and reduces materially the friction between the threads of the locking-bolt and those in the breech end of the barrel, when the said locking-bolt is

being rotated, as it counteracts the pull of the rotator. This spring is of sufficient strength to hold the front end of the face-bolt tightly against the rear end of the barrel-tube while the locking-bolt is being rotated, and thus reducing the sliding friction between the threads to practically nothing, insuring thereby an easy movement of the locking-bolt within the breech end of the barrel. When the backward stroke or the breech-block mechanism is about completed, the rear ends of the extractor-fingers abut against pins 60 60 in the breech-block frame, which push the extractor-fingers forward, compressing the Belleville springs and releasing the cartridge, which can now be removed and a new one inserted. At the beginning of the forward stroke the extractor-fingers are released from the pins 60 60 and the cartridge is held rigid against the front of the face-bolt. All of the parts move forward together until the catch-arms 51 51 of the sear engage with the notches 158, which hold the firing-pin head against further forward movement until released by actuating the sear, as before described. The balance of the breech-block mechanism continues its forward movement until the cartridge is pushed home in the gun-barrel. The face-bolt now remains stationary and the rotator continues its forward movement alone, which additional movement rotates the locking-bolt about its axis, and the threaded projections thereon engage with those within the interior of the breech of the barrel, as before described, locking the face-bolt and all of the parts together and furnishing a rigid unyielding backing to sustain the force of the explosion of the cartridge. The movements of the breech-block lever and the rotator are completed as the front face of the rotator is brought up flush with the rear face of the locking-bolt head.

Recesses 61 are cut in the bottom of the face-bolt and the locking-bolt to permit the same to slide over the arms of the sear. In the bottom of the rotator the recesses 62 are not cut entirely through from front to rear, but terminate midway of its length to permit the sear to be actuated when the rotator is home, as illustrated in Fig. 23. As the rotator 33 rides over the rocker-arms 50 50 of the sear the catch-arms 51 51 are thrown upward into the path of the firing-pin head and enter the notches 158 therein, holding the same against movement while the rotator advances. When the rotator comes to rest, the recesses 62 are directly over the rocker-arms 50 50 and the sear can be swung upon its pivot-mountings, so that the catch-arms will be disengaged from the firing-pin head. During the return movement of the breech mechanism the rotator 33 engages with the arm 50 of the sear and elevates the catch-arms 51, which enter recesses 169 in the firing-pin head 46. The recesses 169 are of sufficient depth to permit of a partial rearward movement of the firing-pin head without effecting or engaging with the catch-arms 51; but as the breech mechanism continues its rearward movement the ends of the recesses 169 engage with and depress the catch-arms 51, at the same time elevating the arms 50 against the bottom of the rotator. As the arms 50 have a slight yielding movement, due to the recesses 168 therein, the catch-arms can be depressed sufficiently to permit the firing-pin head to pass over them and be disengaged from the sear. This construction of parts insures a positive means against accidental or premature discharges of the piece before the breech-block mechanism is at rest and the cartridge home in the barrel, as the forward movement of the rotator insures a positive engagement of the sear with the firing-pin head, which cannot be released until the breech-block mechanism is home and at rest.

Rotatably mounted between the sides of the case 1 beneath the breech end of the barrel is the sleeve 63, supported at one end by a boss 130 and at the other end by a bushing 64, fitted into the side of the case. Extending through said sleeve and case is a spring-bolt 65, having a radially-slotted head 67 and a nut 66 threaded thereon. Surrounding the spring-bolt is a coil-spring 70, which is fixed at one end to a pin 68 in the spring-bolt and at the other end to a pin 69 within the sleeve. The sleeve 63 is actuated manually by means of the hand-lever 71, rotatably mounted within the bushing 64 and through the hub of which passes the spring-bolt 65, the hand-grip 72 being secured to one end of said lever upon a stud 73. A recess is cut in the end of the sleeve 63, Figs. 10, 11, and 12, for the reception of the lug 74 upon the hand-lever 71, this recess being of sufficient width to permit the movement of the sleeve without movement of the hand-lever. When the parts are in the position shown in Fig. 4, the shoulder 75 at one end of said recess is against the face of the lug 74, and by now moving the hand-lever the engagement of the lug 74 with the shoulder 75 causes the sleeve 63 to rotate and to actuate the other mechanisms. The tension of the coil-spring 70 is varied by shifting the relative position of the pin 68 with the pin 69, which is accomplished by rotating the spring-bolt 65 upon its axis and securing it in a new position. To rotate the spring-bolt, the hand-lever 71 is turned upon its hub until the groove 76 is brought into register with one of the radial grooves 77, when a key of any common construction is placed in said groove, making a rigid connection between the two parts. Now by unloosening the nut 66 and by swinging the hand-lever the spring-bolt is rotated and the tension of the spring is increased or lessened, according to the direction of rotation, and when the desired tension is attained the nut 66 is again tightened and the spring-bolt 65 is held rigid in its new position. During the operation just described the lug 71 moves within the recess cut in the end of the sleeve 63.

Any form of preferred device may be used to retain the hand-lever 71 in its vertical position against accidental displacement, the particular form or construction of which is immaterial to my invention. In the drawings I have illustrated a device which consists of a boss 78 upon the side of the case, which fits into a recess upon the inner side of the lever. (See Fig. 7.)

The breech-block lever mechanism comprises a breech-block lever 37, having a hub end thereon within which is a socket 79 to receive the stud 36 upon the rotator, and secured at the other end to a rock-lever 80, pivotally fixed by a stud 81 to a hub 82 upon the barrel-strap 3. A link 159 joins the rock-lever 80 with the lever-arm 83, which is integral with and projects radially from the sleeve 63. Secured within the lugs 84 84 upon the bottom of the case 1 is the pawl 85, having a vertical arm 86, to which is secured one end of a pawl-bar 87. The pawl-bar 87 passes through the barrel-strap 3 and is supported at its rear end by a cam 88, held within a lug 89, depending from an interior part of the case, and lying between said strap and the cam 88 is a coil-spring 90, which encircles the said pawl-bar. When the barrel recoils, the rotator 33 is carried back with it, which movement of the rotator rearwardly oscillates the levers from the position shown in Fig. 4 to that shown in Fig. 10, and thereby imparting a partial rotation to the sleeve 63 against the tension of the coil-spring 70. During the recoil of the barrel the spring 90 is compressed and exerts an endwise pressure upon the pawl-bar 87 and through it to the pawl 85, which lies normally upon the outer surface of the sleeve 63. As the barrel reaches its rearmost position the pawl 85 drops into a notch 91 in the sleeve 63 and is there held by the spring 90, thus preventing a return movement of the sleeve 63 until the pawl 85 has been disengaged from the notch 91. When the barrel is moving forward under the action of the spring 11, the rock-lever 80 is oscillated through its connection with the strap 3, and when the barrel has completed its forward movement the levers occupy the relative positions shown in Fig. 11, in which the hub end of the lever 37 is in its rearmost position. This movement of the levers carries the breech-block mechanism to the rear and withdraws the cartridge-shell from the breech of the barrel. By swinging the pawl 85 upon its pivot-mounting, which is done through the pawl-rod 87, the pawl 85 is lifted from the notch 91 in the sleeve 63 and the spring 70 returns said sleeve and the lever mechanism to their original positions. (See Fig. 4.) The pressure exerted upon the pawl 85 by the spring 90 is greatest when the barrel reaches the limit of its recoil, the spring being then compressed the most at the time when the pawl engages with the notch 91. When the pawl is released after the barrel has moved forward again, the pressure of the spring is the least, or none at all, if desired, and but little effort is required to disengage it from the sleeve 63. The means for actuating said lever-bar 87 will be hereinafter described.

Within the case 1, near the forward end, is the fluid-chamber 160 and the auxiliary chamber 161, which chambers are closed at either end by suitable packing-glands 162 of any preferred form or construction. The auxiliary chamber 161 is closed at its front end by the plug 163, having a hexagonal head. Movable within the fluid-chamber 160 is a piston 164, preferably integral with a piston-rod 167, that is secured at its rear end to a cross-head 165, the upper end of which is movable in a guideway 166, integral with the case 1, and the lower end of which is provided with a slot 92, having an open throat.

Integral with the sleeve 63 are two arms 93, which extend radially therefrom, being joined at their outer ends by a circular follower 94, which follower is movable within the slot 92. The open space between the arms 93 is sufficient to permit the cross-head 165 to pass therethrough.

In the auxiliary chamber 161 is the valve 95, through the center of which is a tube 96, having a port-hole 97 through one side thereof and having an arm 98 fixed to the rear end. A coil-spring 99 lies between the valve 95 and the plug 163 and normally holds the said valve against its seat. The fluid-chamber 160 and auxiliary chamber 161 are connected at the front end by the port 100 and at the rear end by the port 101. The movement of the sleeve 63 imparts a longitudinal movement to the cross-head 165 and the piston 164 through the follower 94, which engages with the sides of the slot 92. The extreme positions of the arms 93 and the follower 94 are shown in Fig. 5 by full and broken lines. During the recoil of the barrel the piston 164 moves rearwardly within the chamber 160 and the fluid therein enters the auxiliary chamber 161 through the port 101, forcing the valve 95 off its seat against the spring 99, and the fluid entering the opposite end of said chamber 160 through the port 100. A portion of the fluid also passes through the tube 96, entering the same through the port 97. When the piston comes to rest, the pressure upon the fluid is removed and the valve 95 is forced back again upon its seat by the spring 99. (See Fig. 5.) After the pawl 85 has been lifted from the notch in the barrel 63 and the spring 70 is returning the said sleeve to the position shown by full lines in Fig. 5 the piston 164 forces the fluid from the chamber 160, through the port 100, into the front end of the auxiliary chamber 161. The only escape for the fluid from the front to the rear end of the auxiliary chamber is through the tube 96 and port 97, as the valve is held tightly against its seat by the spring 99.

By means of a lengthwise adjustment of

the tube 96 within the stem of the valve 95 the area of the exposed opening or port 97 can be varied and the quantity of fluid that can pass therethrough in a given time be regulated. It is apparent that the smaller the area of the port 97 the slower the return movement of the piston 164, which, through the connection between the cross-head 165 and the sleeve 63, governs the speed of return movement of said sleeve and also of the breech-block mechanism, which is connected therewith through the levers before described.

The means for adjusting the longitudinal position of the tube 96 consists of a grip-handle 102, the shank 103 of which passes through the shoulder-piece 104 and upon which is fixed a crank-arm 105, having engagement with the lower end of a rock-lever 106, pivotally mounted within said shoulder-piece upon the pin 107, and a tube connection 108, pivotally secured to the upper end of said rock-lever at one end and to the arm 98 at the other end. (See Figs. 14 and 15.) By turning the grip-handle 102 the rock-lever 106 is oscillated, and through the tube connection 108 the tube 96 is given a longitudinal movement, the exposed area of the port 97 being increased or diminished, as desired. The shoulder-piece 104 is of the ordinary construction, having a rubber cushion 131 fixed thereto and supported upon the rear end of a tube 132, fixed in a portion 133 of the case 1.

It will be noted that by the mechanism just described the speed of movement of the breech-block mechanism is controlled by simply turning a grip-handle at the breech end of the gun. This speed-controlling device permits a cartridge to be pushed home in the breech of the barrel either quickly or slowly, as desired, and which movements are entirely independent and separate from the movement of the barrel itself.

The breech-block mechanism is operated manually by grasping the hand-grip 72 and pulling the same toward the rear end of the gun, swinging the hand-lever 71 upon its hub, and the engagement of the lug 74 with the shoulder 75 on the sleeve 63 actuates the said sleeve in the same manner as if operated by the recoil of the barrel. As the loading mechanism is actuated from the breech-block mechanism, these devices also control the speed of the said loading mechanism without requiring additional parts.

The device for conducting the cartridges to the breech-block mechanism consists of a carrier 109, pivotally secured to the upper end of a swinging yoke 110, that is supported upon the shaft 112 between the lugs 111 111, integral with the case 1. This shaft is hexagonal where it passes through the hub 113 of the yoke 110, and one end is surrounded by a coil-spring 114, having a connection with a pin upon the shaft and another pin within the sleeve 115. (See Fig. 17.) The coil-spring 114 exerts a pressure upon the yoke 110, which tends to throw the carrier in toward the center of the case. Sleeve 115 is supported at one end within a counterbore in one of the lugs 111. The tension exerted by the spring 114 upon the shaft 112 can be varied by shifting the position of the sleeve 115 within the lug 111 and placing the pin 116, which holds the sleeve, into any one of a number of holes 134, drilled through the sleeve. (See Fig. 17.)

Upon the upper end of the carrier 109 is a horizontal shelf 117, which projects through the side of the case, (see Fig. 8,) and at the lower end of said carrier is a horizontal shelf 118. Integral with said carrier is a spring cam-plate 119, having a cam-groove 120 therethrough, a cam 121 upon one of its edges, and a stop-lug 122. Pivotally secured in lugs 135, integral with the vertical portion of said carrier, and extending over the top of the horizontal shelf 118 is a latch-lever 123, provided with a latch 124. (See Figs. 16, 17, and 18.) The position of the carrier when the breech-block is forward is shown in Fig. 8 by full lines, in which position the horizontal shelf 117 is beneath the opening 125 through the side of the case 1, thus preventing the passage of a cartridge therethrough.

Fixed in the rotator 33 is an arm 126, having a circular cam 127 upon its bottom end. The inner edge of the carrier abuts against the said follower. In Fig. 16 the broken lines designated A illustrate the position of cam 127 when the breech-block mechanism is forward, the cam then being beneath the horizontal shelf 118, with the edge 128 of said shelf against the shank of the follower. During the backward movement of the breech-block mechanism the follower rests against the edge 128 and the carrier remains stationary. At the end of the shelf 118 the cam 127 engages with the edge 129 of the spring-plate 119, and the shank of the follower is free from engagement. The position of the cam 127 at this point is shown by the broken lines B in Fig. 16, no movement of the carrier taking place during this change, as the distance between the edges 128 and 129 is exactly the same as the distance between the shank of the follower and the front of the cam 127. The cam now rides against the edge 129 until substantially the rearmost position of the breech-block mechanism is attained when it meets the cam 121. The broken lines C in Fig. 16 illustrate the position of the cam 127 at this point. As the cam 127 rides against the cam 121 the carrier is forced outwardly and the latch 124 on the latch-lever 123 passes through the hole 136 and engages with the case 1, (see Fig. 18,) in which position the carrier is held by the latch against the action of the spring 114. The location of the upper end of the yoke-arm and latch-lever when the carrier is in this position is illustrated in Fig. 8 by broken lines, the shelf 117 having been moved outwardly a sufficient distance to admit a cartridge through the opening 125, which cartridge drops through said

opening from the magazine attached to the gun. I have not shown the magazine in the drawings, as it is not a part of the present invention. The new cartridge drops upon the inner end of the latch-lever 123 and lifts the latch 124 from its engagement with the case 1, and the spring 114 then thrusts the yoke and the carrier 109 inwardly, the cartridge lying upon the top side of the shelf 118. The innermost position of the carrier is illustrated by broken lines in Fig. 8 and in which position the horizontal shelf 118 is above the lower arm of the breech-block frame 15 and the cam-plate 119 below. The engagement of the shelf 117 with the case 1 holds the carrier against a rocking movement until the breech-block frame is reached, when the horizontal shelf 118 rests thereon. Stop-lug 122 limits the inward movement of the carrier, it abutting against the cam 127, as shown by broken lines in Fig. 16. When the carrier is conveying a new cartridge to the breech-block mechanism, the extractor-fingers 25 are in engagement with the stop-pins 60 and their hold upon the old shell is released. The extractor-fingers remain in this position until the carrier places the new cartridge between the said extractor-fingers, pushing out the old shell, which drops through the case, following the path designated by the arrow in Fig. 8. A knock-off arm 137 is made integral with the hub 113 of the yoke 110 and projects laterally therefrom toward the center of the gun and in line with the cam 88 upon the pawl-bar 87. When the new cartridge has been placed in the extractor-fingers, the knock-off arm 137 engages with the inclined face of said cam, moving the pawl-bar 87 lengthwise and rocking the pawl 85, so that it is disengaged from the notch in the sleeve 63. The sleeve 63 being now released is returned to the position shown in Fig. 4 by the spring 70, as before described, and the levers move the breech-block mechanism forward, pushing the new cartridge home in the barrel. As soon as the breech-block mechanism begins to advance the cam 127, which has been against the stop-shoulder 122, enters the cam-groove 120 and the carrier is pushed outward during the forward movement of the rotator until the cam rides out of said groove onto the edge 129 of the cam-plate, when the carrier is in the position shown by full lines in Fig. 8, as before described. The cam-groove 120 is of varying depths, tapering from the cam edge 121 to a knife-edge at the shoulder 122. The cam 127 springs the cam-plate 119 downward while passing through said cam-groove; but instantly upon its leaving said cam-groove the cam-plate springs back again to its original position. This construction prevents the cam 127 entering the cam-groove from the cam 121 instead of from the stop-lug 122, which would be the case if the cam-groove were of a uniform depth.

At no time can a cartridge pass through the opening 125 except when the breech-block mechanism is in substantially its rearmost position. Hence the carrier does not receive the new cartridge until said breech-block mechanism is about ready to receive it.

Integral with the side of the case 1 are trunnions 138, which project laterally therefrom and are journaled in a head-yoke 139, having the hinged caps 140 secured thereto, the shank 141 of said yoke being rotatable in a mount 151.

Any preferred form of sight devices may be attached to the gun-body, the particular form or construction of which not being material to my invention. The numerals 152 designate the sights I prefer to use, which are attached to the case 1.

The mechanism for adjusting the range of the gun either vertically or in a circular path comprises a bevel-pinion 153, rotatably mounted within the base of the head-yoke 139 and covered by a cap 142, the said bevel-pinion having engagement with an integral bevel-gear 143 upon the top of the mount 151, a rod 144, upon the rear end of which is the hand-wheel 145 and having a tube 146 fixed upon the forward end, a ball-joint 147, connecting the shank of the bevel-pinion 153 with the tube 146, a threaded sleeve 154, a nut 148, having trunnions 149, the said nut being supported between ears 150, integral with the case 1 and projecting downwardly therefrom, and a hand-wheel 155, keyed to the rear end of said threaded sleeve 154. To move the barrel vertically, the hand-wheel 145 is rotated, which through the threaded sleeve 154 and the nut 148 is given the desired vertical position, as will be clearly understood from the drawings, and to move the piece in a rotary plane the hand-wheel 145 is rotated, and by means of the engagement of the bevel-pinion 153 with the bevel-gear 143, the gun is caused to move in a rotary path. Both a rotary and vertical range of adjustment at one and the same time may be given to the barrel by rotating the hand-wheels 145 and 155 synchronously.

In the rear end of the case 1 is a telescopic extension-case 156, which is pushed outward to the position shown by broken lines in Fig. 4 when the barrel recoils and remains in said rearward position until pushed in again manually. When in its foremost position, or that shown by full lines in Fig. 4, the head is substantially flush with the rear end of the case 1. By the use of this extension-case I am enabled to shorten the case 1 considerably, as the necessary length of the case required to admit of the movement of the breech-block frame with the recoil of the barrel is accommodated by this extension-case, the end of which is flush with the end of the breech-block frame when in its forward position and is forced outward therewith when the barrel and the frame recoil, where it remains, being an extension of the case only when an extension is required—that is, during the firing of the gun. This tube may be fas-

tened in the case, if desired, so as not to be withdrawn without removing the fastening devices, and to provide for such fastening means, which means are well known in the art, one or more longitudinal recesses 157 are provided in the bottom and top of said case.

There are many minor changes and alterations that can be made within my invention, and I would therefore have it understood that I do not limit myself to the exact construction herein shown and described, but claim all that falls fairly within the scope of my invention.

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

1. An automatic machine-gun having a longitudinally-movable barrel; a breech-frame attached to and movable with said barrel; a breech-block mechanism; lever mechanism for actuating said breech-block mechanism within said frame, the said lever mechanism being actuated from a fluid-controlled sleeve beneath the breech end of said barrel, substantially as described.

2. In an automatic machine-gun having a longitudinally-movable barrel; a breech-frame attached to and movable with said barrel; a breech-block mechanism; a fluid-controlled sleeve beneath the breech end of said barrel having a lever connection therewith whereby the recoil of said barrel imparts thereto a partial rotation; and a lever mechanism connecting the said sleeve with the said breech-block mechanism, substantially as described.

3. In an automatic machine-gun having a longitudinally-movable barrel; the combination therewith of a breech-block mechanism; and means for actuating the same, which means comprises a sleeve rotatably mounted, beneath the breech end of said barrel, lever connections between the said sleeve and said breech-block mechanism, fulcrumed to a part upon the said barrel so that the recoil of said barrel imparts a partial rotation to the said sleeve; and a spring connected with said sleeve for imparting thereto a reverse rotation, substantially as described.

4. In an automatic machine-gun, having a longitudinally-movable barrel; the combination therewith of a breech-block mechanism; and means for moving the same toward and away from said barrel, the said means comprising a rotatably-mounted fluid-controlled sleeve, a coil-spring for actuating said sleeve in one direction; a rock-lever pivotally fixed to a part upon said barrel; a link connection between said rock-lever and said sleeve; and a lever connecting said rock-lever with said breech-block mechanism, substantially as described.

5. In an automatic machine gun, having a longitudinally-movable barrel, a breech-block mechanism, and means for actuating the same, the said means comprising a fluid-controlled sleeve rotatably mounted in the case; a rock-lever pivotally secured at one end to a rigid part upon said barrel; a breech-lever joined at one end to said breech-block mechanism and at the other end to the said rock-lever, a link pivotally secured to the said rock-lever midway of its length, and to the said sleeve, substantially as described.

6. In combination with the breech-block mechanism of an automatic machine-gun; means for moving said mechanism toward and away from the barrel, which means are actuated by the recoil thereof; and means for regulating the speed of movement of said breech-block mechanism, the said means comprising a fluid-chamber, an auxiliary fluid-chamber, a piston movable within said fluid-chamber during the movement of said breech-block mechanism, ports connecting the said chambers, a valve within said auxiliary chamber, and a tube passing through said valve having a port therethrough, said tube being adjustable whereby the exposed area of said port may be varied, substantially as described.

7. In an automatic machine-gun, having a longitudinally-movable barrel; a breech-block mechanism; lever mechanism having connection with said breech-block mechanism and said barrel; a sleeve connected with said lever mechanism whereby the recoil of the barrel imparts thereto a partial rotation; a fluid-chamber; a piston having connection with said sleeve and movable within said fluid-chamber; an auxiliary chamber; ports between said chambers; a valve within said auxiliary chamber, a tube passing through said valve having a port therethrough, and means for adjusting the position of said tube whereby the exposed area of said port may be varied; substantially as described.

8. In an automatic machine-gun, the combination with a rotatably-mounted sleeve; of a coil-spring for imparting thereto a partial rotation in one direction; and means for regulating the speed of movement of said sleeve under the action of the coil-spring, the said means comprising a piston movable within a fluid-chamber and having connection with said sleeve; an auxiliary fluid-chamber; ports connecting the said chambers at either end, a tube having a port through one side thereof, within said auxiliary chamber; a valve surrounding said tube; and adjusting devices whereby the relative positions of the port in said tube and the said valve may be varied, substantially as described.

9. In an automatic machine-gun, having a longitudinally-movable barrel; a breech-block mechanism; lever mechanisms for moving said breech-block mechanism toward and away from the said barrel; a rotatably-mounted fluid controlled sleeve beneath the breech end of said barrel having a link connection with said lever mechanism whereby the recoil of the barrel imparts thereto a partial rotation; and a pawl designed to engage with and hold the said sleeve against backward

rotation when said sleeve has assumed a predetermined position, substantially as described.

10. In an automatic machine-gun, having a longitudinally-movable barrel; the combination with the sleeve 63, having the arms 93 93 projecting therefrom; of the fluid-chamber 160 and auxiliary chamber 161; piston-rod 167 upon one end of which is a cross-head 165 having engagement with the said sleeve 63; valve 95; coil-spring 99; tube 96 having the port 97 therethrough, and means for adjusting the position of said tube in relation to said valve; all constructed and operating substantially as described.

11. In an automatic machine-gun, having a longitudinally-movable barrel; a breech-frame attached to and movable with said barrel; a breech-block mechanism and means for moving the same toward and away from the said barrel; a carrier pivotally secured to a yoke having a movement each side of its normal position and provided with a shelf portion which projects beneath the cartridge-opening in said case, except when the said yoke is in its outermost position, substantially as described.

12. In an automatic machine-gun, having a longitudinally-movable barrel; a breech-block mechanism; lever mechanism for moving said breech-block mechanism toward and away from said barrel, a sleeve having a connection with said lever mechanism; a pawl, designed to engage with said sleeve when the barrel has recoiled, a spring-rod connected with said pawl, a laterally-moving carrier, means connected therewith for moving said spring-rod and tripping said pawl at a predetermined time, whereby the said sleeve is released, substantially as described.

13. In an automatic machine-gun in combination with the gun-barrel; a sleeve 63; pivotally-mounted pawl 85; pawl-rod 87 secured thereto, and having a cam at one end; a spring for normally holding said pawl in engagement with said sleeve; and a laterally-moving carrier having a knock-off arm 137 thereon movable in the path of said cam, the engagement of said knock-off arm with said cam imparting an endwise movement to said pawl-rod and releasing the said pawl from engagement with said sleeve, substantially as described.

14. In an automatic machine-gun, the combination with a swinging yoke 110, of a carrier 109 pivotally secured thereto; and having the horizontal shelves 117 and 118; a cam-plate 119 having a cam 121 thereon and a cam-groove 120 therethrough, fixed to said carrier; and a latch-lever 123, and means, as a cam 127, for swinging said yoke, all constructed and operating substantially as described.

15. A breech-block mechanism, comprising a face-bolt having extractor-fingers therein and a central bore therethrough; a plug for closing the rear end of said bore; a rotator surrounding and movable upon the shank of said face-bolt, and having means whereby an actuating-lever may be attached thereto; a locking-bolt also surrounding the said face-bolt having an interior thread engaging with the exterior thread upon the said rotator and provided with an interrupted exterior screw-thread; and means, as a coil-spring, for reducing the sliding friction upon the exterior threads of the said locking-bolt.

16. In a breech-block mechanism, in combination with a face-bolt, a non-rotatable rotator movable lengthwise upon the shank of said face-bolt and having an exterior thread thereon; a locking-bolt provided with a plurality of threaded projections and having an interior thread engaging with the thread upon the said rotator, and means, as a coil-spring, abutting at either end against the said locking-bolt and the said rotator, for reducing the sliding friction upon the said threaded projections, substantially as described.

17. In a breech-loading gun having a barrel provided with a plurality of threaded projections in the breech thereof; the combination therewith of a breech-frame, and a breech-block mechanism movable in said frame; the said mechanism comprising a face-bolt; a rotator; and a locking-bolt having threaded projections corresponding with the threaded projections in the barrel-breech; means for rotating the said locking-bolt during the movement of the said rotator, and means, as a coil-spring, for reducing the sliding friction between the threaded projections in the barrel-breech and upon the locking-bolt, substantially as described.

18. In a breech-block mechanism, the combination with a face-bolt, of a non-rotatable rotator movable lengthwise upon the shank of said face-bolt, and having an exterior thread thereon, of a locking-bolt having an interior thread engaging with the thread upon the said rotator, and a coil-spring surrounding a portion of the said locking-bolt and abutting at either end against the said locking-bolt and the said rotator, normally thrusting said locking-bolt and rotator apart, substantially as described.

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

FRANK M. GARLAND.

Witnesses:
C. H. TAYLOR,
M. C. GARLAND.