No. 623,003. Patented Apr. 11, 1899.

F. M. GARLAND.

AUTOMATIC MACHINE GUN.

(Application filed Aug. 13, 1898.)

(No Model.) 8 Sheets—Sheet 1.

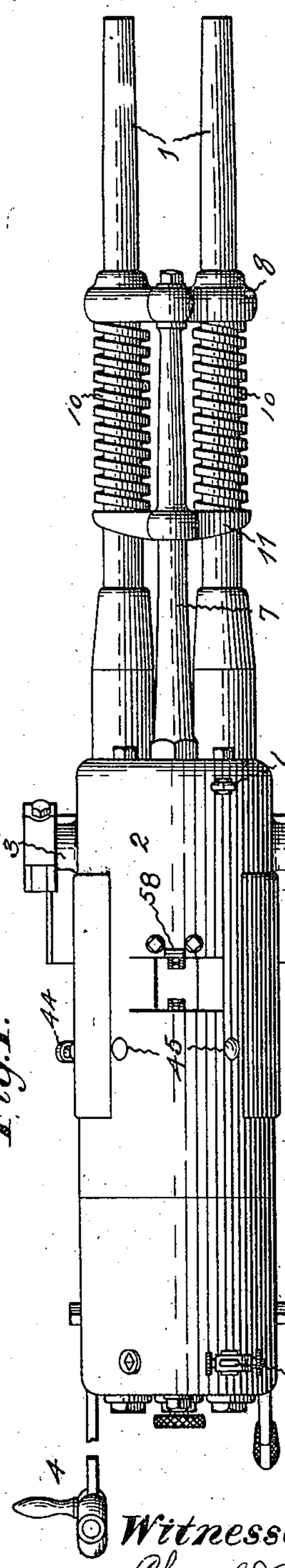

Fig. 1.

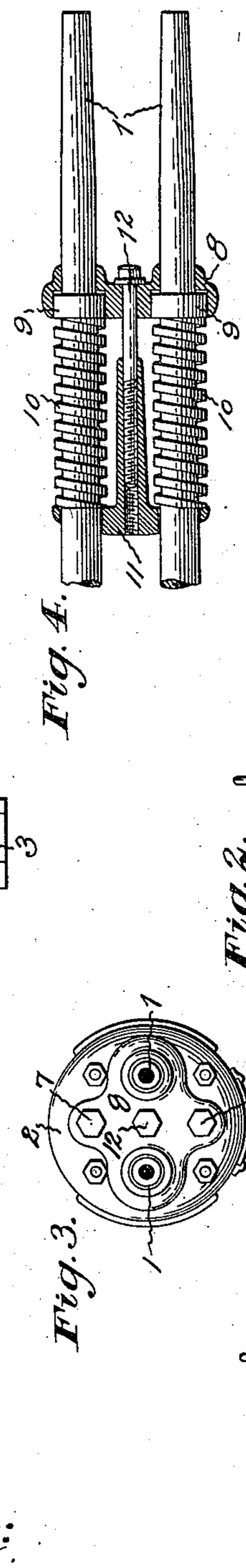

Fig. 4.

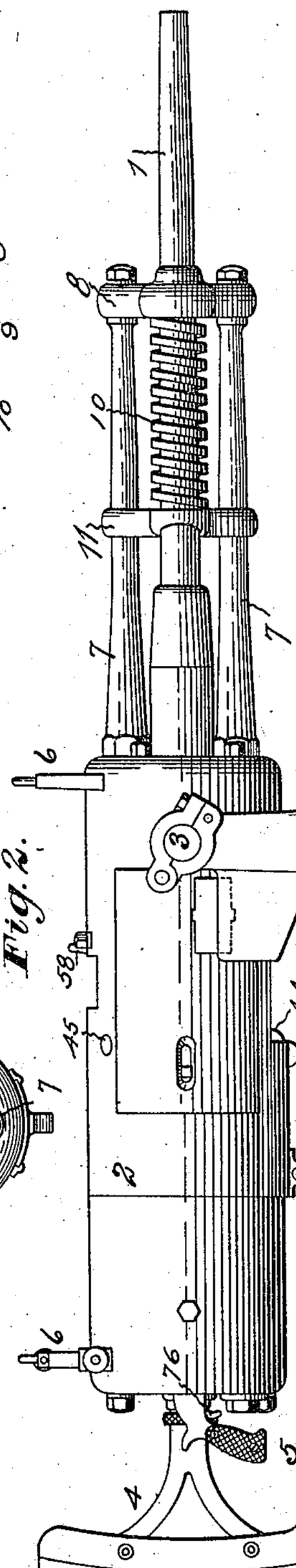

Fig. 2.

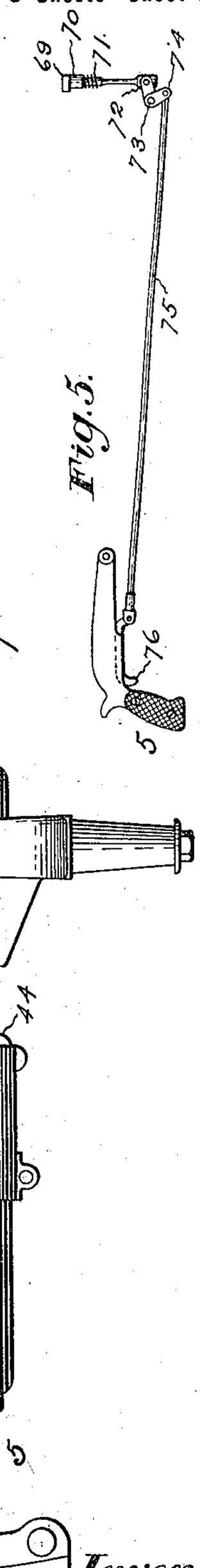

Fig. 5.

Fig. 3.

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Fig. 6.

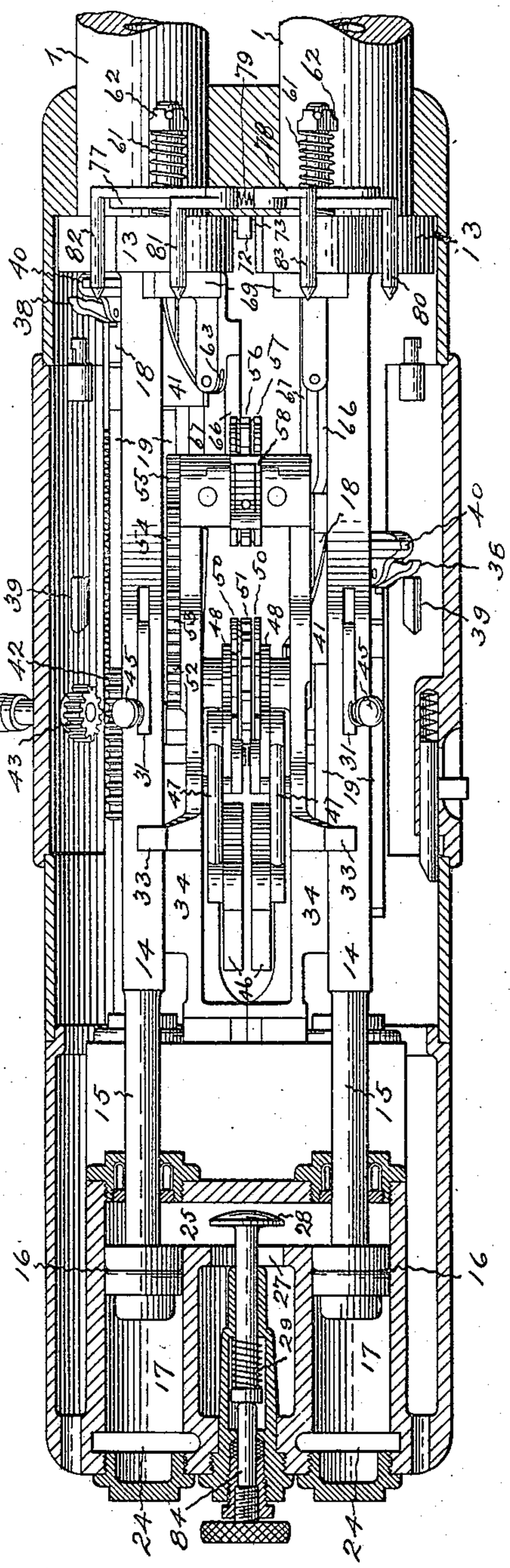
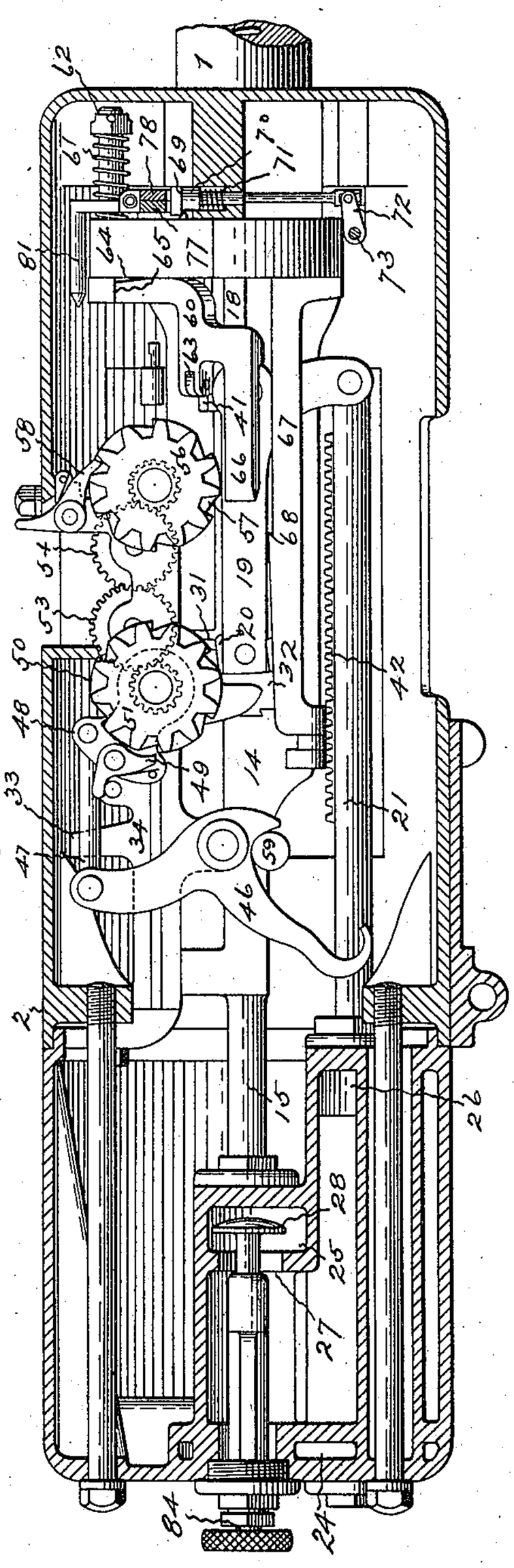


Fig. 7.



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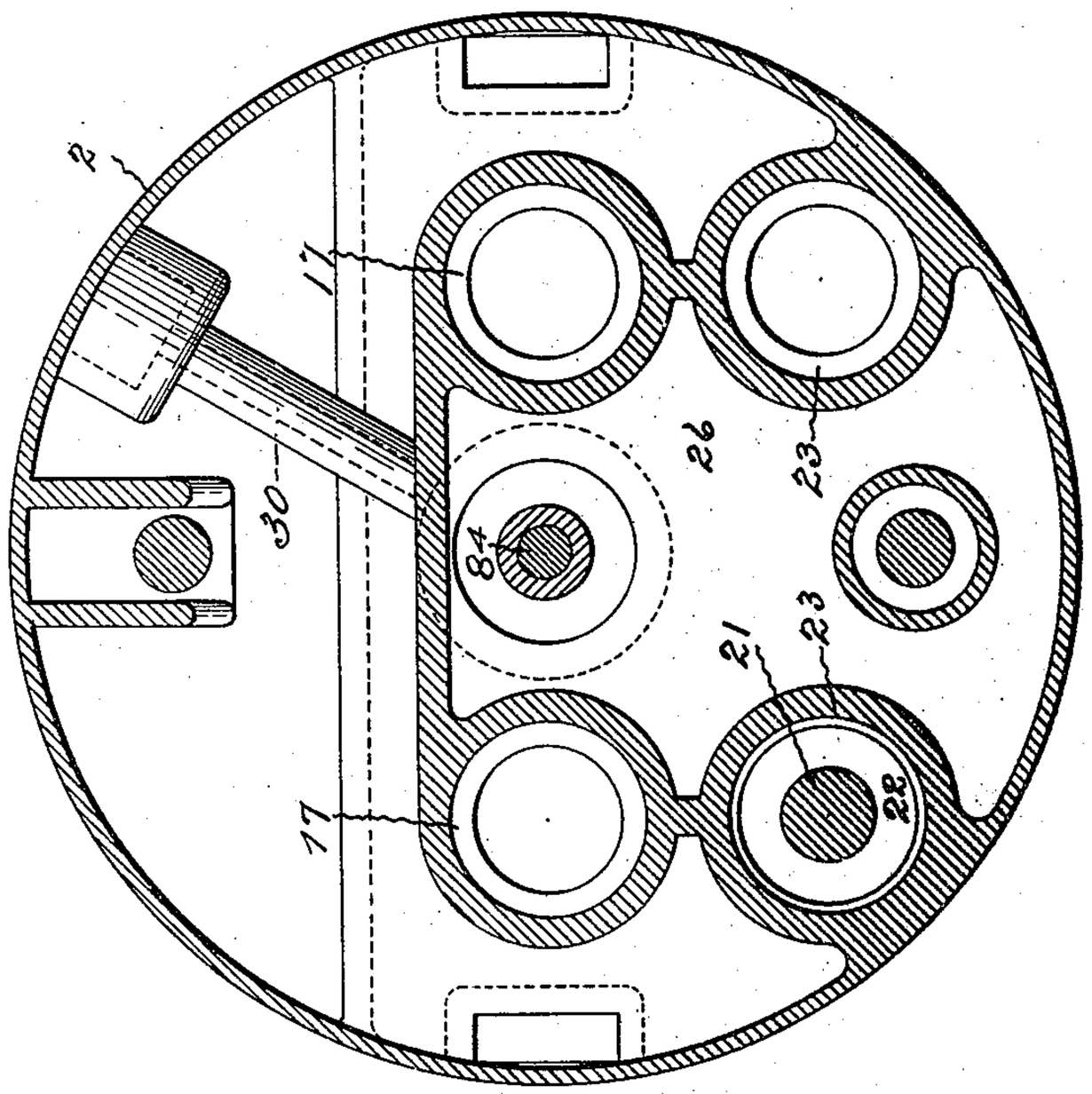

Fig. 9.

Fig. 8.

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Fig. 10.

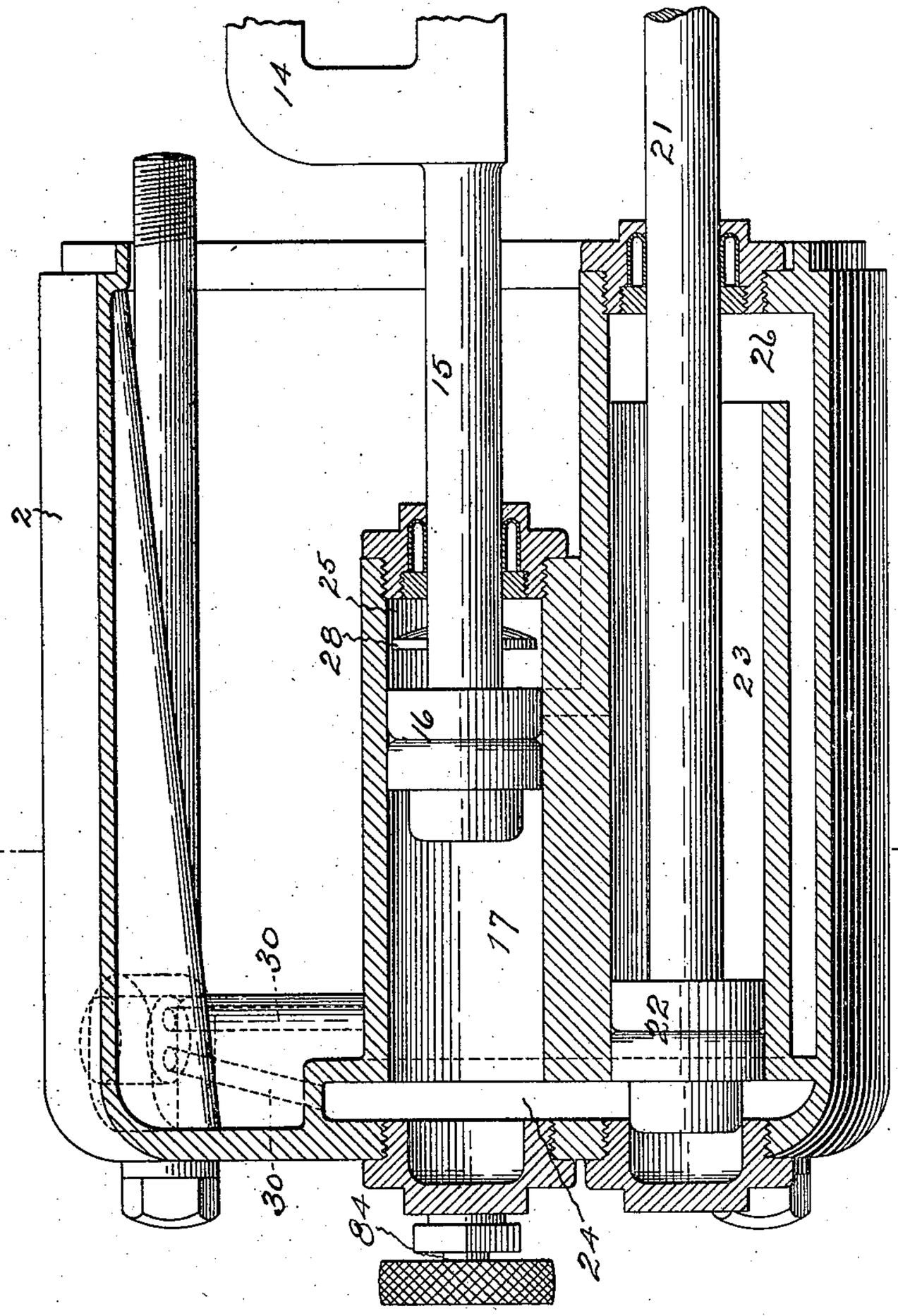

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Fig. 11.

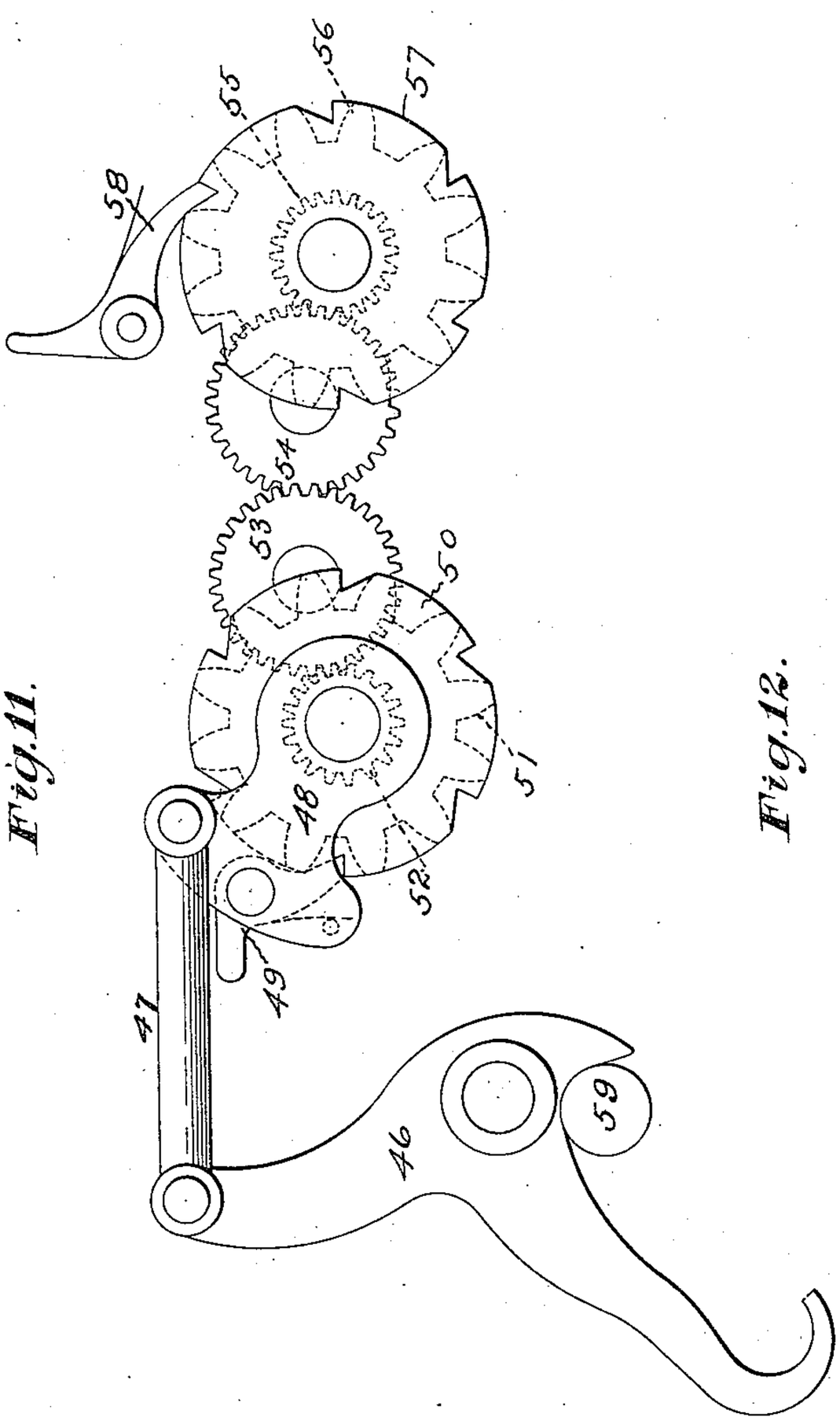

Fig. 12.

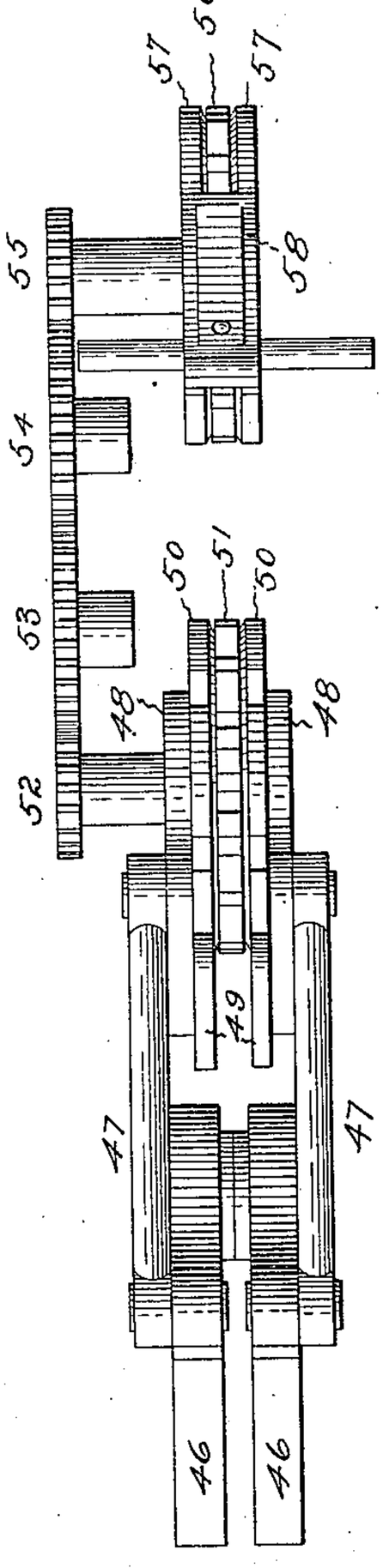

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Fig. 13.

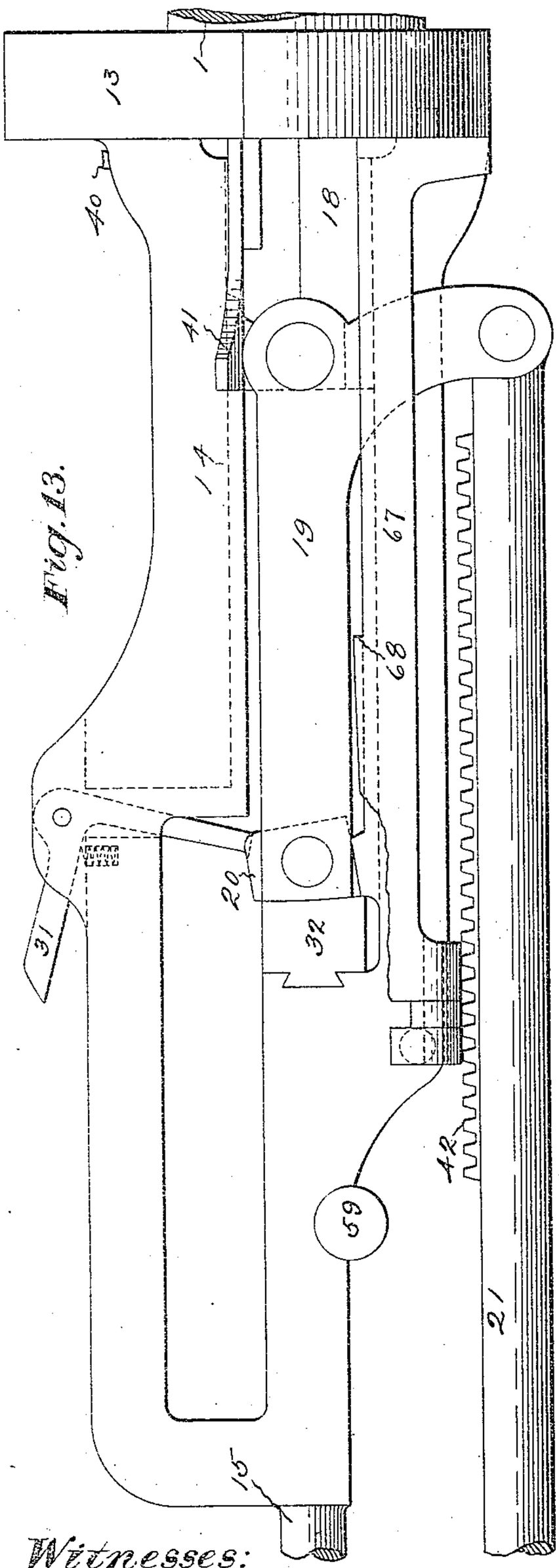
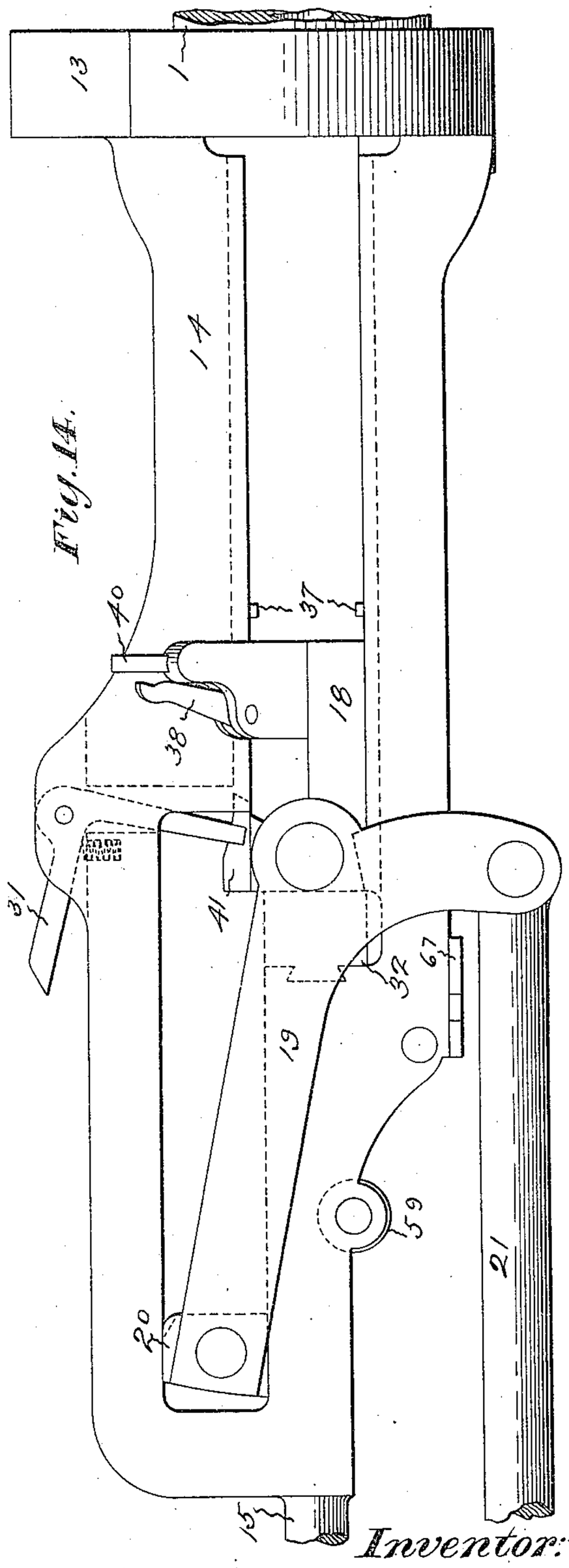


Fig. 14.



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(No Model.)

8 Sheets—Sheet 7.

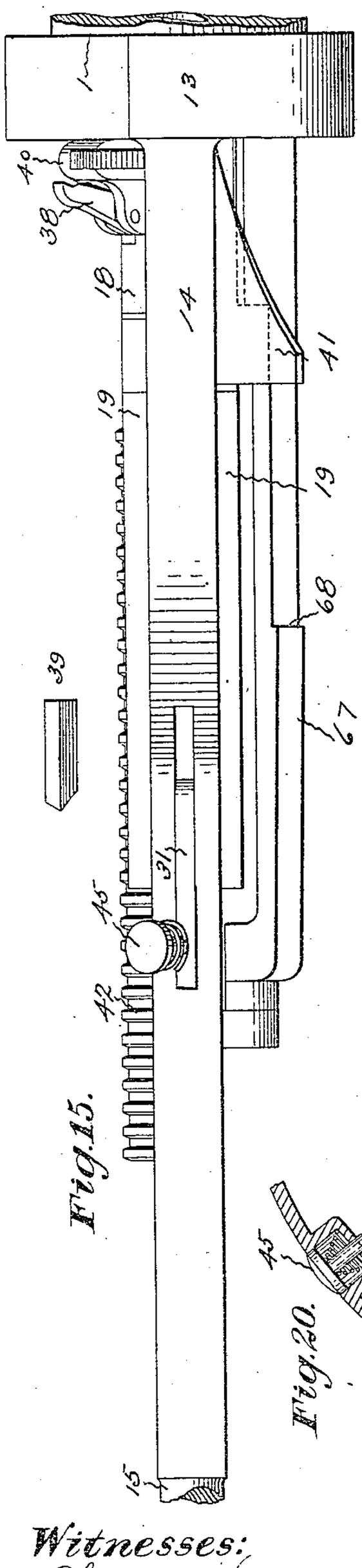

Fig. 15.

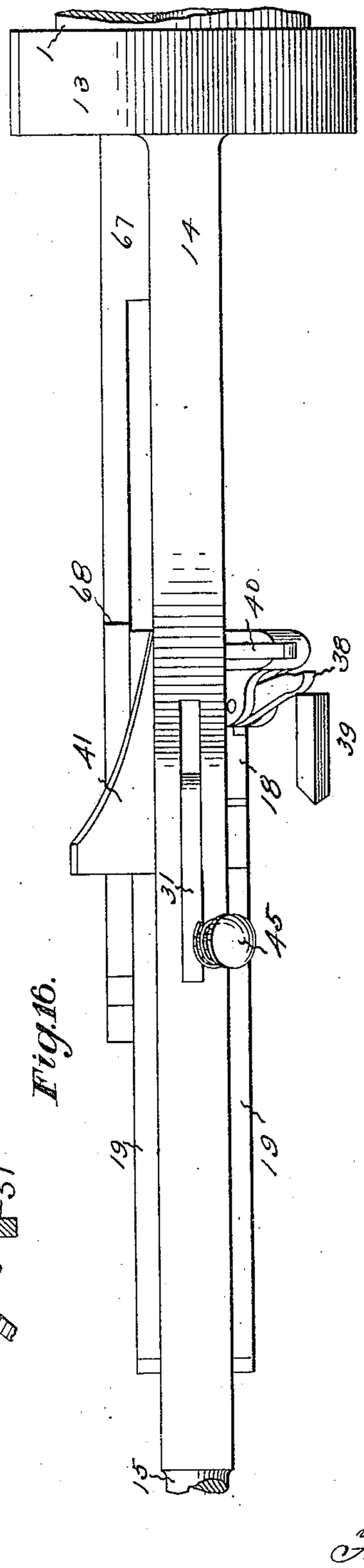

Fig. 16.

Fig. 20.

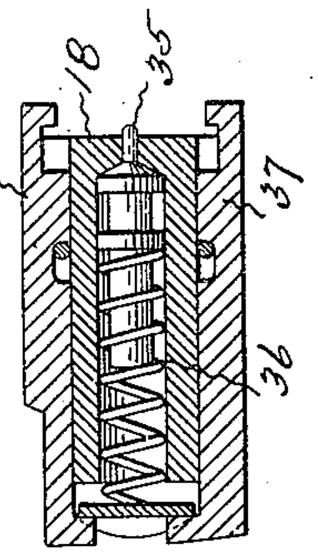

Fig. 19.

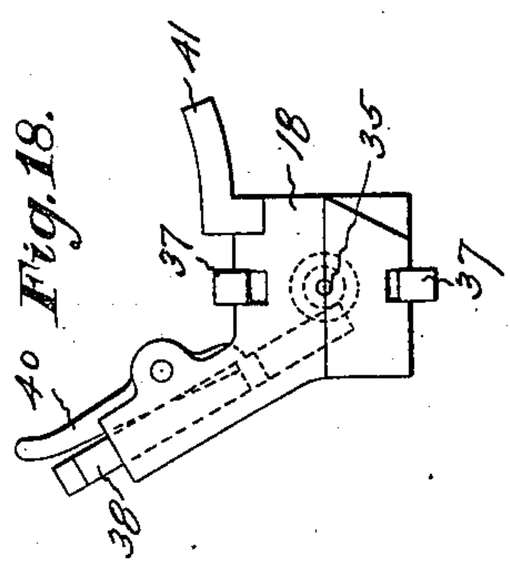

Fig. 18.

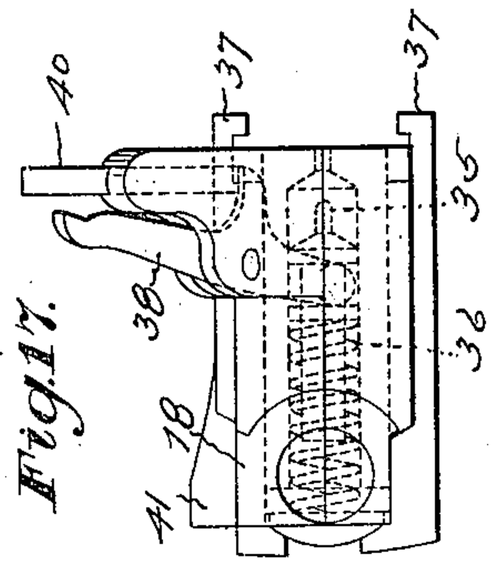

Fig. 17.

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(No Model.) 8 Sheets—Sheet 8.

Fig. 22.

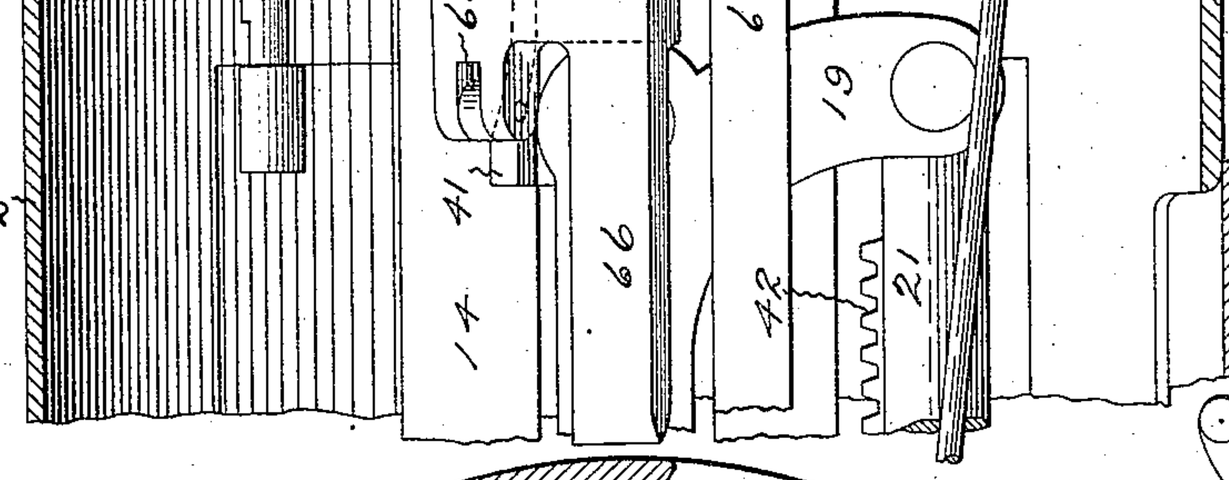


Fig. 23.

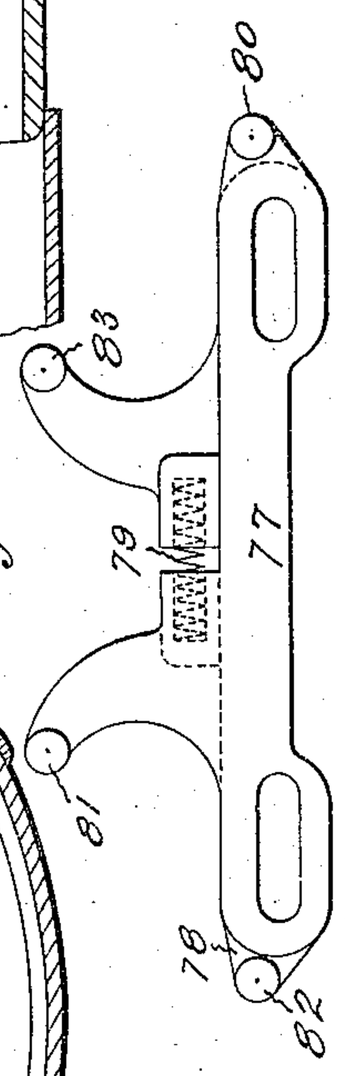
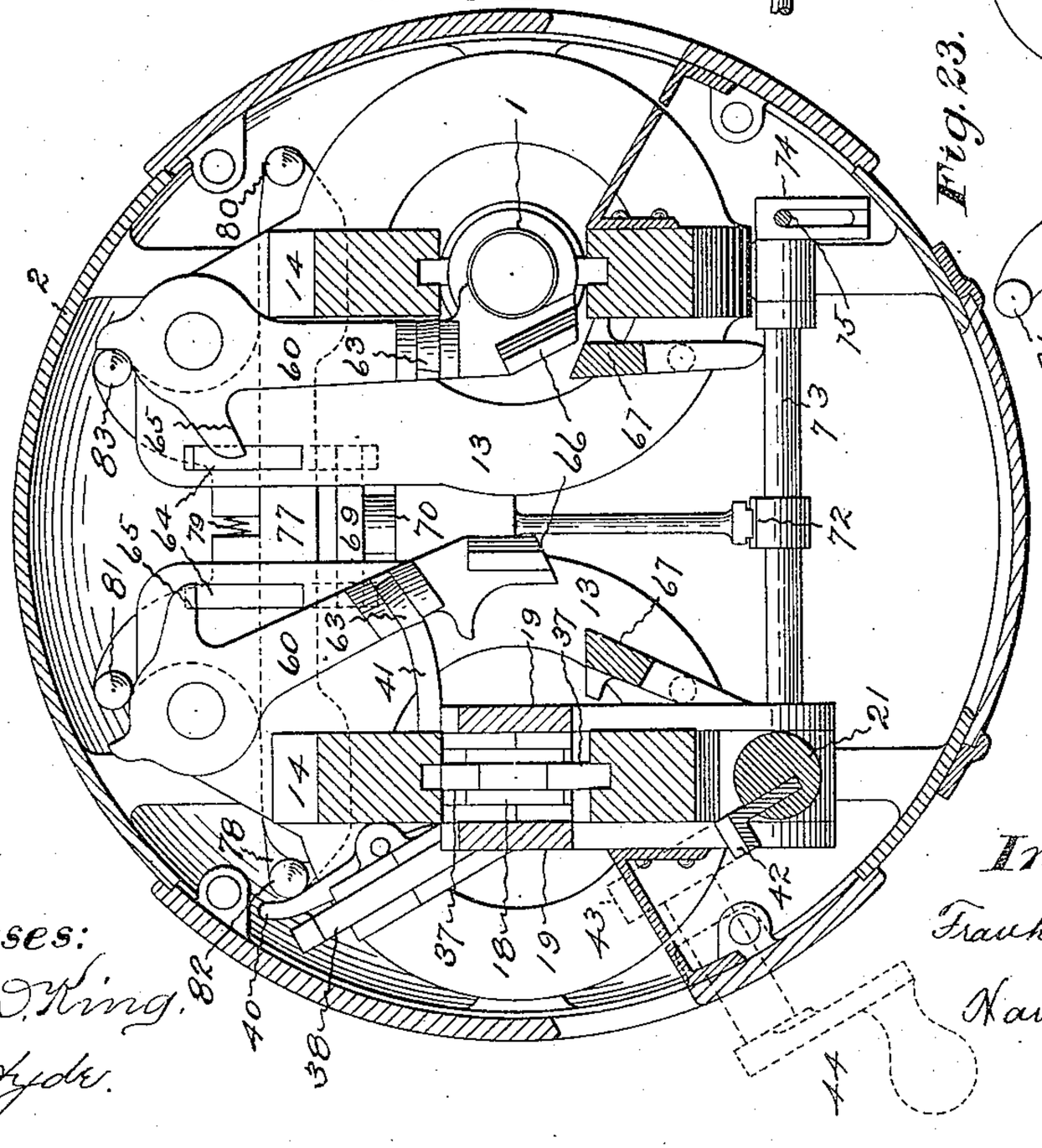


Fig. 21.



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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. 623,003, dated April 11, 1899.

Application filed August 13, 1898. Serial No. 688,537. (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.

This invention relates to a machine-gun having two barrels which are so arranged that the recoils incident to the explosions of the cartridges that are supplied from a belt are utilized to feed the cartridges and load and fire the opposite barrels alternately.

The object of the invention is the production of a reliable and accurate machine-gun of this nature having simple and durable mechanisms that can be rapidly and safely operated automatically for feeding, loading, and firing ammunition so as to discharge projectiles individually or in quick succession.

In the gun illustrated the cartridges, which are temporarily held by spring-clips to reverse sides of a flexible belt, are by a positive feed intermittently elevated into the case that incloses the mechanisms through an opening in the bottom. As the cartridges alternately on opposite sides reach the level of the barrels in which they are to be fired they are forced laterally from the belt and after being carried forward by longitudinal feeds are by transverse feeds moved sidewise into the paths of the breech-blocks, which bear the cocking-levers, firing-pins, sears, and shell-extractors. The breech-blocks are advanced alternately at the proper times and push the cartridges into the barrels and tightly close the breeches until the cartridges have been fired and the recoil utilized. Then the breech-blocks are moved backwardly and withdraw the exploded cartridge-shells.

The recoil of an exploding cartridge in a barrel causes the backward movement of that barrel and its breech-block, and this is transmitted by connected pistons through the medium of a confined fluid to pistons connected with the other barrel and breech-block in such manner that the latter breech-block is caused to load a cartridge into and close the breech of its barrel. After the explosive energy has been utilized to load the opposite barrel the barrel that has been fired is drawn forward by a spring and its breech-block pulled farther back in order to extract the exploded shell and permit the placing of another cartridge in position to be loaded by the next forward movement of the withdrawn breech-block into the empty barrel when the loaded barrel is fired. The transverse movements of the cartridges discharge the exploded shells through openings in the sides of the case, and the belt as its feed continues passes out through an opening in the top of the case. The movement of a cartridge into the path of a breech-block is accomplished by a transverse feed which is set in operation as the empty barrel nears the end of its forward movement, and the movement of this transverse feed pulls the trigger and causes the barrel that was loaded by the firing of the first barrel to be fired and in its turn cause the reloading of the first barrel.

After a cartridge has been loaded into one barrel, pulling a trigger causes the transverse feed to act and place a cartridge in position to be loaded into the empty barrel, which action fires the loaded barrel. The firing of either barrel will feed the cartridges and load and fire the other barrel as long as the trigger is pulled and cartridges are supplied. The barrels may be fired individually as slowly as desired by pulling and releasing the trigger, which, if held pulled, allows the loading and firing of the barrels alternately to continue automatically until the supply of ammunition is exhausted.

Figure 1 of the drawings is a plan of a gun that embodies the invention. Fig. 2 is a side elevation of this gun. Fig. 3 is a view looking toward the muzzles of the barrels. Fig. 4 is a plan of the outer ends of the barrels with the spring-frame cut in section. Fig. 5 is a view of the pistol-grip, showing the trigger connection. Fig. 6 is a plan of the operating mechanism, with the casing cut in central section. Fig. 7 is a central vertical sectional view of the mechanisms. Fig. 8 is an enlarged view looking at the butt-section of the casing from the front. Fig. 9 is a transverse section of the casing. Fig. 10 is a longitudinal section of the butt portion of the casing. Fig. 11 is a side elevation of the belt feeding mechanism. Fig. 12 is a plan of the belt feeding mechanism. Fig. 13 is a side

elevation of a barrel-frame with the breech-block closed, looking from the inside. Fig. 14 is a similar view of a barrel-frame with the breech-block opened, looking from the outside. Fig. 15 is a plan of a barrel-frame with the breech-block closed. Fig. 16 is a plan of a barrel-frame with the breech-block opened. Fig. 17 is a side elevation of the breech-block. Fig. 18 is an end elevation of the breech-block. Fig. 19 is a central longitudinal section of the breech-block. Fig. 20 is a view of one of the buttons which may be employed to unlock the recoil-blocks. Fig. 21 is a transverse section of the casing, looking toward the front. Fig. 22 is a vertical section of the front part of the casing. Fig. 23 is a detail view of the trigger-slides.

The barrels 1, which may have a bore of any caliber, extend forward side by side from the front end of the casing 2, which incloses the operating mechanisms and to which are attached ordinary trunnions 3, shoulder-rest 4, pistol-grip 5, and sights 6. The casing is shown as made of two cylindrical sections, and portions of the walls are removable in order that the mechanisms may be uncovered for inspection. Posts 7 are secured to the front end of the casing, and to the ends of these posts a cross-head 8 is attached. The barrels slide through the end wall of the casing and through this cross-head, which is perforated for the barrels and recessed to receive collars 9, secured to the barrels. Springs 10 are coiled about the barrels between the collars and a yoke 11, that is adjustably joined with the fixed cross-head by a bolt 12. The springs thrusting between the yoke and the collars hold the barrels forward, and the force they exert is regulated by the position of the yoke, Figs. 1 to 4.

The breech ends of the barrels are secured to the heads 13 of frames 14, each of which is connected by a rod 15 with a piston 16 in a cylinder 17, that is formed in the butt-section of the casing. Movable in guideways in the barrel-frames toward and from the breeches of the barrels are the breech-blocks 18. Levers 19 are pivoted to the breech-blocks, and the long arms of these levers are connected with recoil-blocks 20, which are movable in guideways in the frames, while the short arms are attached to rods 21, that are connected with pistons 22, which move in cylinders 23, formed in the butt-section of the casing beneath the cylinders 17, Figs. 10 and 13 to 16.

The cylinders 17 and 23 open into a common chamber 24 at the rear of the butt-section of the casing, while at the front the cylinders 17 open to a chamber 25 and the cylinders 23 open to a chamber 26. The chamber 24 has no communication with the chambers 25 and 26; but the latter are connected by a passage 27. The passage 27 has a port the capacity of which is regulated by the valve 28, which is held from forward movement by a spring 29 and from backward movement by a rod 84, that is adjustable from the outside of the casing. These cylinders are filled with a fluid through passages 30, one of which opens into the rear chamber 24, while the other opens into the chamber that communicates with the front ends of the cylinders. These passages are closed by a screw-plug, which also when in place shuts of all communication between the passages. This fluid can flow in and out of the rear ends of the cylinders freely. At the front ends the fluid can flow freely from the chamber 26 to the chamber 25, for the valve yields to flow in that direction; but the flow will be somewhat restricted in the opposite direction, depending upon the position of the valve, Figs. 6 to 10.

Levers 31 are pivoted in mortises in the barrel-frames in such positions that when only subjected to the thrust of their springs they lock the recoil-blocks in the lower guideways of the frames against the backing-blocks 32. When the recoil-blocks are locked against upward movement by these levers, the backward movements of the barrel-frames carry back the breech-blocks, together with the recoil-blocks, so that the pistons connected with these parts move together equal distances. As the frames approach the ends of their backward movements the upper ends of the locking-levers engage fingers 33, projecting from the frames 34, that support the actuating mechanisms, and are so moved as to unlock the recoil-blocks. When the barrel-frames reach the end of the backward movements caused by the explosive effects of the cartridges that are fired and the recoil-blocks are unlocked, the frames and barrels are drawn forward by the springs. The forward movements of the upper pistons drive the fluid in the cylinders, so as to force the lower pistons farther backward, and the backward pull of these pistons causes the breech-block levers to first oscillate the recoil-blocks up from the backing-blocks into the upper guideways in the frames and then to move backward while the barrel-frames are being drawn forward. The backward movements of the recoil-blocks and the connected breech-blocks open the breeches of the barrels, Figs. 13 to 16.

When a barrel is fired, the recoil incident to the explosion of the cartridge, through the breech-block, recoil-lever, and recoil-block, drives the frame of that barrel, together with the barrel, backward, and the barrel-frame piston and the recoil-lever piston move together the same distance, for the recoil-block is locked. The effect of this is to drive the fluid from the back ends of the cylinders and rear chamber on one side into the back ends of the cylinders on the opposite side, and this, as the barrel on that side has been drawn forward by its spring, forces the recoil-lever piston that is back on that side to move forward, carrying its connected breech-block and a cartridge in front of it to the breech of the barrel that is empty. After the explosive energy has expended itself

and the breech-block on the empty side has been pushed home and becomes locked the spring of the barrel that was thrown back by the firing draws that barrel forward, and the forward movement of this barrel, as stated, so moves its connected piston that the fluid is forced from the front of the upper cylinder on that side into the front of the lower cylinder on the same side and causes the lower piston, which is connected with the recoil-lever on that side, to be moved farther back and open its breech-block. In other words, when a barrel is fired its frame-piston and recoil-lever piston are moved back together until the explosive energy has accomplished its work of thrusting forward the breech-block of the other barrel. Then the spring of the barrel fired draws that barrel forward, and this movement causes a flow of the fluid in such manner as to move the piston and connected recoil-block that has been unlocked backward and withdraw the breech-block of that barrel, so as to extract the exploded shell and be in position to load another cartridge into the empty barrel. The recoil drives back the upper and lower pistons on one side together and displaces the fluid, so as to move the lower piston on the opposite side forward a distance equal to their combined movements, and thus completely close the breech-block on the side that was not fired. Then the upper piston moves forward as the fired barrel returns to normal position, and the lower piston is moved backward to open its breech-block, in which position it remains until the loaded barrel is fired.

The breech-blocks are provided with firing-pins 35, that are normally thrust forward by springs 36, and they have extracting-arms 37, that are loosely placed in grooves in the upper and lower parts of the breech-blocks. The extracting-arms are arranged to travel in grooves in the barrel-frames, so as to guide the blocks in their movements. Cocking-levers 38 are pivoted in mortises in the blocks, so as to engage grooves in the heads of the firing-pins. These levers, when the breech-blocks are drawn backward, engage cocking-lugs 39, secured to the casing, and are oscillated so that the pins are drawn backward and their springs made tense. When the springs are compressed, sear-levers 40, pivotally mounted upon the blocks, engage notches and retain the cocking-levers, with the springs under tension. Projecting from the inner sides of the breech-blocks are cams 41, which coöperate with the arms of the transverse feeds, Figs. 15 to 19.

One of the recoil piston-rods may be provided with rack-teeth 42, and arranged so that it may be pushed into mesh with these is a pinion 43, having outside of the shell a handle 44. By means of this pinion the piston-rod and pinion may be moved back and forth by hand, Figs. 13, 15, and 21.

Spring push-buttons 45 may be arranged in sockets in such positions that when forced inwardly their shanks will project into the paths of the recoil-block-locking levers and so oscillate these levers as to unlock the recoil-blocks and allow the breech-blocks to be opened, Figs. 15, 16, and 20.

A pair of feed-levers 46 are pivotally mounted upon the mechanism-supporting frames, and these levers are connected by rods 47 with pawl-plates 48, that carry pawls 49, which are arranged to engage teeth in and by forward and backward movements to intermittently advance ratchet-wheels 50. These ratchet-wheels are connected with a toothed feed-wheel 51, and the shaft of this wheel bears a gear 52, that meshes with a gear 53, meshing with a gear 54, that is in mesh with a gear 55 on the shaft of another toothed feed-wheel 56. Connected with the latter feed-wheel are ratchet-wheels 57, and arranged to engage with the teeth of these is a spring-pawl 58. The levers 46 are arranged to be oscillated by studs 59, projecting from the barrel-frames, Figs. 6, 7, 11, and 12.

The cartridge-belt employed with this gun is provided with teeth that will mesh with the teeth of the feed-wheels, which are intermittently advanced first by the movement of one barrel-frame and then by the movement of the other barrel-frame. The gears require that the feed-wheels move together, and the pawl 58 prevents the belt from pulling back after being elevated. The upper end of the pawl 58 is extended through the top of the casing, so that it may be reached from the exterior, and, if it is desired to remove a belt that has been started in the gun, this pawl may release the teeth of the ratchet-wheels 57, and then the belt will run back by gravity through the bottom of the casing, Figs. 7 and 11.

The transverse feed-arms 60 are secured to shafts mounted in the heads 13 of the barrel-frames. These shafts are provided with springs 61 under such tension that they tend to rotate the shafts and swing the arms toward the axes of the barrels. The front ends of the springs are connected with adjusting-nuts 62, by means of which the tensions of the springs can be regulated. These arms are provided with rolls 63, arranged in the paths of the cams 41 on the breech-blocks, so that when the breech-blocks are at the forward limits of their movements the cams force the arms outwardly against the tensions of their springs. When the arms are forced outwardly, the ends of levers 64, carried in recesses in the heads of the barrel-frames, are by springs forced beneath shoulders 65, so as to hold the arms with the springs tense. When the barrel-frames are forced backward by the explosions of the cartridges, the projecting fingers 66 of the arms 60 pass between cartridges and the body of the belt that has been lifted by the feed mechanism and force the cartridges alternately from the spring-clips on opposite side of the belt. Swinging

plates 67 are hinged to the inner faces of the barrel-frames for supporting the cartridges as they are forced from the belt-clips, and these plates are provided with shoulders 68, that engage the rims of the cartridge-heads and when the barrel-frames move forward carry the cartridges with them. As the barrel-frames, together with the transverse feed-arms and the supporting-plates with the cartridges, reach the forward limits to which they are pulled by the barrel-springs and the breech-blocks are pulled to their extreme backward positions the levers 64 engage a tripping-bar 69 and are oscillated so as to release the arms and allow their springs to throw them outwardly and force the cartridges transversely into line with the breech-blocks and barrels. As the breech-blocks move forward to push the cartridges into the barrels the cams carried by the breech-blocks again oscillate the arms and place their springs under tension, Figs. 6, 7, 21, and 22.

The tripping-bar 69 is mounted upon a plunger 70, that is normally held raised by a spring 71. The lower end of this plunger is connected with a rocker-arm 72, mounted on a shaft 73, supported by brackets attached to the casing. This shaft also has a rocker-arm 74, which by a rod 75 is connected with the trigger 76 of the pistol-grip 5. When the tripping-bar is in its raised position, the levers 64 in their forward movement will not be engaged and oscillated; but when the trigger is pulled and the tripping-bar drawn downward the forward movements of the barrel-frames cause such engagement with the tripping-bar that the levers 64 are oscillated and release the transverse feed-arms so that their springs will throw them, Figs. 5, 7, 21, and 22.

Supported by a part of the casing in front of the heads of the barrel-frames are a pair of transverse slides 77 and 78. These slides lie side by side and extend transversely of the casing, and between portions of them is a spring 79, that tends to thrust them in opposite directions. Projecting rearwardly from the end of one slide is a stud 80, and projecting rearwardly from the upper part of the same slide is a stud 81, while projecting from the end of the other slide is a stud 82, and projecting from the upper part of that slide is a stud 83, Fig. 23. These studs project rearwardly in such manner that when the barrels are forward and the breech-blocks close the breeches the stud 80 extends by the side of one of the firing-sears 40 and the stud 81 on the same slide extends by the side of a shoulder on the transverse feed-arm 60 on the opposite side of the casing, while the stud 82 extends by the side of the other firing-sear and the stud 83 on the slide with the stud 82 extends by the side of a shoulder on the other of the transverse feed-arms 60. When these arms are thrown by their springs to transversely feed cartridges, the shoulders at their upper ends engage the studs 81 and 83 and drive the slides 77 and 78 so that the studs 80 and 82 move the sears out of engagement with the cocking-levers and allow the firing-pins to be thrown by their springs for exploding the cartridges. The pulling of the piston-grip trigger draws the tripping-bar so that the transverse feed-arm-holding lever that is forward is tripped and allows the transverse feed-arm on that side to swing outwardly and carry a cartridge into line with the breech-block on that side. This movement of the transverse feed-arm on this side so drives the trigger-slide that the firing-pin on the other side is allowed to explode the cartride in the barrel on that side, and this, as stated, causes the extraction of the shell which is exploded and the loading of a cartridge into the opposite barrel, Figs. 6, 7, 21, and 22. The actions for both barrels are the same, but, as stated, they occur alternately—that is, the transverse feeding of a cartridge for one barrel fires the cartridge in the opposite barrel, and the firing of that cartridge loads the cartridge that was transversely fed, and which in turn when fired loads the barrel that was fired to accomplish its loading. As long as the pistol-grip trigger is pulled a transverse feeding-arm will be released at each forward movement of a barrel, and the releasing of this lever places a cartridge into position to be loaded on its own side and fires a cartridge that has been loaded into the barrel on the opposite side.

I claim as my invention—

1. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, and fluid-cylinders for receiving the pistons, said cylinders opening to a common chamber in front of the pistons and to a common chamber back of the pistons, substantially as specified.

2. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, said cylinders opening to a common chamber in front of the pistons and to a common chamber back of the pistons, and springs arranged to hold the barrels forward, substantially as specified.

3. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, said cylinders opening to a common chamber in front of the pistons and to a common chamber back of the pistons, a spring-frame connected with the casing, a yoke adjustably connected with the spring-frame, and springs

thrusting between the yoke and parts of the barrels for holding the barrels forward, substantially as specified.

4. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, said cylinders opening to a common chamber in front of the pistons and to a common chamber back of the pistons, and a valve that permits the free flow of fluid in one direction but restricts the flow of fluid in the opposite direction located in the passage between the front ends of the upper cylinders and the front common chamber, substantially as specified.

5. A machine-gun having a casing, barrels removably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, firing-pins and extractor-fingers carried by the breech-blocks, pistons connected with the breech-blocks, and fluid-cylinders for receiving the pistons, said cylinders opening to a common chamber in front of the pistons and to a common chamber back of the pistons, substantially as specified.

6. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, spring firing-pins, extractor-fingers, cocking-levers and sears carried by the breech-blocks, pistons connected with the breech-blocks, and fluid-cylinders for receiving the pistons, said cylinders opening to a common chamber in front of the pistons and to a common chamber back of the pistons, substantially as specified.

7. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, reciprocating breech-blocks movable to and from the breeches of the barrels, recoil-blocks loosely connected so as to have a reciprocation with and oscillation independent of the breech-blocks, pistons connected with the breech-blocks, and fluid-cylinders for receiving the pistons, substantially as specified.

8. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, reciprocating breech-blocks movable to and from the breeches of the barrels, recoil-levers pivotally connected with the breech-blocks, recoil-blocks connected with the recoil-levers, pistons connected with the recoil-levers, and fluid-cylinders for receiving the pistons, substantially as specified.

9. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, reciprocating breech-blocks movable to and from the breeches of the barrels, recoil-levers pivotally connected with the breech-blocks, recoil-blocks connected with the recoil-levers, recoil-blocking levers movable with the barrels, pistons connected with the recoil-levers, and fluid-cylinders for receiving the pistons, substantially as specified.

10. A machine-gun having a casing, barrels movably supported by the casing, barrel-frames connected with the barrels, pistons connected with the barrel-frames, reciprocating breech-blocks movable in guideways in the barrel-frames to and from the breeches of the barrels, recoil-blocks connected with the breech-blocks and movable in guideways in the barrel-frames, pistons connected with the breech-blocks and recoil-blocks, and fluid-cylinders for receiving the pistons, substantially as specified.

11. A machine-gun having a casing, barrels movably supported by the casing, barrel-frames connected with the barrels, pistons connected with the barrel-frames, reciprocating breech-blocks movable in guideways in the frames, pistons connected with the breech-blocks, movable cartridge-supports borne by the barrel-frames, and fluid-cylinders for receiving the pistons, substantially as specified.

12. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, cams mounted upon and movable with the breech-blocks, and transverse feeds arranged to be moved by the cams, substantially as specified.

13. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, and feeding mechanisms for elevating the cartridges to the level of the barrels operated by the reciprocation of the barrels, substantially as specified.

14. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feed mechanisms for elevating the cartridges to the level of the barrels, and mechanisms for feeding the cartridges transversely into line with the barrels, substantially as specified.

15. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feed mechanisms for elevating the cartridges, mechanisms for forcing the cartridges laterally, and mechanisms for feeding the cartridges into line with the barrels, substantially as specified.

16. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feed mechanisms for elevating the cartridges, mechanisms for feeding the cartridges transversely into line with the barrels, and trigger-slides moved by the movements of the transverse feeding mechanisms for releasing the firing-pins, substantially as specified.

17. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feed mechanisms for elevating the cartridges, mechanisms for feeding the cartridges transversely into line with the barrels, cams on the breech-blocks for moving the transverse feeds inwardly, springs for moving the transverse feeds outwardly, and trigger-slides moved by the movements of the transverse feeds, substantially as specified.

18. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feed mechanisms for elevating the cartridges, mechanisms for feeding the cartridges transversely into line with the barrels, cams on the breech-blocks for moving the transverse feeds inwardly, springs for moving the transverse feeds outwardly, fingers for forcing the cartridges laterally from the belt, mounted upon the transverse feeds, and trigger-slides moved by the movements of the transverse feeds, substantially as specified.

19. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feed mechanisms for elevating the cartridges, cams on the breech-blocks for moving the transverse feeds inwardly, springs for moving the transverse feeds outwardly, levers holding the transverse feeds with the springs under tension, a tripping-bar, and a trigger connected with the tripping-bar and arranged to draw the tripping-bar into the path of the levers, substantially as specified.

20. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, reciprocating breech-blocks movable to and from the breeches of the barrels, recoil-levers pivotally connected with the breech-blocks, recoil-blocks connected with the recoil-levers, piston-rods connected with the recoil-levers, pistons connected with the piston-rods, fluid-cylinders for receiving the pistons, a rack borne by one of the piston-rods, a pinion adapted to mesh with the rack, and a crank-handle connected with the pinion, substantially as specified.

21. A breech-block for an automatic machine-gun having a firing-pin, a cocking-lever adapted to engage the firing-pin, a sear arranged to retain the lever cocked, loosely-retained extractor-fingers, and a spring thrusting the firing-pin forward and the extractor-fingers backward, substantially as specified.

22. A transverse feed mechanism for an automatic machine-gun consisting of an arm, a finger projecting rearwardly from the arm, a shaft supporting the arm, a spring for turning the shaft in one direction and an adjusting device for regulating the tension of the spring, substantially as specified.

23. An elevating feed mechanism for an automatic machine-gun consisting of a pair of independently-oscillating levers, pawls arranged to be oscillated by the movements of the levers, ratchet-wheels intermittently advanced first by one and then by the other pawl, and toothed wheels connected with and intermittently advanced with the ratchet-wheels, substantially as specified.

24. A firing mechanism for an automatic machine-gun consisting of a pair of transversely-moving slides thrust in opposite directions by a yielding force, breech-blocks with firing-pins, cocking-levers and sears, studs projecting from the slides into the paths of the sears, transversely-moving arms, springs for throwing the arms, studs projecting from the slides into the paths of the arms, levers for retaining the arms from movement, a tripping-bar in the paths of the arm-levers, and a trigger connected with the tripping-bar, substantially as specified.

25. In combination with the firing mechanisms of an automatic machine-gun having reciprocating barrels, trigger-slides movable transversely of the barrels, a spring for thrusting the slides from each other, studs projecting from the slides in position to be engaged for forcing the slides against the thrust of the spring, and studs projecting from the slides in position to engage the firing-sears, substantially as specified.

26. In combination with the feeding and firing mechanisms of an automatic machine-gun having reciprocating barrels, frames attached to and movable with the barrels, breech-blocks bearing firing-pins, cocking-levers and sears movable in guideways in the barrel-frames, recoil-blocks movable in guideways in the barrel-frames, levers pivotally connecting the recoil-blocks with the breech-blocks, and levers mounted in the frames and adapted to lock the recoil-blocks when the barrels are at the forward limits of their movements, substantially as specified.

27. In a machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the bar-

rels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feeding mechanisms for elevating the cartridges, mechanisms for moving the cartridges laterally, mechanisms for moving the cartridges longitudinally, and transverse feeding mechanisms for passing the cartridges into line with the breech-blocks, substantially as specified.

28. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feeding mechanisms for elevating the cartridges, mechanisms for moving the cartridges laterally, mechanisms for feeding the cartridges longitudinally, transverse feeding mechanisms for passing the cartridges into line with the breech-blocks, and a trigger mechanism operated by the movements of the transverse feeding mechanisms, substantially as specified.

29. A machine-gun having a casing, barrels movably supported by the casing, pistons connected with the barrels, breech-blocks movable to and from the breeches of the barrels, pistons connected with the breech-blocks, fluid-cylinders for receiving the pistons, feeding mechanisms for elevating the cartridges, feeding mechanisms for moving the cartridges into the paths of the breech-blocks, and a trigger mechanism operated by the movements of the feeding mechanisms, substantially as specified.

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