

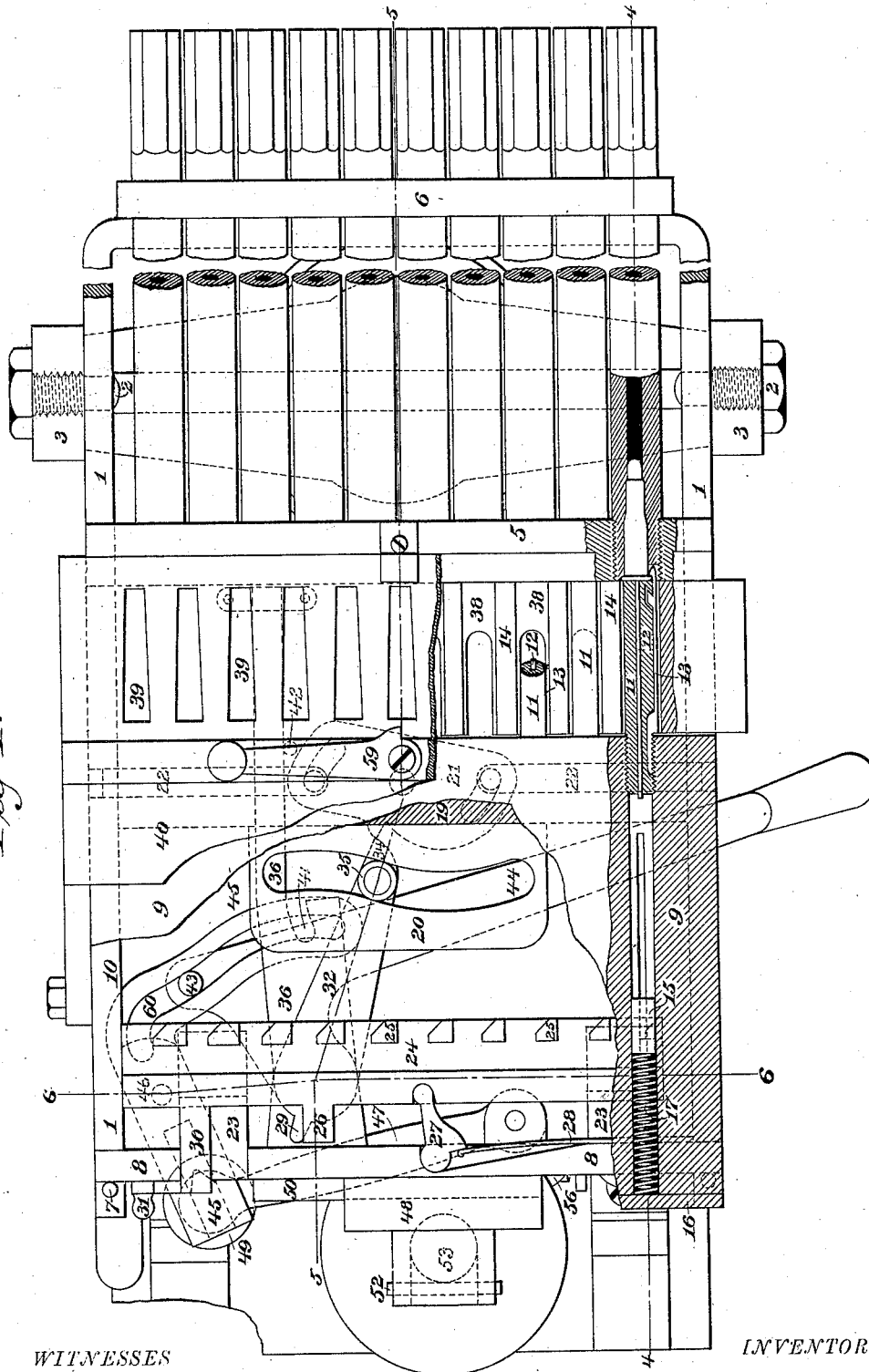
H. PALMCRANTZ.

Machine-Gun.

No. 220,545.

Patented Oct. 14, 1879.

Fig 1.



WITNESSES

INVENTOR

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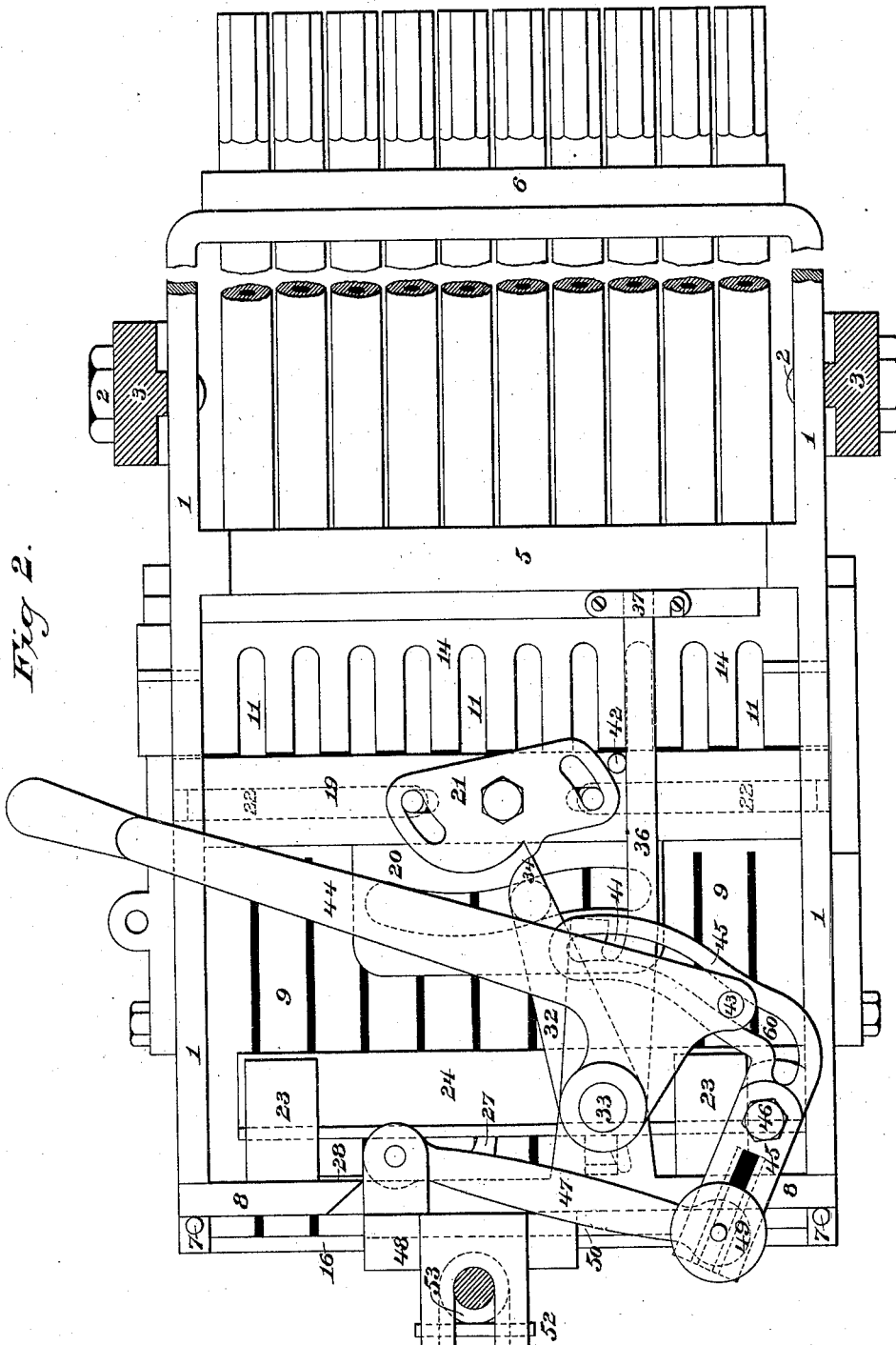
Baldwin, Hopkins, & Peyton.

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5 Sheets—Sheet 3.

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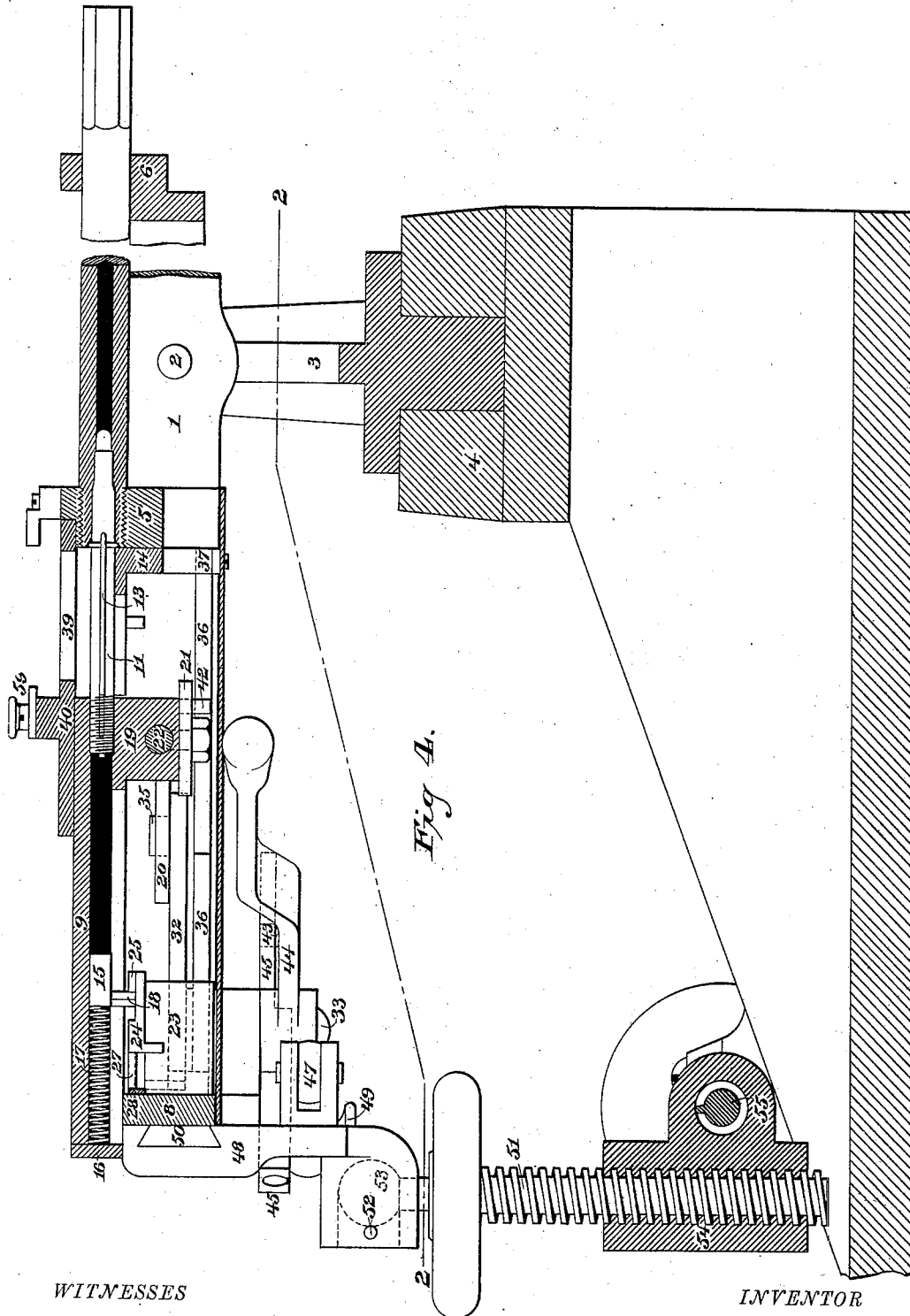


Fig. 4.

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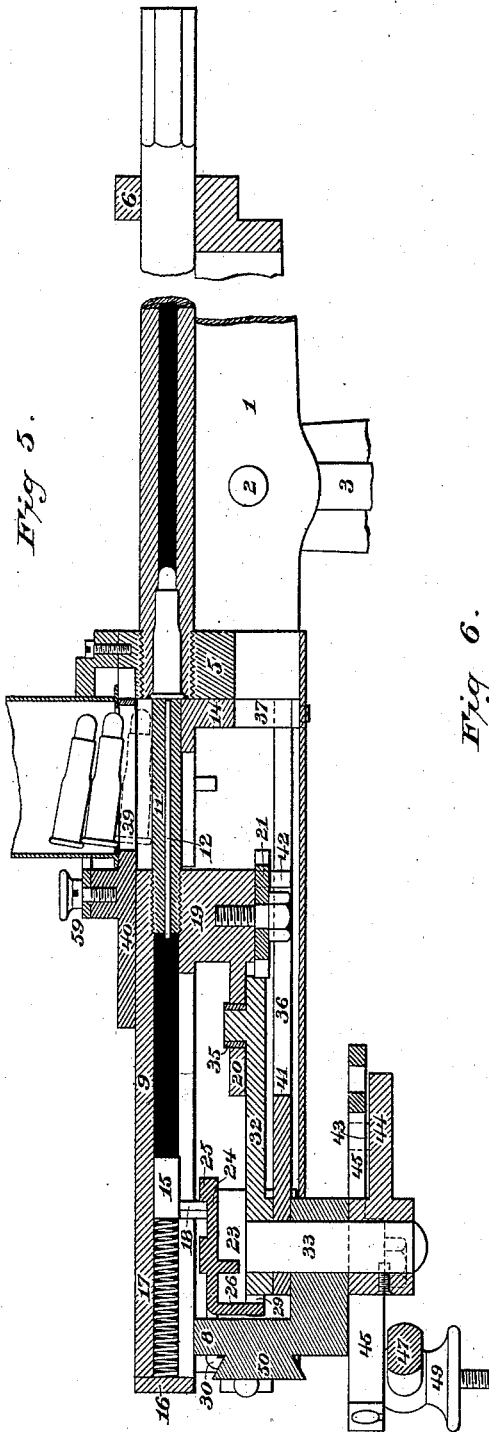
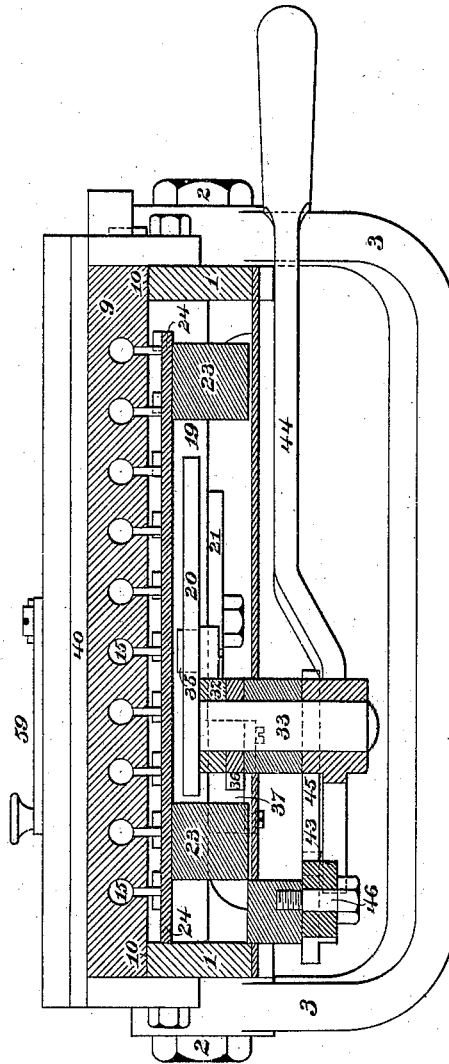


Fig 6.



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Fig 7.

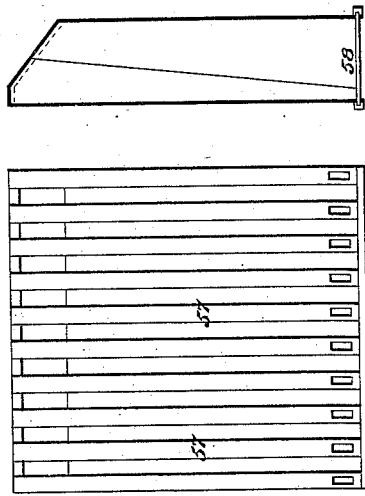


Fig 8.

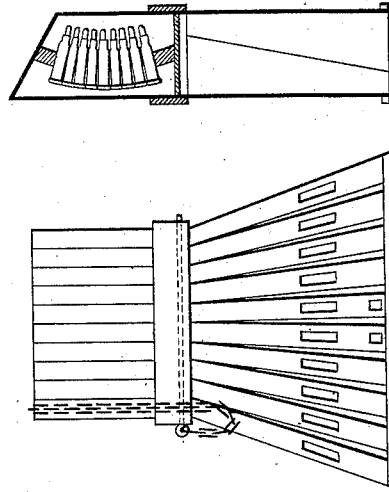
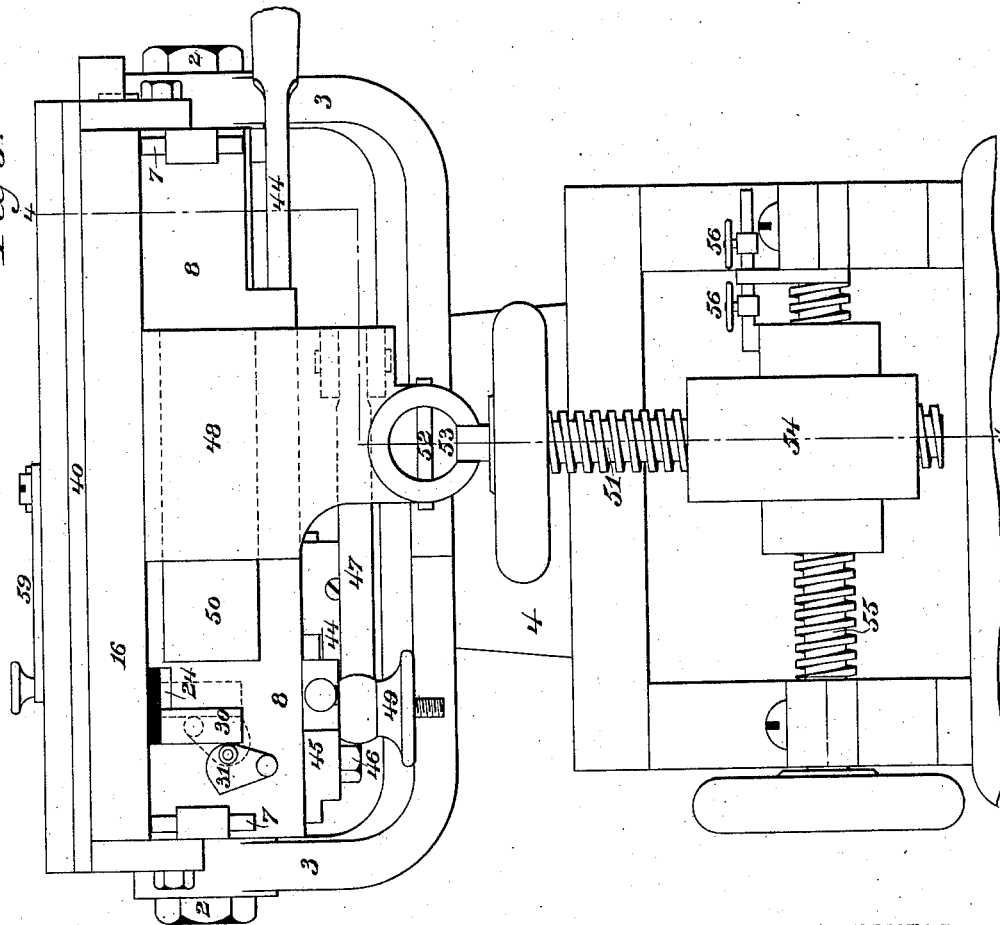


Fig 3.



WITNESSES

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UNITED STATES PATENT OFFICE.

HELGE PALMCRAANTZ, OF STOCKHOLM, SWEDEN, ASSIGNOR TO THORSTEN NORDENFELT, OF LONDON, ENGLAND.

IMPROVEMENT IN MACHINE-GUNS.

Specification forming part of Letters Patent No. **220,545**, dated October 14, 1879; application filed January 21, 1879; patented in England, May 13, 1873.

To all whom it may concern:

Be it known that I, HELGE PALMCRAANTZ, of Stockholm, in the Kingdom of Sweden, civil engineer, have invented a new or Improved Battery-Gun, which improvement is fully set forth in the following specification, reference being had to the accompanying drawings.

The said invention consists of an improved form and arrangement of mitrailleuse or repeating battery-gun with improved firing mechanism, feeding apparatus, spreading apparatus for dispersing the shot, and improved pointing instrument and charge-box.

This battery-gun consists of a fire-arm destined to be used in war, and which is alike serviceable by land and on water.

The construction of this fire-arm is quite new and independent, and is not on the revolving system. It operates quickly and with certainty.

The said battery-gun consists of two chief parts, videlicet: first, the weapon itself; second, the support or carriage. The former consists of the barrels, ten different ones, all lying in the same plane, and parallel to each other in the front part of the frame in which the weapon reposes.

The firing mechanism is inclosed in the gun-box, which is movable to and fro on guides, and is perforated with cylindrical holes, in which are to be found the breech-pins with their self-locking extractors, and with percussion-needles, the percussion hammers or cogs, and the spiral springs.

Behind and beneath the turned-down and swelled front part of the gun-box are fixed the driving-plate and the bolt-plate, to which latter the stoppers are united.

On two arms applied on the back piece of the frame rests the trigger-comb, which moves and releases the spiral springs.

All these parts are combined with each other by means of a crank, which catches in the bolt-plate and in the driving-plate.

By means of a feeding-arm the movement of the gun-box is conveyed to the carrier-block, whose object is to bring cartridges to the rear ends of the barrels and, after the discharge, to carry the exploded shells or cases away.

To spread the projectiles automatically on the shooting-plane in the act of firing an arm is provided movable about a center, and combined with the bent lever, operated by the gunner.

The pointing instrument is mounted on the support, and is combined with the slide which incloses the ball of the elevation-screw, which can be moved in a horizontal direction by another screw at right angles to the first-named screw.

The magazine has a particular chamber for each barrel, and is placed immediately above the carrier-block. The chambers in which the cartridges are piled up have a form corresponding to the longitudinal section of the cartridges.

The power and motion required for operating the weapon are furnished by the gunner in moving the bent lever to and fro with his right hand, and for each complete movement a volley is discharged.

The feeding goes on uninterruptedly without any other interference by hand than the changing of the magazine for each two hundred and fifty shots or more.

The support of the battery-gun must vary in condition according to the use for which it is intended. For service in the field a carriage is most suitable.

The whole arm, with limber, is to be drawn by two horses, and the serving is accomplished by only one man.

In the accompanying drawings, illustrating my invention, Figure 1 is a plan view, partly in section. Fig. 2 is a bottom view, partly in section. Fig. 3 is a rear elevation. Fig. 4 is a vertical longitudinal section on the line 4 4 of Figs. 1 and 3. Fig. 5 is a section on the line 5 5 of Fig. 1. Fig. 6 is a vertical transverse section on the line 6 6 of Fig. 1; and Figs. 7 and 8 are views, in detail, of the magazine.

The gun or weapon itself can be placed in any position, as it rests in a frame, 1, which can be moved in a vertical plane round its two horizontal gudgeons, 2, mounted on a vertical two-armed stand, 3, which is itself movable in a horizontal plane on a pivot in the turntable 4, fastened to the carriage or main support.

The frame 1 has three cross-pieces, and the barrels are inserted in front, (to the number of ten in the drawings,) all lying in the same plane and parallel to each other. The butt-ends of the barrels are screwed into the metallic center cross-piece, 5, and the muzzles rest in the front cross-piece, 6, which, as well as the center cross-piece, is firmly attached to the frame by means of keys or wedges 7, strongly united to the end cross-piece, 8, on which is fixed the spreading apparatus, the trigger-comb, and the moving mechanism; consequently these parts can without difficulty be removed.

The firing mechanism is inclosed in the gun-box 9, which in this gun is of cast-iron. This is movable to and fro on guides 10, and perforated with cylindrical holes answering in number to the barrels, directly facing them and running in the same direction. In the front part of the holes an equal number of tubular breech-pins, 11, are fastened, each provided on the inside with a percussion-needle, 12, and on the outside with a self-locking extractor, 13. The extractors are inserted in grooves in the breech-pins, where they are free to move a little to and fro, and, together with the breech-pins, are screwed in the holes in the gun-box.

In Fig. 1 four of the breech-pins are removed in order to show plainly the carrier-block 14. One breech-pin is also seen in section. The percussion hammers or cocks 15 are situated behind the breech-pins, and between these and the rear end cross-pieces, 16, of the gun-box are disposed the spiral mainsprings 17. Each cock has a sloping tenon or projection, 18, running each in its separate straight groove in the bottom of the gun-box. Behind and on the front part, 19, of the gun-box, which is made thicker and stronger, there is secured the driving-plate 20, for causing the forward and backward motion of the gun-box. Under the above-mentioned thicker and stronger part 19 is fitted the bolt-plate 21, movable around a center pivot and connected in such a manner with the locking-bolts or stoppers 22, that these, when worked by the bolt-plate, may simultaneously receive a longitudinal motion transversely to the gun. The gun-box being in its forward or advanced position, the bolts or stoppers engage in holes made in the sides of the frame, as shown in Fig. 1, so as to lock the gun-box while in that position, and receive the recoil on firing the gun.

On two arms, 23, attached to the inner side of the end cross-piece, 8, the trigger-comb 24 rests, capable of a slight lateral movement in guiding cross-grooves on the arm 23. The object of the trigger-comb is to compress the spiral springs when the gun-box is moved forward, and afterward to release them when the successive firing of the barrels is to take place. This is effected by the trigger-comb, which is formed with vertical teeth 25, beveled or inclined on their left sides and differing in length, but equal in number to the cocks.

The trigger-comb is further provided with a sloping projecting arm, 26, and by the short lever 27 and the spring 28 it is forced toward the left side of the frame. In this position the teeth partly and successively cover the grooves traversed by the projections 18 of the hammers or cocks 15. Hence it follows that the cocks become stationary during the advancing motion of the gun-box, and operate on the spiral springs by compressing them. The gun-box having been advanced, and the locking-bolts or stoppers 22 having been simultaneously protruded, the trigger 29, combined with the moving mechanism, acts on the sloping projecting arm 26 of the trigger-comb, thereby thrusting it to the right side and successively releasing the several cocks or hammers. Moreover, the trigger-comb is provided with a protruding and accessible arm, 30, by means of which, when thrust to the right, it can easily be held by the action of the catch 31 in a closed or inoperative condition.

The parts of the mechanism already described are connected with each other by means of the lever-arm 32, movable through the shaft 33, and provided at its front end with a protruding tooth, 34, and anti-friction roller 35, the former catching in the corresponding notch of the bolt-plate and the latter running in the slot in the driving-plate 20, thus communicating to both plates their respective movements.

Through the medium of the feeding-arm 36, which is connected with the carrier-block 14 by means of a hook, 37, formed on or attached to the latter, the movement of the gun-box is conveyed to the carrier-block moving on guides, the object of which is to supply cartridges to the breech ends of the barrels at each volley after the discharge of the shots, and to remove by the extractors the exploded cartridge-cases and carry them away. For this purpose the carrier-block is supplied with troughs or recesses 38, corresponding in number to the barrels, and having grooves for the extractors therein. The troughs are, during the charging, so placed that all the breech-pins may enter them simultaneously. Fig. 1 shows partly the appearance of the carrier-block from above, likewise its position on the discharge of the shots—exactly opposite to the breech ends of the barrels.

After firing, and when the gun-box and the breech-pins have moved backward, the carrier-block receives, by means of the feeding-arm, a left-hand motion, so as to bring the troughs at the completion of the operation under the orifices 39 on the lid or cover 40, and free from the cartridge cases or shells which have escaped by that movement. To carry out this operation the feeding-arm 36 has a forked notch, 41, in which the anti-friction roller 42, placed on the gun-box, engages as it moves back, so that in its backward and forward motion it will cause the arm 36, by reason of the oblique position of the fork to the direction of

motion of the anti-friction roller, to move by turns to the right and to the left. In cleaning the gun or in dismounting it the carrier-block can be readily removed.

On the bent part of the bent lever 44 is a rising tenon or pin, 43, connecting it with the spreading or dispersing apparatus, the object of which is to spread or disperse the projectiles in the plane of fire in the form of a fan. This is accomplished by means of the spreading-crank 45, movable around the center 46, and having a groove in its bent end, 60, shaped so as to give periodically to the spreading-crank 45 (by the pin 43 in the bent lever 44 running in the groove) a uniform and angular movement. This movement is transmitted to the main frame by the connecting-rod 47, one end of which is united to the slide 48, while the other end is provided with a turning joint and an attachment-screw, 49, so as to be movable in the straight part of the spreading-crank 45. The end piece of the main frame has a guide, 50, which works in the said slide 48, and as this slide is immovably fastened to the elevating-screw 51, the frame, consequently, must partake of the motion which causes the spreading of the projectiles on the discharge of the shots. By moving the attachment-screw 49 to varied distances from the center 46, the spreading angle may be most accurately regulated, and in the center position the gun remains stationary.

The whole mechanism just described is put in motion when the bent lever 44, attached to the same shaft as the crank 32, is moved backward and forward by the gunner.

The pointing or aiming instrument, Fig. 4, is mounted on the carriage or support and attached to the slide 48, so as to leave room in its spherical socket (which is supplied with a wedge, 52,) for the reception of the ball 53 on the elevation-screw.

The nut or casing 54 of the elevation-screw may be moved in a horizontal direction by a second screw, 55, in a direction at right angles to the first-named screw, and the side motion thereby caused in the gun may be entirely regulated by the adjusting-screw 56. By this arrangement the adjustment is easy and certain, and the trajectory of each volley may, without loss of time or any particular adjustment, be changed in its position in the plane of fire, in addition to which the pointing instrument, by the aid of the adjusting-screws, may be used in the spreading of the projectiles.

The magazine, Fig. 5, has its place on the lid immediately above the carrier-block, and consists of an obliquely-cut parallelopiped box, with a separate chamber, 57, for each barrel. The chambers in which the cartridges are piled up can be closed by means of a movable bottom, common to them all, and having rectangular holes therein.

When the magazine is applied the bottom is pushed aside, leaving the orifices 58 of the chambers free, so that the cartridges may unobstructedly fall down through the said ori-

fices in the lid into the chambers of the carrier-block.

Every chamber has a slit made in it for the observation of the consumption of cartridges during the firing, and each chamber corresponds in form to the longitudinal section of the cartridges, and is provided with a rabbet for the flange of the cartridges. When the magazine is to be loaded this rabbet conducts the cartridges so that they arrange themselves systematically on each other when falling through into the chamber.

The lever-arm 59, provided with an eccentric, serves to keep the magazine in its proper place.

In order to establish a continuous feeding, a different construction of the magazine can be used; but a special apparatus will then be required—videlicet, a conductor of the cartridges. In this case the magazine may be similarly constructed to that before described, but much smaller, and with the chambers lying close together, and provided with a sliding bar instead of the movable bottom.

The conductor of the cartridges resembles the magazine before described; but it is open at both ends, and the chambers slope together at the upper end, where they are inclosed within a rim.

When charging the conductor of the cartridges is fastened in the same manner as before described in reference to the fastening of the magazine, and the magazine now described is placed within the rim of the conductor of the cartridges, whereupon the sliding bar is withdrawn, and the cartridges fall down, to be supplied by others, as soon as fired, by changing the magazine for another charged with fresh cartridges.

Should it not be desired to make use of the magazine for loading, this operation may be accomplished by spreading the cartridges on the openings in the lid, which is movable on its joint.

The gun is supplied with a protecting-plate under the mechanism, and with openings for lubrication, so placed as to allow of its being lubricated while in action.

The fore and back sights are placed in the middle of the gun or at its side.

The carriage or support of the battery-gun will vary in form, according to the use for which it is intended, whether for land or sea service. For field-service the gun-carriage is the most suitable support, and should be of iron, and provided on its trail with a seat, on which the gunner sits astride.

For the protection of the gunner, who, by reason of his position, presents but a very small surface exposed to fire, this battery-gun may be provided with a shield or screen.

The recoil is counteracted by the shape of the trail and by the weight of the gunner sitting thereon.

The operation of this battery-gun is as follows: The power and motion required for operating the gun are furnished by the gunner,

who, by moving the bent lever to and fro with his right hand, causes a volley to be discharged at each double motion.

Fig. 1 shows the position of each of the different parts of the battery-gun relatively to the others at the moment when the first shot is discharged. The lever is then in the act of advancing, and on continuing its forward movement the remaining shots are successively discharged, the rapidity of the discharge depending on the movement of the lever. During the discharge the spreading apparatus acts so as to communicate to the projectiles a radial direction. The spreading-crank is compelled, by the tenon or pin on the lever, to turn from right to left. The slide, on the contrary, by reason of its fixed position, cannot by the connecting-rod be moved from its place; but the frame, with the parts attached to it, is moved; hence the barrels must partake of the motion, moving from left to right. By the time the whole of the barrels have been discharged the lever will have reached its most forward position, and when it is brought back again to that represented in Fig. 1, the gun is restored to its original position, and the firing mechanism is stationary. By continuing the retrograde movement of the lever the locking-bolts or stoppers are drawn in, and the gun-box, the breech-pins, and the extractors attached to it are brought backward, causing the exploded cartridge-cases to be extracted.

While the lever is drawn backward the carrier-block moves to the left, and the spent cases are set free from the extractors and fall down through the openings in the carrier-block. When the latter has accomplished its movement it is ready to receive the cartridges required for another volley. These cartridges fall from the chambers of the magazine through the orifices in the lid.

When the lever is in its most backward position all the projections of the percussion-hammers are then behind the teeth of the trigger-comb. If the lever be caused to advance, the carrier-block moves to the right in such a manner as to cause its chambers, supplied with fresh cartridges, to come immediately opposite to the breech ends of the barrels, and the gun-box moves forward, thereby compressing the mainspring, and loading the barrels, into which the cartridges are introduced by the action of the breech-pins. In the manner just described the gun is again made ready for firing, which operation may be commenced by the farther advancement of the lever, and brought about in the manner above described.

The peculiarities and advantages of this gun are as follows, videlicet:

The mechanism is simple, consisting of strong parts well protected. The movements are chiefly caused by levers communicating but little rapidity to the movable parts as distinguished from the revolving systems in general use. The mechanism consequently suffers but little from the action of dust or rain, and is not injured by the residuum of gunpowder; but

should any dirt accumulate the injurious effect will not be important, owing to the slow movements of the axis and pivots.

Every part is directly accessible for cleaning and lubrication, while the mechanism is, in consequence of its simple construction, easily managed, taken to pieces, and put together again.

The barrels, breech-pins, needles, extractors, and springs may all be exchanged for others without the necessity for taking the whole to pieces.

The barrels are independent of each other, so that should one or more of them get out of order the remaining ones may, without any interruption to the firing, be supplied. Moreover, being independent of the mechanism, they may easily be cleaned and exchanged for others.

The magazines are devoid of loose weights, springs, and weakening grooves; consequently they are strong and not liable to get out of order, and may, without inconvenience, be conveyed ready charged.

The system admits of the use of cartridges of different lengths, provided the magazine and carrier-block are made to correspond.

The feeding proceeds uninterruptedly without any other exchange by hand being requisite than the changing of the magazine for each two hundred and fiftieth shot or more. The cartridges, moreover, during the feeding process have more time to escape than in the revolving systems now in use, since more orifices are used, and the feeding apparatus is stationary during the introduction of the cartridges, which, on entering the barrels, are not pressed by others lying above them, and thus the otherwise common inconvenience of the suspending and squeezing of the cartridges is entirely removed.

The rarely-occurring change of magazines, which is easily effected, however, in a few seconds, renders the firing less dependent on an unpracticed and careless service.

The spent cartridge-cases are removed with certainty after each discharge; but even supposing that the cases from some reason or other should remain in one or more of the barrels, the firing of the other is not thereby hindered. Hanging fire when using ammunition of an inferior quality does not cause any inconvenience, as the breech-pins remain closed sufficiently long. The closeness of the breech-pins is complete, and the recoil is received by the heavy gun-box, thereby preventing its affecting the firing mechanism.

The firing mechanism may instantly be shut or locked, so as to prevent the percussion-hammers from acting, and the men may thus be exercised, although the cartridges may be loaded with ball, without any danger of their exploding, and without any useless compression of the springs.

The mainsprings are uniform, and but slightly compressed relatively to their length, thus tending to increase their durability.

Both the firing and the spreading of the projectiles is effected automatically, and either shot after shot may be fired, or volley on volley, and the spreading operation may be augmented or diminished at pleasure, or be effected by hand with the pointing-instrument. The vertical and horizontal aim with the pointing-instrument may be accomplished by the gunner by hand and during the firing.

Rapidity of the discharge, now amounting to ten shots a second, may on an average be reckoned at five hundred a minute, and can be increased to a greater extent than by any hitherto known system.

The loading can be done by hand should the magazine be wanting, and the rapidity of the discharge is even then equal to that of the French mitrailleuse.

The serving is effected by one man, whose sitting posture presents only a very small exposed surface, which may be still more diminished by employing a screen or shield.

The weight of the gun differs somewhat, according to the varying thickness of the material and the lengths of the barrels; but in any case the gun may be carried by the men alone, if necessary, over the roughest ground, and even on the field of battle.

Finally, the gun can be instantly dismounted by removing the carrier-block, which is easily accessible, and is necessary for the use of the gun, and cannot readily be replaced.

The gun may easily be lifted from its carriage by knocking out the wedge in front of the ball on the elevating-screw.

Having now described and particularly ascertained the nature of the said invention, and the manner in which the same is or may be used or carried into effect, I would observe in conclusion that what I consider to be novel and original, and therefore claim as the invention secured to me by the hereinbefore in part recited Letters Patent, is—

1. The combination of the parallel breech-loading barrels, firmly fixed in a cross-piece at

their rear ends, with the pivoted supporting-frame, the slotted driving-plate 20, the feeding-arm 36, the carrier-block, the spreading-crank 45, and the vibrating hand-lever, all arranged and operating substantially as described.

2. The combination of the vibrating hand-lever and the lever-arm 32, provided with tooth 34, with the bolt-plate and its bolts 22, and notch, whereby the gun-box is bolted firmly in place for firing, substantially as described.

3. The combination of the vibrating hand-lever and the lever-arm 32, having the trigger 29, with the trigger-comb, having teeth of different lengths, all beveled on the same side, and the firing-pins, whereby the successive firing of the barrels is effected, substantially as described.

4. The combination of the bent lever to be operated by the gunner, the grooved spreading-crank 45, the adjustable pivoted link 47, and the slide 48 with the supporting-frame, whereby the lateral oscillation of the barrels and the spreading of the projectiles during the period of the successive firing of the barrels is effected, substantially as described.

5. The combination of the trigger-comb with its arms and varying sized and inclined teeth, the spring, and short lever 27, which tend to carry the comb to the left, and the adjustable catch 31, which will hold the comb in its extreme limit of throw to the right, all constructed and operating together substantially as described.

6. The combination of the forked feeding-arm 36, the gun-box, provided with the downwardly-projecting lug 42, which engages with the forked feeding-arm, pushing it to one side, and the carrier-block attached to the forward end of the feeding-arm, the combination being and operating substantially as described.

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