

(No Model.)

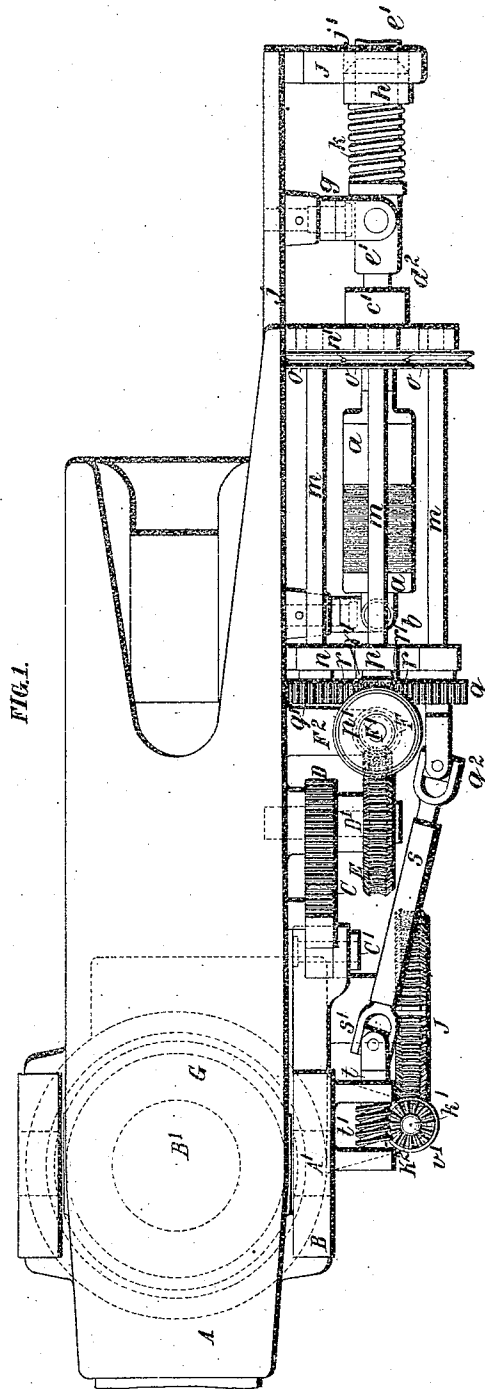
5 Sheets—Sheet 1.

H. S. MAXIM.

POWER MECHANISM FOR POINTING AND TRAINING GUNS.

No. 508,733.

Patented Nov. 14, 1893.



Witnesses:
Raphael Netter
Ernest H. Peterson

Inventor
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by Duncan Page
Attorneys

(No Model.)

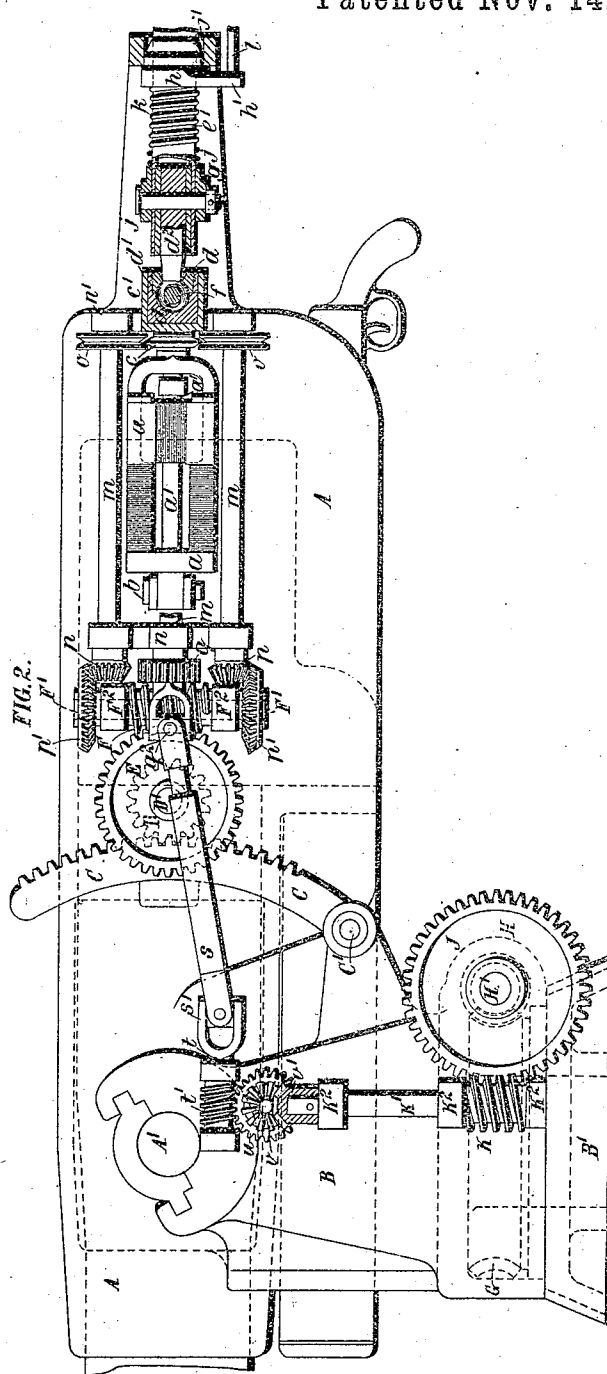
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No. 508,733.

Patented Nov. 14, 1893.



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No Model.)

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FIG. 3.

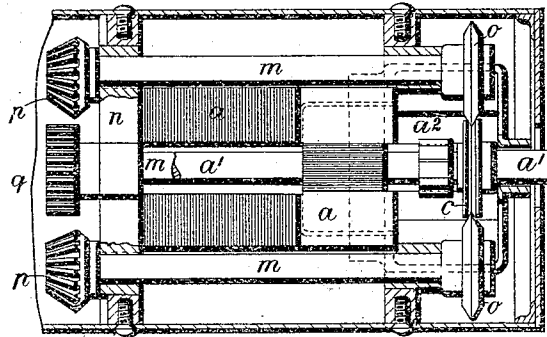


FIG. 4.

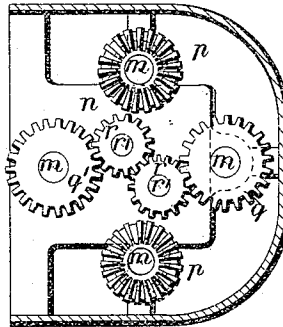
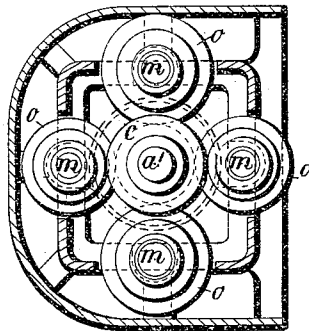


FIG. 5.



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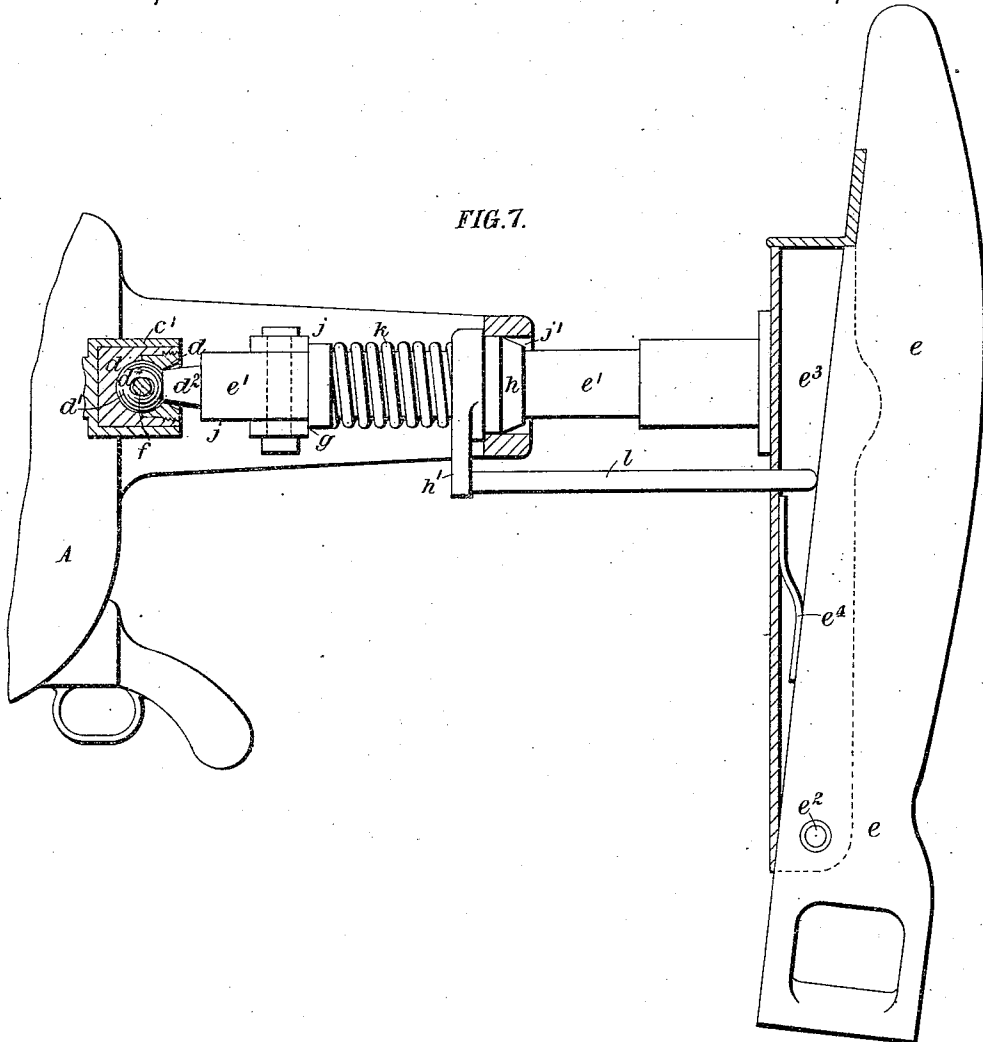
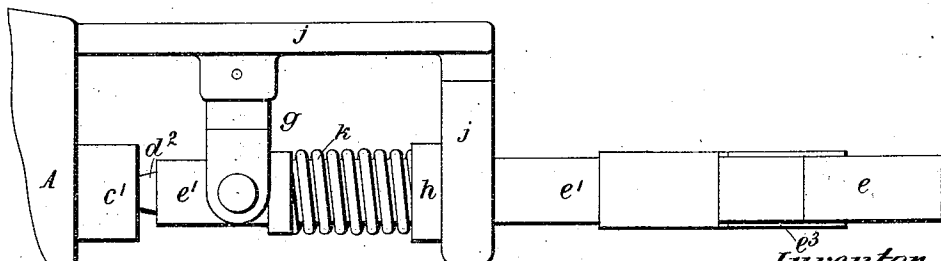


FIG. 6.



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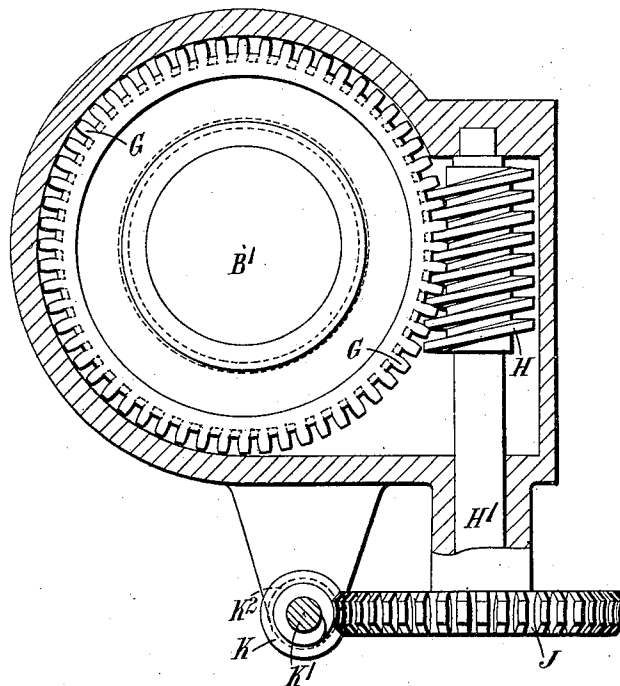
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Fig. 8.



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UNITED STATES PATENT OFFICE.

HIRAM S. MAXIM, OF LONDON, ENGLAND.

POWER MECHANISM FOR POINTING AND TRAINING GUNS.

SPECIFICATION forming part of Letter Patent No. 508,733, dated November 14, 1893.

Application filed February 20, 1891. Serial No. 382,139. (No model.)

To all whom it may concern:

Be it known that I, HIRAM STEVENS MAXIM, mechanical engineer, a citizen of the United States of America, and a resident of London, England, have invented certain new and useful Improvements Relating to the Pointing, Training, or Laying of Guns and to Apparatus Therefor, of which the following is a specification, reference being had to the accompanying drawings.

This invention is an improvement in mechanism for pointing, training and laying quick-firing guns, in which the movements of the gun are imparted by means of a motor of suitable construction controlled by a handle, crutch or other suitable device.

My improvements comprise apparatus constructed in such manner that when the movement of the crutch which directs or controls the movement of the gun is arrested, the disconnection of the motor from the elevating or training gear is effected automatically, so that it is only necessary to bring the gun into firing position without arresting or changing the movement of the motor. I prefer to provide suitable means for automatically effecting the return of the shoulder-piece or its equivalent to its central position when it is released.

My said invention, moreover, comprises other improvements hereinafter set forth.

I find it advantageous to construct my improved apparatus as follows, viz:—I provide a friction-wheel or driving-wheel which is rotated by the electric or other motor, and which is adjustable, by means of the said shoulder-piece or its equivalent, for the purpose of putting it into and out of gear with other friction-wheels above, below and at both sides of the aforesaid driving-wheel. These friction-wheels are fixed upon shafts mounted in suitable bearings which may or may not be movable with the gun. The shafts above and below the central or driving-wheel are connected, in any convenient manner, with the elevating-gear; while the shafts at the sides of the said central or driving wheel are connected, in any convenient manner with the training-gear. Therefore when the shoulder-piece or its equivalent is moved upward, the driving-wheel will be brought into frictional contact with one of the said friction

wheels so as to transmit motion from the motor through this wheel to the elevating-gear in the proper direction to depress the muzzle end of the gun; when moved downward, the said driving-wheel will come into contact with another of the said friction-wheels so that the motor will operate to elevate the gun. When the shoulder-piece or its equivalent is moved laterally in either direction, the motor will, through the corresponding friction-wheel, operate the training-gear to turn the gun in the same direction. Moreover by bringing the driving-wheel into contact with two of the said friction-wheels at the same time, the motor may be caused to operate the training-gear and the elevating gear simultaneously. While the driving-wheel is out of contact with the other wheels, the motor may, if desired, be kept rotating, so that it will be in readiness to operate the elevating-gear or the training-gear or both when required. In some cases, however, I provide suitable means whereby the starting and stopping of the motor may be very readily effected as required. For instance I provide for the starting and stopping of the said motor by the application of pressure to, and its removal from the said shoulder-piece or its equivalent.

In the accompanying drawings I have shown how my said invention may be conveniently and advantageously carried into practice.

Figure 1 is a plan, and Fig. 2 a side elevation, partly in vertical section, showing a quick-firing gun provided with apparatus constructed in accordance with my said invention. Fig. 3 is a side elevation, partly in vertical section, showing another form or modification of my improved apparatus. Fig. 4 is a front elevation, and Fig. 5 a rear elevation of part of the said apparatus. Fig. 6 is a plan, and Fig. 7 a side elevation, partly in vertical section, showing a convenient device for automatically effecting the return of the shoulder-piece or its equivalent to its central position, when it is released after being moved in either direction. Fig. 8 is an enlarged top plan view of parts of the training gear.

Like letters indicate corresponding parts throughout the drawings.

A is a frame or cradle in which the gun is arranged to recoil and which is supported by

means of trunnions A' in a suitable carriage or mounting B. This carriage or mounting, or the upper portion thereof, is arranged to turn about a vertical pivot B' for the purpose of training the gun.

The elevating-gear, in the gun shown in the drawings, comprises a curved toothed rack C pivoted at C' to the rotating part of the mounting B, and geared with a pinion D fixed on a shaft D' in which is also fixed a worm-wheel E. This worm-wheel is geared with a worm F formed or fixed on a shaft F' supported in suitable bearings F² secured to the gun.

The training-gear, in the gun shown in the drawings, comprises a worm-wheel G formed or fixed on the stationary part of the mounting B, and geared with a worm H formed or fixed on a shaft H', which is fitted in suitable bearings in the rotating part of the mounting B, and on which is also fixed a worm-wheel J. This worm-wheel J is geared with a worm K formed or fixed on a vertical shaft K', which is supported in suitable bearings K² secured to the rotating part of the mounting B.

a is a small electric motor which is attached at one end, by a universal joint b, to the side of the frame or cradle A. a' is the armature-spindle of the said motor, on one end of which is fixed a friction-wheel or driving-wheel c provided with a socket c'. Into this socket is fitted another socket d made in two parts which are hollowed out to receive and hold a ball d' formed on the end of a spindle d², which is fixed in the rod e' of the shoulder-piece e (Figs. 6 and 7). A ball-and-socket joint is thus formed between the armature-spindle a' and the said rod e'. The socket d is restrained from rotation with the armature-spindle c' by a pin f which is fitted in the said socket and extends through an oval or elongated hole in the ball, in which the said pin has a small amount of play. The rod e' of the shoulder-piece e is attached by a universal joint g to a bracket j which is formed or fixed on the frame or cradle A in which the gun recoils. The said shoulder-piece e is held in its central position and is automatically returned thereto (after being operated and released) by the following means viz:—A sleeve h is fitted on the rod e' so that it can slide to and fro thereon. This sleeve is tapering or conical at its forward end, and is adapted to enter a hole j' in the bracket j. The said sleeve h is acted upon by a spring k, which presses the said sleeve rearward and thus retains it in the said bracket, while permitting its disengagement therefrom as hereinafter described. The sleeve h is provided with an arm h' against which bears one end of a rod l, the other end of which bears against the shoulder-piece e as shown in Fig. 7. This shoulder-piece is pivoted at e² to a frame e³ fixed upon the rod e' and is acted upon by a spring e⁴ which tends to move it rearward about its pivot e². By pressing against the said shoulder piece and moving it forward about its pivot e², the

sleeve h may through the medium of the rod l be forced out of the hole in the bracket j; the shoulder-piece e and rod e' can then be turned through a small angle in any desired direction about the universal joint g, this movement being limited by the bracket j. By means of the said shoulder-piece, therefore, the motor a can be moved in any desired direction about its universal joint b for the purpose hereinafter specified.

m, m are spindles which are fitted to rotate in brackets n, n', attached to the side of the gun. On one end of each of these spindles is fixed a friction-wheel o. These friction-wheels are so arranged that, when the shoulder-piece e is in its normal or central position, the periphery of each of the said wheels is in the close proximity to, but not in contact with periphery of the driving-wheel, c. When the shoulder-piece is liberated by moving the sleeve h out of the bracket j as above described, the driving-wheel c can, by turning the motor about its universal joint b, be put into gear with either of the four friction-wheels o. The upper and lower spindles m are connected by bevel-wheels p, p' with the shaft F' on which is formed or fixed the worm F of the elevating-gear. The two other spindles m have fixed thereon small spur-wheels q, q', geared with each other through idle spur-wheels r situated between them and geared with them both. These wheels r are fitted to rotate upon pins or studs r' fixed in the bracket n. The spindle m on which the spur-wheel q is fixed is connected by a gimbal joint q² with a rod or shaft s. This rod or shaft is connected by a gimbal joint s' with a shaft t having formed or fixed thereon a worm t' which is geared with a worm-wheel u connected by bevel-wheels v, v' with the shaft K' of the training-gear. The rod or shaft s and gimbal joints q², s' serve for imparting rotary motion from the spur-wheel q or q' in one or the other direction to the shaft s, while permitting the turning of the gun about its trunnions for vertical pointing or elevation.

The operation of the apparatus above described is as follows, viz:—When it is desired to point or lay the gun, the motor a is first started; the gunner then, by pressing his shoulder against the shoulder-piece e, disengages the sleeve h from the bracket j; he then moves the said shoulder-piece e about the joint g in the direction in which he desires to move the gun, thus bringing the driving-wheel c into gear with one or other of the friction-wheels o or with two of the said friction-wheels as the case may be. Motion will then be imparted from the motor a through the said wheel or wheels o to the elevating-gear or to the training gear or to both the elevating and the training gear, so as to move the gun in the desired direction. The spring k constantly tends to force the taper or conical part of the sleeve h into the hole j' in the bracket j, and to thus automatically return the rod e' and shoulder-piece e to the central position. It is

evident, moreover, that, as soon as the gunner ceases to move the shoulder-piece in the same direction as the gun, the continued movement of the gun through a very small angle will automatically effect the disconnection of the elevating or training gear from the motor. Therefore, in order to elevate or train the gun through any desired angle the gunner must maintain the pressure against the shoulder-piece *e* so as to keep the said sleeve *h* out of the bracket *j*, and must also continue to move the shoulder-piece in the desired direction to keep the driving wheel *c* in contact with the wheel or wheels *o* until the gun has been moved through the required angle. When the shoulder-piece *e* is released, the sleeve *h* is forced by its spring *k* into the hole in the bracket *j*, thus effecting the return of the shoulder-piece to its central position. The motor *a* is so arranged that the driving-wheel *c* will always rotate in the same direction, as the movement of the said wheel does not require to be reversed. It is evident that the motor can, if desired, be kept rotating while the gun is in use, so that the said motor is in readiness to be put into gear with either of the wheels *o* when required. I find it advantageous, however, to provide for the starting and stopping of the motor by the application of pressure to, and its removal from the shoulder-piece *e* or its equivalent. For instance, in the case of an electric motor, I provide the said shoulder-piece with a suitable device for closing and interrupting the electric circuit in which the said motor is included; and I so arrange this device that, when the gunner presses against the shoulder-piece, the electric circuit will be closed or completed, but, immediately such pressure is removed, the said circuit will be broken or interrupted. When a handle or other suitable device is used instead of the said shoulder-piece, I provide means whereby the motor will be started when the said handle or other device is grasped by the hand and will be stopped when the said handle or other device is released.

In the modification of my apparatus shown in Figs. 3, 4 and 5, the motor *a* is rigidly attached to the side of the gun and the four spindles *m* are fitted to rotate in bearings firmly attached to the frame of the said motor. The armature-spindle *a'* is provided with a suitable joint at *a''* which permits a slight lateral motion of the friction wheel or driving-wheel *c* either up or down or to the left hand or right hand side, sufficient to allow of its being put in gear with the friction-wheels *o*; in other respects the construction and operation of the said apparatus are similar to those of the apparatus hereinbefore described.

The apparatus may, if desired, be inclosed in a suitable box or case as shown.

When the apparatus is designed for the pointing or laying of heavy guns, it is not necessary that the shoulder-piece or its equivalent

should move with or be attached to the gun; it is sufficient that a shoulder-piece, a lever, a shaft or other convenient device be provided, whereby the driving wheel or pulley can be put into gear with one or more wheels or pulleys connected with the training-gear or with the elevating-gear for the purposes above specified. This shoulder-piece, lever or shaft may, if desired, be mounted on the rotating platform or turntable or other suitable part of a gun-mounting. For instance, an electric motor may be attached to the rotating platform or other suitable part of a gun-mounting by a universal joint and provided with a shoulder-piece or its equivalent for adjusting it for the purpose above specified.

I do not confine myself to any special construction or arrangement of the details of my improved apparatus, as it is obvious that such construction or arrangement can be modified in various ways without departing from the nature of my said invention. For instance, any other suitable motor may be employed and any other suitable description of gearing may be used for transmitting motion from the motor to the gun or to its mounting for the purpose of elevating or training the gun. The shoulder-piece *e*, instead of being pivoted to the frame *e''*, may be arranged to slide in the said frame toward and away from its rod *e'* for the purposes above specified.

Any other convenient device may be employed for retaining the shoulder-piece or its equivalent in, and returning it to its central position; and any other suitable device may be provided for starting and stopping the motor either by the application of pressure to, and its removal from the shoulder-piece or its equivalent, or in any other convenient manner.

My improved apparatus can, if desired, be used for operating only the elevating-gear, or only the training-gear, or it can be arranged to operate both sets of gearing as above described.

What I claim is—

1. The combination, with a gun barrel and its frame mounted upon a fixed support and capable of angular movement with respect thereto in a horizontal and vertical direction, a motor carried by the gun frame, elevating and training gears between the fixed support and the motor, a shoulder piece or controlling crutch, having a limited range of movement independently of the frame and adapted by such movement to bring into gear or engagement the motor and either or both of the elevating and training gears, and a spring acting on said controlling device with a tendency to throw it in position to effect the disengagement of the motor, as set forth.

2. The combination with a gun barrel and a frame or cradle pivotally mounted in a fixed support, elevating and training gears between the frame and the fixed support, and a motor

mounted on the said frame for operating said gears, a frictional connecting gear between the motor and the respective gears, a shoulder piece or controlling crutch pivotally connected with the frame and operatively connected with the frictional gear whereby its movement in a given direction will bring into engagement the motor and the gear or gears that will move the gun in the same direction, as set forth.

3. The combination, with a gun barrel, its frame or cradle, a fixed support upon which the frame is pivotally mounted, gearings for elevating and training the gun and a motor carried by the frame for operating the gears and provided with a driving wheel adapted to be moved into engagement with the respective gears, of a shoulder-piece adjustable about a universal joint for controlling the movement of the driving-wheel into or out of engagement with the respective gears and means for automatically returning said shoulder-piece to its normal position when released from the control of the gunner, as set forth.

4. The combination, with a gun barrel and frame, a fixed support on which the same is pivotally mounted, and elevating gears and training gears between the support and the gun barrel or its frame, of a motor attached to the gun by a universal joint and means for moving said motor about its point of support and into and out of engagement with the respective gears, as herein set forth.

5. The combination, with a vertically and horizontally movable gun barrel and a fixed support therefor, of a system of gearing between the support and the barrel for elevat-

ing and a similar system for training said barrel, each system of gears terminating in a friction-wheel, of a motor attached to or moving with the barrel and provided with a friction driving-wheel movable into or out of engagement with the friction-wheels of the respective systems of gears, and a shoulder-piece or controlling device adapted to move said driving-wheel into or out of such engagement, as herein set forth.

6. The combination, with the elevating and training gears of a gun, of a motor attached to the gun and movable into or out of engagement with the respective gears and a shoulder-piece attached to and arranged to control or direct the movement of the motor, by which it is brought into or out of engagement with said gears, as herein described.

7. The combination, with the elevating and training gears of a gun, of a motor attached to the gun and normally out of engagement with said gears, but capable of being moved into or out of engagement therewith, a shoulder-piece adapted to be moved by the gunner and connected with the motor whereby the latter may be thrown into engagement with one or both of the gears and an automatic mechanism for restoring the shoulder-piece and motor to their normal positions when freed from control of the gunner, as set forth.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HIRAM S. MAXIM.

Witnesses:

DAVID YOUNG,
A. G. WEAVER.