No. 691,254. Patented Jan. 14, 1902.

T. M. FOOTE.

MEANS FOR POSITIONING AND FIRING HEAVY ORDNANCE.

(Application filed Jan. 12, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1

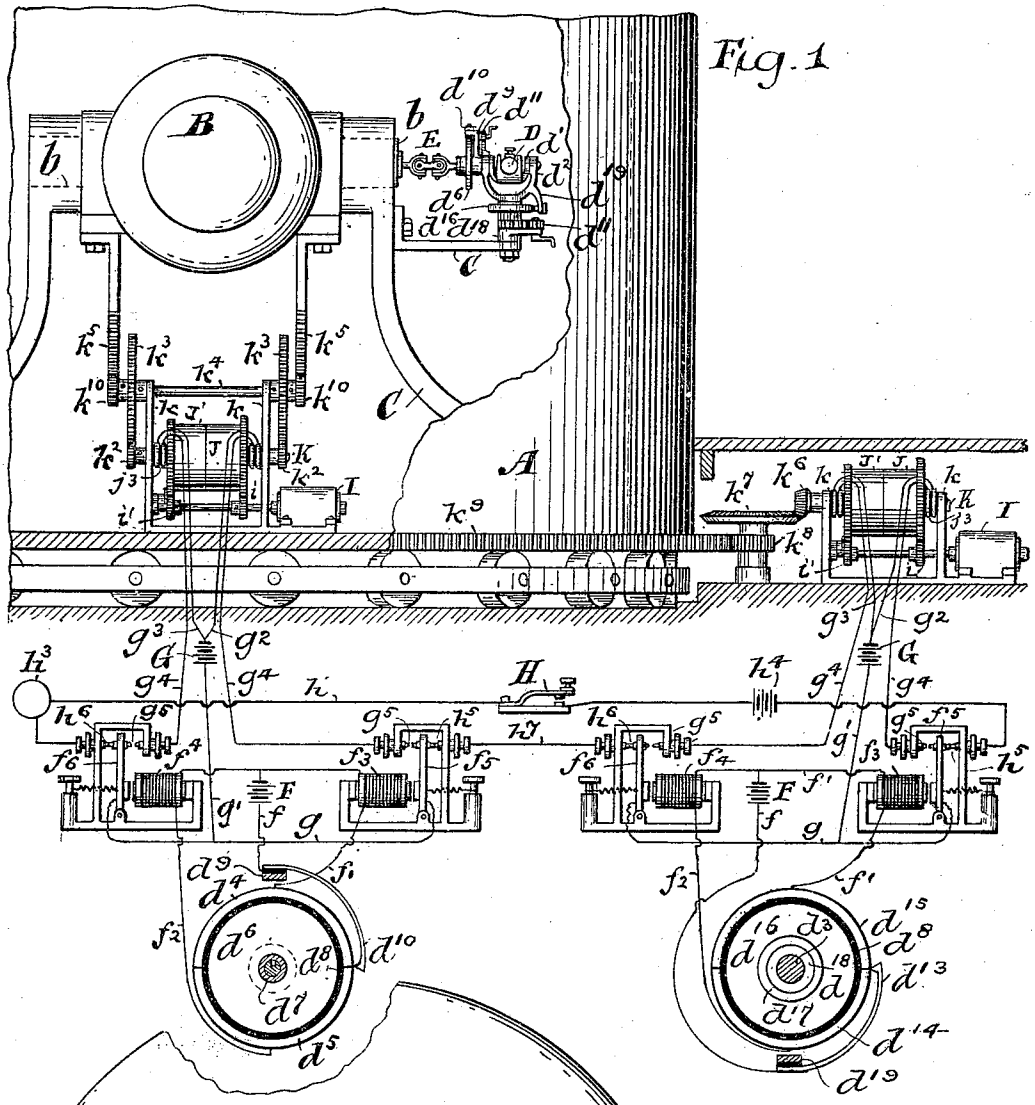


Fig. 2

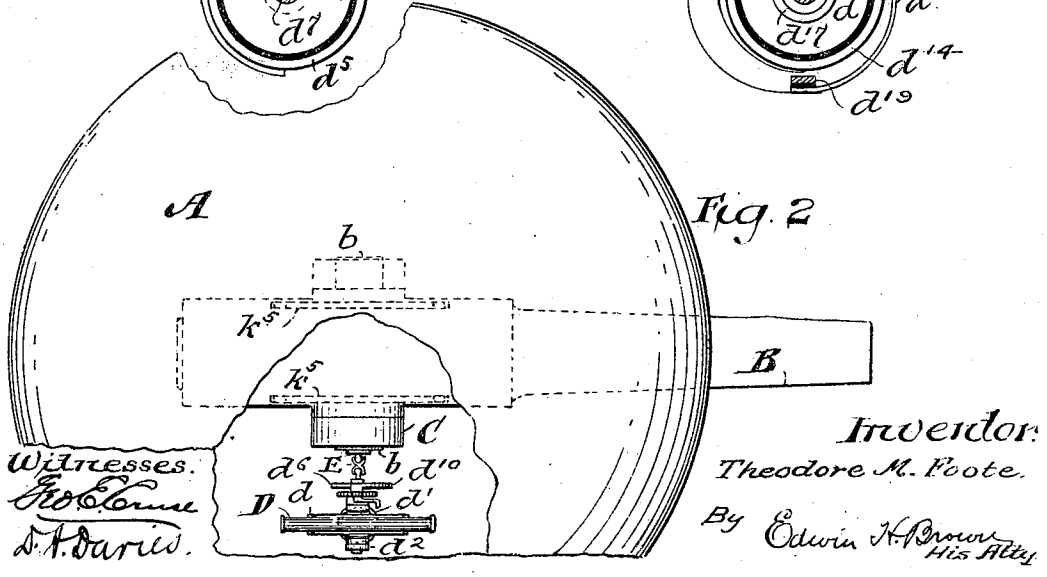


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Fig. 5

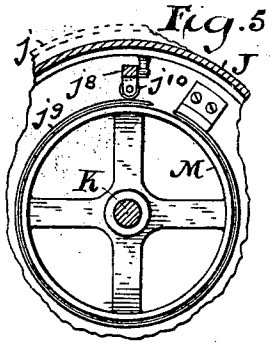


Fig. 3




Fig. 6

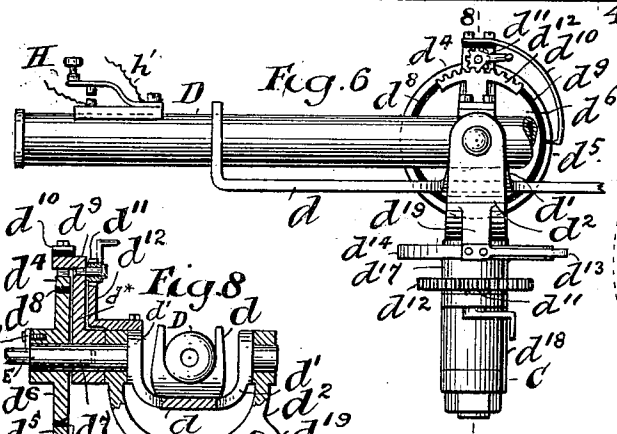


Fig. 4

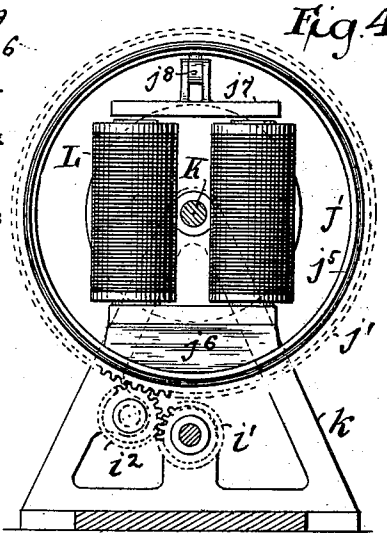


Fig. 8

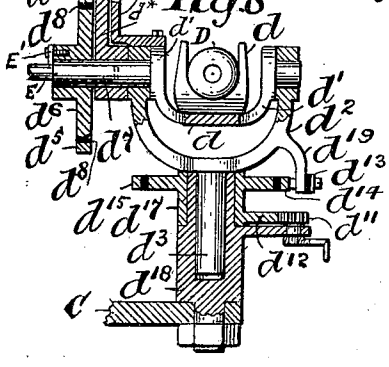


Fig. 7

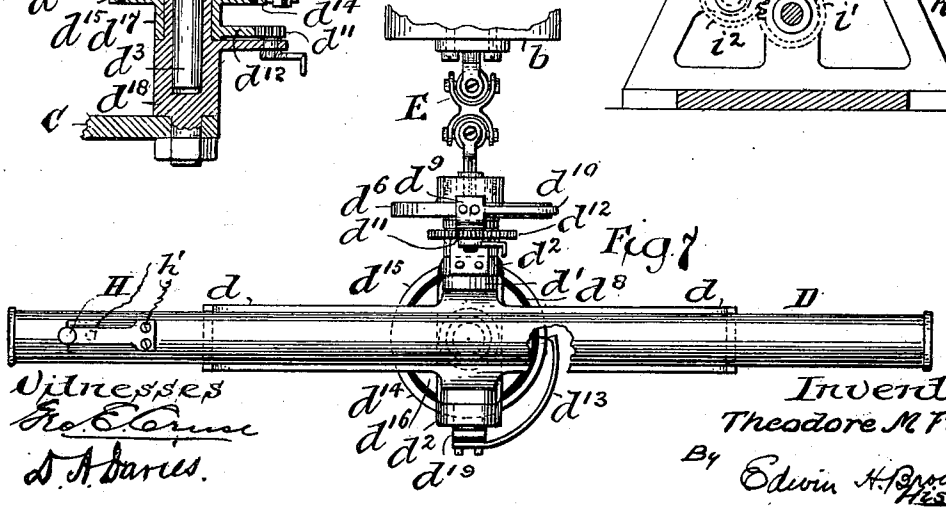


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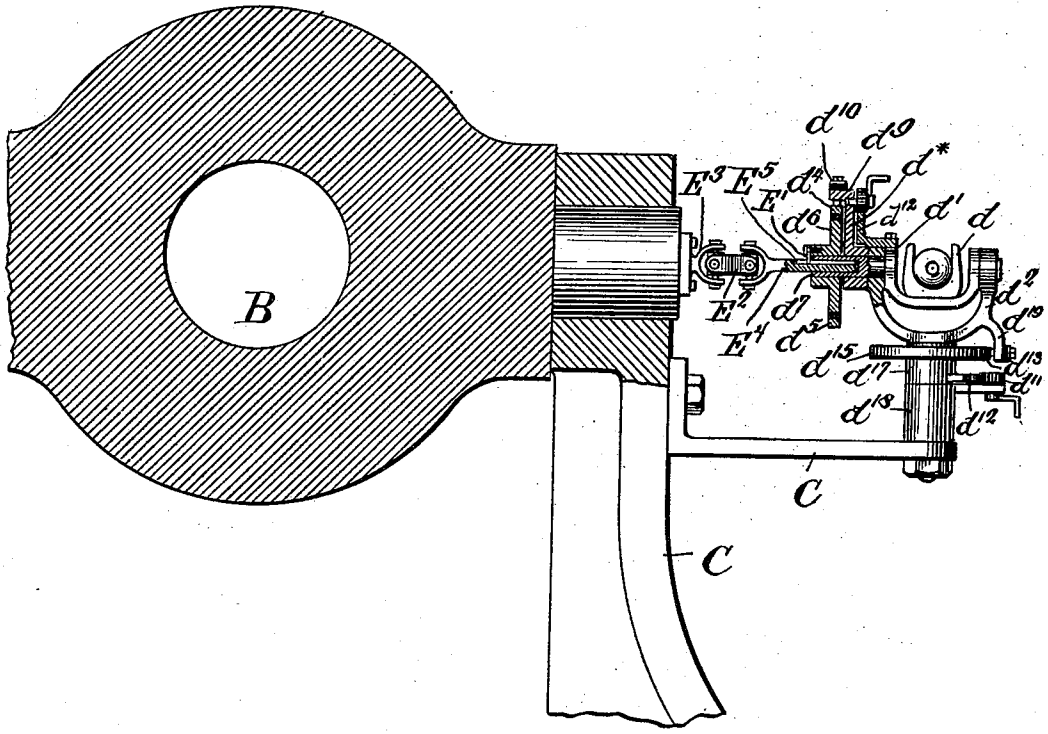
Fig. 9.

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# UNITED STATES PATENT OFFICE.

THEODORE MARSHALL FOOTE, OF BROOKLYN, NEW YORK, ASSIGNOR TO EDWIN H. BROWN, OF BOROUGH OF MANHATTAN, NEW YORK, N. Y.

## MEANS FOR POSITIONING AND FIRING HEAVY ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 691,254, dated January 14, 1902.

Application filed January 12, 1899. Serial No. 701,898. (No model.)

*To all whom it may concern:*

Be it known that I, THEODORE MARSHALL FOOTE, a citizen of the United States of America, residing in the borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Means for Positioning and Firing Heavy Ordnance, of which the following is a specification.

My invention relates to means for positioning ordnance preparatory to its being fired and also to means for firing the ordnance-piece. The firing of the ordnance-piece may be accomplished immediately after its being positioned.

I will describe an arrangement of mechanism embodying my invention and then point out the novel features in the claims.

In the accompanying drawings, Figure 1 is a view, partly in elevation and partly in section, of the mechanism for positioning and firing an ordnance-piece embodying my invention and showing in diagram electric circuits which control such mechanism. Fig. 2 is a top view, partly broken away, of a portion of Fig. 1. Fig. 3 is a vertical longitudinal view of a clutch device used in the mechanism shown in Figs. 1 and 2. Fig. 4 is a transverse sectional view taken on the line 4 4 of Fig. 3. Fig. 5 is a transverse sectional view taken on the line 5 5 of Fig. 3. Fig. 6 is a detail elevational view of a portion of a sighting means and adjacent parts. Fig. 7 is a top view of Fig. 6, showing the full sighting means and showing a portion of an ordnance-piece trunnion and its connection to the sighting means. Fig. 8 is a transverse sectional view taken on the line 8 8 of Fig. 6. Fig. 9 is a detail vertical sectional view showing, on an enlarged scale, the connection between the trunnion of the ordnance-piece and the sighting means.

Similar letters of reference designate corresponding parts in all the figures of the drawings.

A represents a turret; B, an ordnance-piece, heavy gun, or cannon that is mounted by its journals *b* in the carriage C. The carriage is here shown as being located within the turret. The ordnance-piece is adapted to be moved in two directions, both vertically and laterally, the movement in a lateral direction in this instance being accomplished by revolving the turret. If desired, however, the carriage C may be swung or revolved so as to move the ordnance-piece in the opposite lateral directions. The vertical and lateral movements may be made either separately or simultaneously. Should the ordnance-piece be moved vertically and laterally simultaneously, the direction of movement of the ordnance-piece would be oblique to the vertical and horizontal planes of movement of the ordnance-piece.

D represents a sighting means, in this instance shown as a telescope, which is so mounted that it can be adjusted vertically and laterally or in directions oblique to either its vertical or lateral planes of adjustment, and it is by the adjustment of the sighting means that a mechanism or mechanisms are set in operation to position the ordnance-piece for firing. The telescope may be mounted in the following manner to have vertical, lateral, and oblique adjustments: The telescope is rigidly held in the cradle $d$, that is carried by a bail $d'$. The bail $d'$ is pivotally mounted in a second bail $d^2$, and the bail $d^2$ is provided with a projection $d^3$, fitting within the sleeve or socket formed in the standard $d^{18}$. The standard may be secured to any desired support—as, for instance, the carriage C.

The mechanism employed for moving the ordnance-piece in either a vertical or a lateral direction or both directions is preferably electrically controlled. As the telescope is adjusted in any direction it causes a controller or controllers to open or close a circuit or circuits of a device or devices which control the operation of the positioning mechanism. The form of controller preferably employed in the vertical adjustment consists of a metallic ring in two sections $d^4 d^5$, which sections are carried by a disk $d^6$ and a contact-finger $d^{10}$. Insulation is placed between the two ring-sections and the disk $d^6$, and insulation $d^8$ is placed between the adjacent ends of the two ring-sections. The disk $d^6$ is so mounted on an extended trunnion $d^7$ of the bail $d'$ as to be rotated thereon, but prevented from having any sidewise or lateral movement on the trunnion $d^7$. The disk $d^6$ is operatively

connected with the trunnion of the gun in a manner to be hereinafter explained. A projection $d^9$, integral with an arm $d^*$, that is loose on the trunnion $d^7$, carries the contact-finger $d^{10}$. The end of the contact-finger $d^{10}$ is adapted to rest normally over the insulation $d^8$ between the ends of the ring-sections, so that the circuit of which the contact-finger forms a part will be open, and it is adapted when the telescope is adjusted vertically to travel over one or the other of the ring-sections, and thus close the circuit which controls the mechanism for moving the ordnance-piece vertically. As this mechanism is operated the trunnion of the ordnance-piece turns, and through the medium of a connection between it and the disk $d^6$ the disk $d^6$ is made to turn with it until the insulation $d^8$ again comes under the end of the contact-finger $d^{10}$, when the circuit will become broken and the mechanism of that circuit stop from operating. The connection between the trunnion of the gun and the disk $d^6$ (designated by the letter E) comprises a universal joint $E^2$ and a telescoping portion. (See Fig. 9.) The part $E^3$ of the connection on one side of the universal joint is fixed to the trunnion of the gun, while a part $E^4$ on the other side of the universal joint is adapted to slide in and out of the extended trunnion $d^7$. The extended trunnion $d^7$ and the part $e^4$ are here shown as constituting the telescoping portion of the connection E. The part $E^4$ is provided with a longitudinal groove $E^5$, in which a pin or key E′ extends. The pin or key E′ is fast to the disk $d^6$.

It will be seen that the controller hereinbefore described constitutes a make-and-break or other device, which when it is actuated by the telescope will cause the mechanism to operate to position the ordnance-piece for firing and also will act to cause the mechanism to cease operating when the ordnance-piece is moved to a position parallel or approximately parallel with the telescope. In this manner the telescope may be fixed on an object and held fixed while the mechanism is operating to move the ordnance-piece to be pointed at the same object, and when the gun is pointed at the object the mechanism will cease operating. It will be seen also that the slightest movement of the telescope actuates the controller, and the slightest actuation of the controller causes the mechanism to operate or further move the gun. In this manner the ordnance-piece is accurately pointed at the object. The vertical adjustment of the telescope does not, however, always give the exact firing elevation of the ordnance-piece—as, for example, when a projectile or shot is to be thrown a long distance. The ordnance-piece in such case should not be in parallelism with the telescope; but it should be inclined above the longitudinal plane of the telescope when it is sighted upon an object to be fired at. The correct firing elevation is preferably accomplished by means of a pinion $d^{11}$, journaled in the arm $d^*$ and engaging with the disk or segment of a disk $d^{12}$, that is calibrated according to the elevation desired for the ordnance-piece to send a projectile an ascertained distance. The disk or segment of a disk $d^{12}$ is fastened or connected in any desired manner to the cradle $d$, and when the telescope is adjusted vertically the disk or segment of disk $d^{12}$ will move with it. The pinion $d^{11}$ and the teeth on the part $d^{12}$ serve as a connection between the part $d^{12}$ and the arm $d^*$, thus enabling the telescope to move the arm $d^*$ with it. The arm $d^*$, however, can be moved independently of the telescope, owing to its being loose on the trunnion $d^7$. When the distance of the object to be fired at is ascertained, the pinion is made to travel over the calibrated disk until it reaches the point on the scale of the disk indicating the ascertained distance. The part $d^{11}$ traveling over the part $d^{12}$ carries with it the arm $d^*$ and contact-finger $d^{10}$, which is then moved over one or the other of the ring-sections. The circuit will then be closed and the mechanism for moving the gun vertically permitted to operate. As the ordnance-piece moves, its trunnion, through the connection E, turns the disk $d^6$ to move the insulation between the ring-sections under the end of the contact-finger to break or open the circuit, as hereinbefore described. The mechanism then stops operating and the ordnance-piece is held in its position. The telescope is then adjusted vertically (should it be necessary) to be fixed on the object, and as the telescope is moved the contact-finger is again moved onto either of the ring-sections to again close the circuit and permit the mechanism to work, thus accurately putting the ordnance-piece in position with regard to its elevation. The universal joint $E^2$ in the connection E permits of the disk $d^6$ being operated in the vertical adjustment of the ordnance-piece should the telescope be adjusted laterally to move the ordnance-piece in range in that direction before its vertical adjustment, and vice versa. The same form of controller is presumably used in connection with the mechanism for moving the ordnance-piece in a lateral direction. The contact-finger $d^{13}$ of the controller is carried by a projection $d^{19}$ on the bail $d^2$, so that as the telescope is adjusted laterally it will travel over either of the ring-sections $d^{14}$ $d^{15}$, and thus close the circuit of the device that effects the operation of the mechanism for moving the ordnance-piece laterally. The ring-sections of the controller are secured to a disk $d^{16}$, carried by a sleeve $d^{17}$, surrounding the standard $d^{18}$. When the contact-finger is moved over either section of the ring, the circuit of the device effecting the mechanism for moving the ordnance-piece laterally is closed, thus permitting the operation of this mechanism. In this instance the carriage is fixed to the turret, which is made to revolve. As the carriage is revolved with the turret and

the telescope held fixed upon the object, the disk will travel under the end of the contact-finger until the insulation between the ring-sections comes under its end. When this occurs, the circuit will be broken, thus controlling the device to effect the stoppage of the mechanism. The ordnance-piece will then be parallel to the telescope. A calibrated disk and pinion, as described in connection with the disk $d^6$, will also be provided in connection with the disk $d^{16}$. The calibrated disk in this instance is used to compensate for the speed of the object to be fired at, as well as the support carrying the ordnance-piece, should it have any speed, and also for windage.

The devices for controlling the operation of the mechanisms for moving the ordnance-piece vertically and laterally are electrically controlled. Each device preferably comprises two electrically-controlled clutches J J', and each clutch comprises a revolving gear, a casing carrying the operating-magnets loosely mounted on a power-shaft K, and a friction-pulley keyed on said shaft. The magnets of each clutch are preferably included in separate circuits, which circuits are opened and closed by one of the controllers when actuated by the adjustment of the telescope. The circuits of both electrical devices are preferably the same, so that a description of the circuit—as, for instance, the circuit of the electrical device controlling the mechanism for moving the ordnance-piece vertically—will apply to the circuits of the electrical device controlling the mechanism for moving the ordnance-piece laterally. The circuit or circuits of the electrical device controlling the mechanism for moving the ordnance-piece vertically may be as follows: A wire $f$, leading from one pole of a battery F, is connected with the contact-finger $d^{10}$, while the other pole of the battery is connected by wires $f'$ $f^2$ with the ring-sections $d^4$ $d^5$ on the disk $d^6$. Electromagnets $f^3$ $f^4$ are included in the connections $f'$ $f^2$, so that when the contact-finger $d^{10}$ is moved onto either of the ring-sections $d^4$ $d^5$ either magnet will be energized, according to which ring-section the finger $d^{10}$ rests upon. Movable arms $f^5$ $f^6$, which serve as armatures for these magnets, form part of two other circuits which are opened or closed by their armatures, according to which magnet $f^3$ $f^4$ is energized. The magnet in the circuit of each part of each controller and its movable armature serves as a make-and-break. I wish it understood that any other form of make-and-break that will serve the same purpose may be employed. It will also be seen that the make-and-break constitutes means which when operated will control the mechanism for positioning the ordnance-piece for firing. One part of the make-and-break may be operated by the telescope and the other part by the ordnance-piece. The armatures $f^5$ $f^6$ are connected by a wire $g$ or other conductor, and this wire is connected by a wire or conductor $g'$ with one pole of a battery G. The other pole of the battery G is connected to the wire $g^2$ near one terminal of the wiring of the magnets of one of the electrical clutches, while a wire $g^3$ connects the same pole with one terminal of the wiring of the magnets of the other electrical clutch. A wire $g^4$ is connected with the other terminal of the electromagnets of the clutch with which the wire $g^2$ is connected and with the contact-point $g^5$, with which the armature $f^5$ engages when attracted by its electromagnet $f^3$. The same wiring and arrangement are provided for the other magnets of the clutch. It will be seen, therefore, that either of the electrical clutches will be operated according to whether the contact-finger $d^{10}$ is on the ring-section $d^4$ or $d^5$. The same arrangement of circuits is provided in connection with the controller of the electrical device controlling the mechanism for moving the ordnance-piece laterally, and the same form of electric clutch is used. In Fig. 1 I have shown the two circuits connected by means of a wire or other connection $h^7$, extending between two contact-points $h^5$ $h^6$, that are included in the separate circuits. This wire forms part of the firing-circuit $h'$. The firing-key H is preferably located on the telescope, so that when the ordnance-piece has been properly positioned it can be fired from the telescope. The firing-circuit includes a firing device $h^3$ on the ordnance-piece, a battery $h^4$, and two contact-points $h^5$ $h^6$, which are also included in the circuits of the two controllers actuated by the telescope. It will be seen that to have the firing-circuit complete the armatures $f^5$ and $f^6$ in each of the circuits will have to be in engagement with the contact-points $h^5$ and $h^6$ in the two circuits. These armatures are only in this position when the contact-finger of each controller is on the insulation between the ring-sections. As the telescope will always be fixed on the object should it be moved either vertically or laterally, either armature $f^5$ or $f^6$ in either circuit will be attracted to its magnet and the firing-circuit broken. It will thus be seen that the ordnance-piece cannot be fired until it is ranged directly on the object.

The clutches J J' are geared to a dynamo or other motor I, which when the ordnance-piece is being used is operated continuously. The driving-shaft of the dynamo-motor carries two pinions $i$ $i'$, and the gear $j$ of the clutch J is in direct engagement with the pinion $i$, while a gear $j'$ of the clutch J' is in engagement through the pinion $i'$ through the medium of the intermediate gear $i^2$. With this arrangement the gears $j$ $j'$ of the two clutches will be revolved in opposite directions. The gears $j$ $j'$ are loosely mounted on the shaft K, which is journaled in standards $k$. Each gear $j$ $j'$ carries a cylindrical casing $j^5$, which casings are so arranged at their meeting edges as to afford a bearing for each other. In each casing a support $j^6$ is pro-

vided for the electromagnets L, contained therein. The armature $j^7$ for the magnets in each part of the clutch is pivotally hung from one end of a link $j^8$, which is hinged at its other end to the gear. It will be seen, therefore, that as the gears $j$ and $j'$ are rotated the magnets, with their armatures, are carried with them. A band $g^9$, carried by each gear $j$ $j'$, surrounds a friction-pulley M in each part of the clutch, and each band is made to embrace the pulley it surrounds by the armature of the magnets in that part. The roller or other device $j^{10}$, carried by the links $j^8$, may be used to force the band against the pulley. When, therefore, the armature of the magnets in either part is attracted, the pulley M in that part will turn with the gear. The pulleys M are fast on the shaft K, so that as either pulley M is turned the shaft will be turned. On the collar of each gear $j$ $j'$ is fixed a sleeve of insulation $j^2$, and fixed on these sleeves are two rings $j^3$. The terminals of the electromagnets L, comprised in each clutch, are connected with these rings. Contact-fingers $j^4$, carried on a projecting part of each standard $k$, engage with these rings, and it is with these fingers that the wires $g^2$ $g^4$ of each circuit are connected. A spring $j^{11}$ holds the links $j^8$ normally against stops $j^{12}$. (See Fig. 3.)

The ends of the shaft K of the electrical device which controls the mechanism for moving the ordnance-piece vertically are provided with pinions $k^2$, which mesh with gears $k^3$, carried by a shaft $k^4$. This shaft is journaled in the standards $k$, which may be extended for this purpose. Pinions $k^{10}$ engage with the racks $k^5$, that are affixed to the gun. The shaft of the electrical device which controls the means for moving the ordnance-piece laterally is provided with a beveled pinion $k^6$ on one of its ends, which is in engagement with a bevel-gear $k^7$. The bevel-gear $k^7$ is provided with a pinion $k^8$, engaging with teeth $k^9$, provided on the turret. If desired, the mechanism for moving the ordnance-piece may be connected directly with it.

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

1. The combination of an ordnance-piece, an adjustable sighting means, a controller having one part connected and movable with the sighting means, and one part connected and movable with the ordnance-piece, said controller being adapted to positively open and close a circuit or circuits, a motor, electric devices for controlling the movement of the ordnance-piece, and a circuit or circuits for said electric devices in which the controller is included, whereby the adjustment of the sighting means actuates the controller and causes the operation of the electric devices to move the ordnance-piece to a firing position, such movement of the ordnance-piece continuing until the ordnance-piece has reached a firing position in case the sighting means shall have reached the object before the ordnance-piece.

2. The combination of an ordnance-piece, an adjustable sighting means, a controller having one part connected and movable with the sighting means, and one part connected and movable with the ordnance-piece, said controller being adapted to positively open and close a circuit or circuits, a motor, electric devices for controlling the movement of the ordnance-piece, a circuit or circuits for said electric devices in which the controller is included, a magnet included in said circuit or circuits, having a movable armature, and a firing-circuit in which said movable armature is included.

3. The combination of an ordnance-piece, an adjustable sighting means, a controller for positively opening and closing a circuit or circuits, said controller having a part connected and movable with the sighting means and a part connected and movable with the gun, and said last connection comprising telescopic portions and a universal joint, a motor, electric devices for controlling the movement of the ordnance-piece, and a circuit or circuits for said electric devices in which the controller is included, whereby the adjustment of the sighting means actuates the controller and causes the operation of the electric devices to move the ordnance-piece to a firing position, such movement of the ordnance-piece continuing until the ordnance-piece has reached a firing position in case the sighting means shall have reached the object before the ordnance-piece.

4. The combination with an ordnance-piece, mechanism and a motor for effecting its movement vertically, mechanism and a motor operating it for effecting its movement laterally, an electric device for controlling each mechanism, a governing-circuit for each of said devices, a two-part controller provided in each of said governing-circuits for positively opening and closing said circuits, one part of each controller being adapted to be moved with the ordnance-piece, and a telescope adapted to be adjusted vertically and laterally and to have the other part of each controller moved with it, substantially as described.

5. The combination with an ordnance-piece, mechanism and a motor for effecting its movement to position it for firing, an electric device for controlling said mechanism, a circuit for said electric device, a two-part controller in said circuit for positively opening and closing it, one part of which is connected with the ordnance-piece so as to move in unison with it, and the other part of which is connected to a telescope so as to move in unison with it, an adjustable telescope, and means in connection with said controller for moving one part relatively to the other, substantially as described.

6. The combination with an ordnance-piece, mechanism and a motor for effecting its

movement to position it for firing, an electric device for controlling said mechanism, a circuit for said electric device, which, when closed, permits the device to operate, and when open stops the same; a two-part controller in said circuit adapted to keep the circuit open when the parts thereof are in one position, one of said parts being connected with the ordnance-piece so as to move in unison with it, and the other part being connected with the telescope so as to move in unison with it, and a telescope, the adjustment of which causes the controller to be actuated to close the circuit, which circuit will remain closed until the part moving with the gun reaches a position relatively to the other part of the controller to have the circuit open, substantially as described.

7. The combination with an ordnance-piece, mechanism and a motor for effecting its movement to position it for firing, an electric device for controlling said mechanism, a circuit for said device, which, when closed, permits said device to operate, a controller in said circuit comprising two movable parts, insulation carried by one of said parts, against which the other part normally bears to have the circuit open, a connection between one of said parts and the ordnance-piece, and a connection between the other part and a telescope, and an adjustable telescope, the movement of which causes the part connected therewith to move to close the circuit and permit the electric device to effect the operation of the mechanism, whereby the part moving with the ordnance-piece will cause the insulation to come under the other part to again open the circuit, substantially as described.

8. The combination with an ordnance-piece, means in connection therewith for moving it into a firing position, an electrically-controlled device connected with said means for controlling the operation thereof, said device comprising two clutches, and each clutch comprising a part which carries operating-magnets and is loosely mounted on a power-shaft, a friction-pulley keyed to the power-shaft, and a friction-band for operatively connecting the loose part with the friction-pulley.

9. The combination with an ordnance-piece, means in connection therewith to move it into a firing position, an electrically-controlled device connected with said means for controlling the operation thereof, said device comprising two clutches, each of which comprises a loosely-mounted revolving part carrying electromagnets, a pulley adjacent to each part that is fast on a shaft, a band carried by each revolving part, loosely surrounding the pulley and adapted to be tightened when the magnets are energized, a circuit for said electromagnets, and means for opening and closing said circuit, substantially as described.

10. The combination with an ordnance-piece, a motor, mechanism operated by said motor for moving the ordnance-piece, an electric device connected with said mechanism for controlling the operation thereof in either of two opposite directions, a circuit and source of power for said electric device, a make-and-break device movable with the ordnance-piece and a telescope, and the adjustable telescope, whereby its adjustment will close the circuit and cause the mechanism to move the ordnance-piece to a firing position.

11. The combination with an ordnance-piece, mechanism and a motor for effecting its movement vertically, mechanism and a motor for effecting its movement laterally, an electric device for controlling each of said mechanisms, a governing-circuit for each of said devices, which, when closed, permits its device to operate, a controller having a plurality of parts for each of said circuits, each of said controllers having a part connected with the ordnance-piece so as to move in unison with it, and another part connected with a telescope so as to move with it, and an adjustable telescope, substantially as described.

12. The combination with an ordnance-piece, means in connection therewith for positioning it, an electric device having two reversely-revolving parts and two normally stationary parts comprised in said means, an electric circuit including magnets for operatively connecting each revolving part to a corresponding stationary part, a controller for each of said circuits, each of said controllers comprising a disk carrying insulation, and a contact-finger which rests normally on said insulation, and means for moving said contact-finger on either side of the insulation.

13. The combination with an ordnance-piece, means for positioning said ordnance-piece for firing, an electric device having two reversely-revolving parts and two normally stationary parts for controlling said means, an electric circuit for operatively connecting each revolving part to its corresponding stationary part, a controller in said circuit, said controller comprising two parts, one of which is a disk carrying insulation, and connected with the ordnance-piece to move in unison therewith, and the other of which is a contact-finger which rests normally on the insulation carried by the disk, and means for moving said contact-finger onto either side of the insulation according to which revolving part is to operate the positioning means.

14. In combination with an ordnance-piece, means in connection therewith for positioning it for firing, an electric device comprising two clutch parts for controlling said means, an electric circuit for each clutch part, a movable armature in each of said circuits, a third circuit comprising an electromagnet for each movable armature in said first-mentioned circuits, a controller comprising a disk carrying insulation, and a contact-finger normally resting on said insulation, and means for moving said contact-finger to either side of said insulation for closing the circuit through one or

the other of said magnets, substantially as described.

15. In combination with an ordnance-piece, mechanism and a motor operating it for effecting its movement vertically, and mechanism and a motor for effecting its movement laterally, an electric device for controlling each of said mechanisms, comprising two clutch parts which operate in opposite directions, an electric circuit for each clutch part of each electric device, said circuits each comprising a movable armature, a third circuit for the two circuits of each clutch part, which comprises an electromagnet for each armature, a controller for each third circuit, comprising a disk carrying insulation, and a contact-finger and a firing-circuit for said ordnance-piece, said firing-circuit being completed through the armatures of all the magnets when the said armatures are not attracted by their respective electromagnets.

16. In combination with an ordnance-piece, means for positioning said ordnance-piece for firing, electric clutch devices for controlling said means, said clutch devices comprising two parts loosely mounted on a shaft and adapted to rotate in opposite directions, a pulley that is fastened in said shaft adjacent to each part, an electromagnet carried by each of said parts and each provided with an armature, means also carried by said parts and operated on the movement of the armature of the same part to cause the pulley adjacent to said part to turn with it, an electric circuit for each electromagnet, and means for opening and closing said circuits, substantially as described.

17. An apparatus for aiming guns, comprising a sighting means, a range-adjuster connected therewith and partaking of the movement thereof, a motor, and electric connections between the range-adjuster and the motor, whereby the motor causes the gun to automatically follow the movement of the range-adjuster, and sighting means, which automatically controls the movement of the gun.

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

THEODORE MARSHALL FOOTE.

Witnesses:
W. LAIRD GOLDSBOROUGH,
GEO. E. CRUSE.