

No. 752,460.

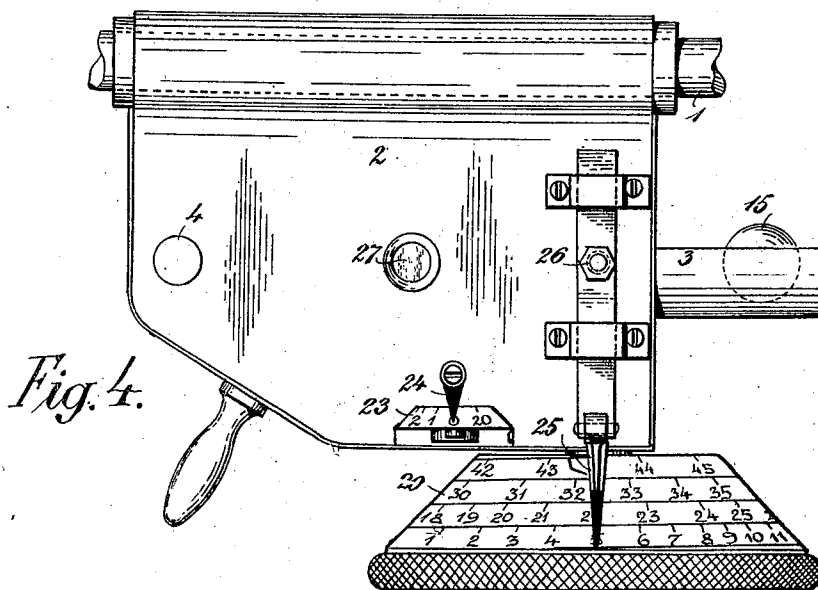
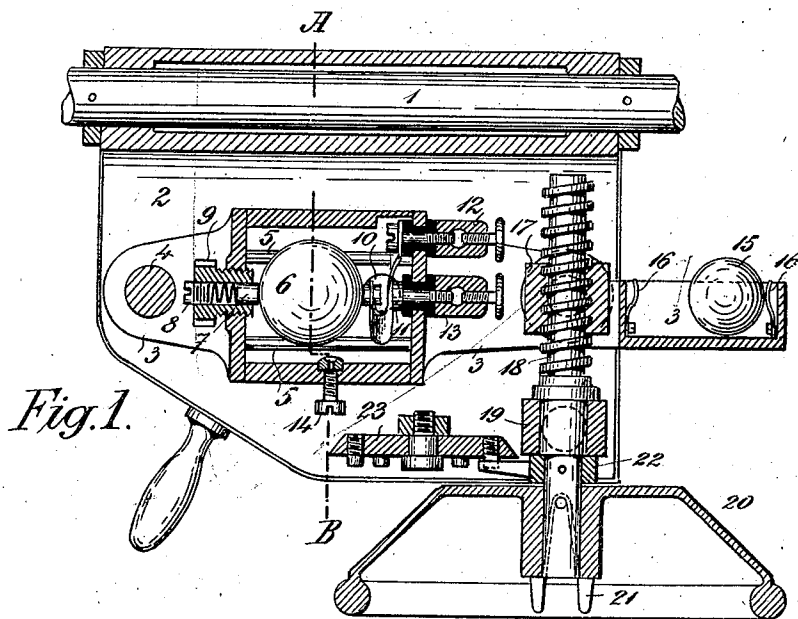
PATENTED FEB. 16, 1904.

L. J. MAUTNER.
FIRING MECHANISM FOR SHIPS' GUNS.

APPLICATION FILED JUNE 4, 1903.

NO MODEL.

4 SHEETS—SHEET 1.



WITNESSES:

P. W. Wright
S. C. Connor

INVENTOR

Ludwig Joseph Mautner
BY *Haworn & Haworn*
HIS ATTORNEYS

No. 752,460.

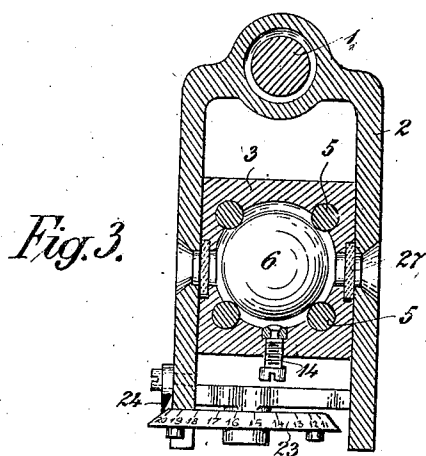
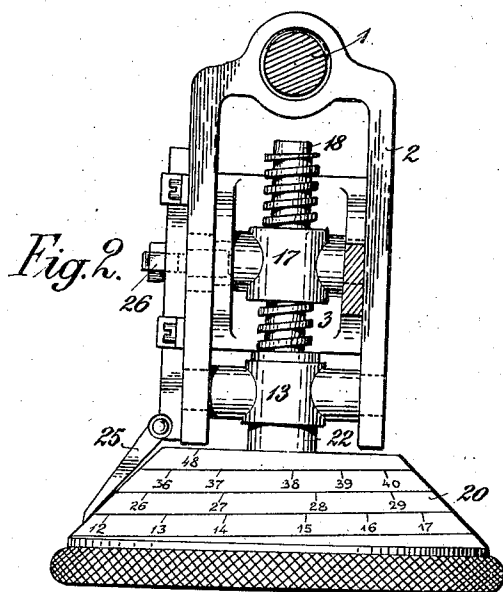
PATENTED FEB. 16, 1904.

L. J. MAUTNER.
FIRING MECHANISM FOR SHIPS' GUNS.

APPLICATION FILED JUNE 4, 1903.

NO MODEL.

4 SHEETS—SHEET 2.



WITNESSES:

F. W. Wright
S. C. Connor

INVENTOR

Ludwig Joseph Mautner
BY *Hawson & Howard*
HIS ATTORNEYS.

No. 752,460

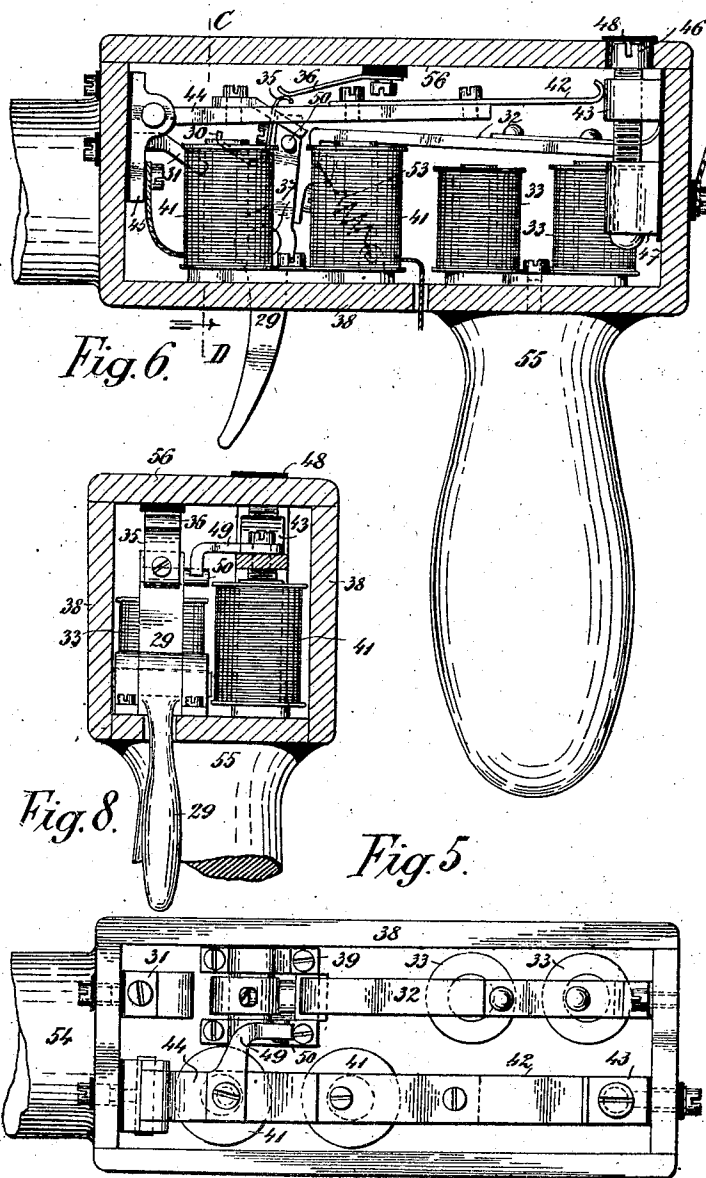
PATENTED FEB. 16, 1904.

L. J. MAUTNER.
FIRING MECHANISM FOR SHIPS' GUNS.

APPLICATION FILED JUNE 4, 1903.

NO MODEL.

4 SHEETS—SHEET 3.



WITNESSES

F. W. Wright
S. C. Connor

INVENTOR

Ludwig Joseph Mautner
BY *Harmon Howson*
HIS ATTORNEYS

No. 752,460.

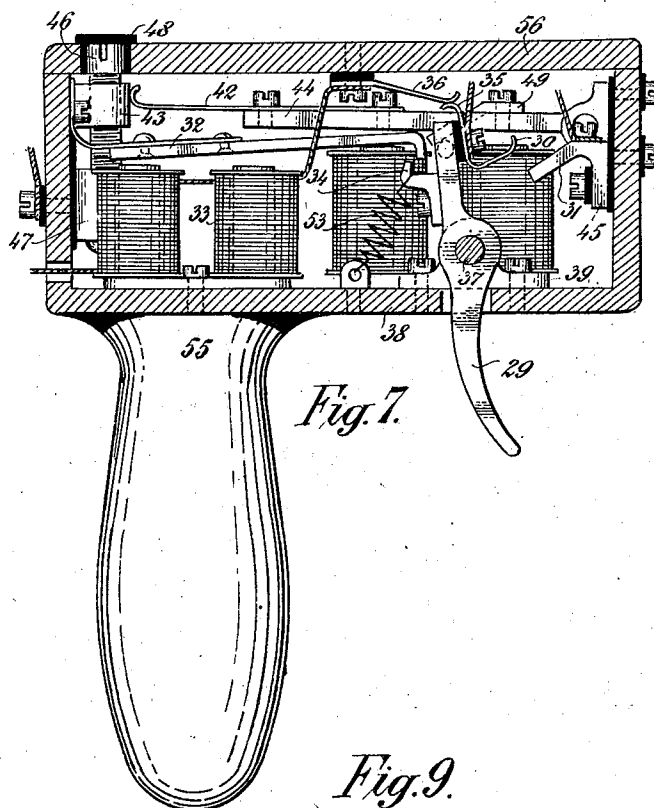
PATENTED FEB. 16, 1904.

L. J. MAUTNER.
FIRING MECHANISM FOR SHIPS' GUNS.

APPLICATION FILED JUNE 4, 1903.

NO MODEL.

4 SHEETS—SHEET 4.



WITNESSES=

A. W. Wright
S. C. Connor

INVENTOR

Ludwig Joseph Mautner
BY *Hawes & Hawes*
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

LUDWIG JOSEF MAUTNER, OF VIENNA, AUSTRIA-HUNGARY.

FIRING MECHANISM FOR SHIPS' GUNS.

SPECIFICATION forming part of Letters Patent No. 752,460, dated February 16, 1904.

Application filed June 4, 1903. Serial No. 160,116. (No model.)

To all whom it may concern:

Be it known that I, LUDWIG JOSEF MAUTNER, Ritter von Markhof, doctor of philosophy, gentleman, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in and Relating to Firing Mechanism for Ships' Guns, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to make and use the same.

This invention has for its object an electrical firing mechanism for ships' guns of all kinds, including howitzers and mortars, which only permits or causes the shot to be fired when the gun has exactly the proper elevation corresponding to its distance from the target, no matter to what extent the vessel is rocking. The arrangement of the mechanism is preferably such that although the firing mechanism is working properly the discharge is delayed, owing to defective ignition or the like. The moment of firing is therefore not selected by the gunner; but the discharge is effected automatically at the moment at which the gun, having been correctly trained in the lateral direction, attains the proper inclination to the horizon by reason of the elevation given to it in the gun-carriage in combination with the rolling of the ship. Only in this manner is it possible to obviate faulty elevation of a gun arising from movements of the vessel and, in fact, to actually turn these movements to account by causing them to supplement or complete the elevation already given to the gun in its carriage so as to produce the desired elevation.

In the accompanying drawings, Figure 1 is a vertical section. Fig. 2 is a front elevation of the device which effects the closing of the firing-circuit when the correct elevation is attained. Fig. 3 is a section on the line A B of Fig. 1. Fig. 4 is a side elevation. Fig. 5 is a plan view of the device by means of which discharge is prevented except at the proper time, even when the mechanism represented in Figs. 1 to 4 has become operative. Figs. 6 and 7 are side elevations viewed from opposite sides. Fig. 8 is a section on line C D,

Fig. 6, parts being shown in elevation. Fig. 9 is a diagram of the electrical connections.

The automatic firing mechanism shown in Figs. 1 to 4 is loosely suspended from a rod 1 or the like rigidly attached to the gun-barrel in such a manner that it may always be set by hand by means of a handle 1^a, if necessary, assisted by its own weight, in a vertical plane parallel with the axis of the bore of the gun. It is arranged in a frame 2, suspended from the rod 1, and consists of a casing 3, rotatable around pivots 4, and in which a sphere 6, exactly guided between bars 5, is loosely mounted, and in its position of repose rests, on the one hand, against a spring 7, the tension of which may be regulated by the screw 8 and adjusted by the nut 9, and, on the other hand, on an insulating-plate on a contact-spring 1.

As soon as the guide-bars 5 of the sphere become inclined toward the right hand and downwardly, Fig. 1, the sphere, rolling toward the right hand, will press the spring 10 upon the insulated contact-piece 11. The terminals 12 and 13 serve for the connection of the wires of the electric circuit. The screw 14 serves for rendering the mechanism inoperative, as when it is screwed in it retains the sphere and prevents this latter pressing the spring 10 against the contact-piece 11. A second sphere 15 in plain sight from outside travels in a prolongation of the casing 3 and at the end of its travel strikes against the buffer-springs 16.

At the rear extremity of the casing 3 is arranged a nut 17, provided with two guide-pins. The bolt 18 of this nut rests in the bearing 19, rotatable around the lateral pins, and may be rotated from outside for the purpose of adjusting the casing 3. The bolt 18 is slit upon its lower end and carries a spring 21 with two noses which ordinarily support the hand-wheel 20, owing to the fact that when they separate they engage beneath the hand-wheel hub, while when they are pressed together to such an extent that they enter the boring in the hub of the hand-wheel this latter may readily be drawn off the spindle. There is also mounted upon the bolt 18 be-

tween the bearing 19 and the hand-wheel 20 a ring 22, formed with a nose engaging in a pin-wheel 23, so that this latter is advanced a step upon each rotation of the hand-wheel, and an index 24 on the periphery of the pin-wheel shows how many complete revolutions the hand-wheel has been caused to effect.

The hand-wheel 20 constitutes a hollow cone, upon the periphery of which a continuous division in accordance with the range is marked in helical lines. Over these divisions moves the index 25, which by means of the pin 26 is fixed to the casing 3 and rises and falls with this casing, so that its point follows the helical line of the divisions of the hand-wheel 20. This indicating device does not constitute a portion of the invention and may be replaced by any other appropriate device.

In the casing 3 there are arranged opposite to the contact-piece 11 two glazed openings 27 in order that the play of the contact-spring 10 may be inspected. The frame 2 is mounted between two adjusting-rings.

On the rear end of the sighting-bar 54, arranged in any convenient known manner, there is mounted within easy reach of the fingers of the marksman's hand resting on the handle 55 of this bar a trigger 29 in such a manner that when this latter is pulled a contact-piece 30, which is connected in series with the igniting-battery and the contact device 10 11, bears against the contact-piece 31, which is in constant connection with the second pole of the battery through an electric firing device Z of any suitable kind, as shown diagrammatically in Fig. 11. If, however, the trigger 29 is not pulled, the contact-piece 30 bears by means of the spring 35 on the spring 36, which is permanently connected, on the one hand, through the contact device 10 11 with one pole and, on the other hand, by means of the winding of an electromagnet 33 with the other pole of the igniting-battery. If contact is effected at 10 11 before the trigger 29 is pulled, the electromagnet 33 will be energized and attract its armature 32, which as it comes in front of the trigger 29 prevents this latter from being pulled. If, however, the trigger 29 is pulled before contact is made at 10 11, the spring 36 loses its connection with the contact-piece 30, the magnet 33 is cut out, and if contact is then made at 10 11 the current will be closed through the firing device Z and the discharge will take place. Of course when the trigger is locked by the armature 32 in the manner indicated above if the circuit is interrupted at 10 11 the magnet will likewise be cut out and the trigger 29 released. If this latter is still submitted to finger-pressure, the contact-pieces 30 and 31 will meet. Ignition can only take place, however, when the circuit is reestablished at 10 11.

An antagonistic spring holds the armature 32 in its position of repose. The trigger 29

is rotatable around the pivot 37, which is mounted in the casing 38 by means of the bearings 39. The spiral spring 53 serves to return the trigger 29 to its position of repose. In the first place, by the rotation of the hand-wheel 20 to an extent corresponding to a given range there is imparted to the frame 3, which, as already stated, is maintained uninterruptedly in a vertical plane parallel with the trajectory of the projectile, an inclination to the horizontal plane equal to the required angle of elevation, so that whatever may be the rolling of the ship carrying the gun the guide-rods 5 pass through the horizontal position when the axis of the bore of the gun forms the correct angle of elevation with the horizontal plane.

As the frame 3 lies in a vertical plane parallel with the axis of the bore, no change of the position of the trunnions of the gun owing to the movements of the vessel can affect the inclination of the rods 5 to the horizontal and to the axis of the bore. As soon, however, as these guide-rods pass through the horizontal position the sphere 6, assisted by the spring 7, presses the contact-spring 10 against the contact-piece 11, whereby if the gunner, standing at the sighting-bar 54 after he has caused the sight-line to cover the target, has pulled the trigger 29 the circuit from the igniting-battery to the firing device Z will be closed and the shot automatically fired. If it should so happen that the sphere 6 makes contact at 10 11 before the trigger 29 has been pulled, a current will pass through the contact-spring 36 to the electromagnet 33, which attracts its armature, thereby locking the trigger 29, and thus rendering the establishment of the firing-circuit through the contact-pieces 30 31 impossible. The discharge cannot, therefore, take place unless the gun is occupying the correct position. When, however, the trigger 29 has been locked in this manner and the marksman follows the target with the sighting-bar and the gun and holds his finger on the trigger 29 and when the elevation of the gun diminishes, owing to the movement of the vessel, in such a manner that the sphere 6 moves back against the spring 7, the current passing through the electromagnet 33 will be interrupted at 10 11 and the trigger thereby released. The trigger will then follow the pressure of the finger and contact can be established at 30 31. When, then, the vessel swings back until the gun has attained the correct elevation and the guide-rods 5 consequently pass through the horizontal, the sphere 6 will, as already stated, close the firing-circuit at 10 11 and produce the discharge at the proper moment. It may, however, happen that owing to a defect in the firing device or in the igniting-circuit the discharge is not effected at the proper moment at which the circuit is closed at 10 11 and 30 31 in the manner already described, but that a certain interval of time elapses between this

closing of the circuit and the ignition of the discharge, (delayed ignition.) This lapse of time would, however, be sufficient, owing to the continuous rolling of the ship, to alter the elevation of the gun to such an extent that the projectile fired too late would miss its mark. In order to obviate this possibility, the contact-piece 31 is connected with the firing device Z by the winding of the electromagnet 41 and the spring 42. In its position of repose this spring 42 rests on the contact-piece 43. If after contact has been established in the manner already described at 10 11 and 30 31 the current passes through the magnet 41, the armature 44 and the spring 42 will be attracted, the latter sliding along and finally off the contact-piece 43. Consequently the current can only pass through the circuit and produce the discharge so long as the spring slides along the contact-piece 43. When the spring 42 has slid off the contact-piece 43, however, the firing-circuit is interrupted and a delayed discharge prevented, thus retaining intact a munition which would otherwise have been expended to no purpose. The period during which the circuit 42 43 remains closed may be regulated by adjusting the contact-piece 43 by means of the screw 46. This screw is mounted in the insulated metal part 47 and covered by an insulated cap 48.

The armature 44 is provided with a lateral inclined projection 49, engaging with a pin 50, projecting from the side of the trigger 29. Therefore when this trigger is released and returned to its normal position of repose by the spring 53, whereby the firing-circuit is interrupted at 30 31, the pin 50, sliding along under the inclined projection 49, raises the latter, together with the lever 44, whereby the contact-spring 42 is returned to its initial position, in which it makes contact with the contact-piece 43. When subsequently the trigger is pulled again toward the handle 55, the pin 50 comes out of contact with the inclined projection on the armature 44, permitting the same to be attracted by its magnet.

The casing 38 is completely closed by a removable cover 56.

From the position and movement of the sphere 15 in the prolongation of the frame 3 it may be seen whether the gun can attain the desired elevation with the rolling of the ship which is taking place. If this is not the case, the elevation of the gun in the carriage should be increased by means of the training mechanism in order to insure contact being made at 10 11. As the adjustment of the frame 3 relatively to the rod 1—that is to say, to the gun—is independent of the adjustment of the gun in the carriage, the movement of the sphere 6, and consequently the correct discharge, will not be in any way influenced by this displacement of the gun.

As by means of the device described above the discharge can only be produced when the

gun has the exact elevation desired, the marksmanship will obviously be greatly improved.

I claim as my invention—

1. In an electric firing mechanism for guns, the combination of the gun, a structure rigidly secured to the gun, a frame adapted to turn loosely in said structure around an axis parallel to the axis of the bore of the gun, guides carried by such frame, a sphere adapted to move along such guide, a contact device adapted to be operated by said sphere when this latter moves in one direction along the guide, to close the firing-circuit and means for adjusting the inclination of the said guide vertically relatively to the axis of the gun, substantially as described.

2. In an electric firing mechanism for guns, the combination of the gun, a structure rigidly secured to the gun, a frame adapted to turn loosely in said structure around an axis parallel to the axis of the bore of the gun, guides carried by such frame, a sphere adapted to move along such guides, an adjustable spring bearing against one side of the said sphere, a contact device on the opposite side of and adapted to be operated by such sphere when this latter moves in one direction along the guide, to close the firing-circuit and means for adjusting the inclination of the said guide relatively to the gun's axis, substantially as described.

3. In an electric firing mechanism for guns, the combination of the gun, a structure rigidly secured to the gun, a frame adapted to turn loosely in said structure around an axis parallel to the axis of the bore of the gun, guides carried by said frame, a sphere adapted to move along said guides, a contact device adapted to be operated by said sphere when this latter moves in one direction along the guide to close the firing-circuit, a second guide parallel to the first guides and a second sphere visible from outside and adapted to move freely in the said second guide, and means for adjusting the inclination of the said guide relatively to the horizontal, substantially as described.

4. In an electric firing mechanism for guns, the combination of the gun, a structure rigidly secured to the gun, a frame adapted to turn loosely in said structure around an axis parallel to the axis of the bore of the gun, guides carried by said frame, a sphere adapted to move along said guides, a contact device adapted to be operated by said sphere when it moves in one direction along the guides to close the firing-circuit, and means for adjusting the inclination of the said guide relatively to the horizontal, in combination with a sighting-bar, a contact apparatus in the firing-circuit in series with the said contact device operated by the sphere, and means carried by such sighting-bar for closing the said contact apparatus at the will of the marksman, substantially as described.

5. In an electric firing mechanism for guns, the combination of the gun, a structure rigidly secured to the gun, a frame adapted to turn loosely in said structure around an axis parallel to the axis of the bore of the gun, guides carried by such frame, a sphere adapted to move along such guides, a contact device adapted to be operated by such sphere when this latter moves in one direction along the guide to close the firing-circuit, and means for adjusting the inclination of the said guide relatively to the horizontal, in combination with a sighting-bar, a firing-switch in the firing-circuit in series with the aforesaid contact device operated by the sphere, and means carried by such sighting-bar for closing the firing-switch at the will of the marksman, an electromagnet adapted to be thrown into circuit by the contact device operated by the sphere, and means controlled by such electromagnet for locking the firing-switch in its open position, substantially as described.

6. In an electric firing mechanism for guns, a firing-circuit, means for closing the same, a contact device in such circuit, an electro-

magnet 41 adapted to be energized by closing such circuit, and an armature adapted to be moved by such electromagnet when energized, said armature in its movement adapted to open the firing-circuit, substantially as and for the purpose described.

7. In an electric firing mechanism for guns, a firing-circuit, a lever for closing the same, a contact device in such circuit, an electromagnet 41 adapted to be energized by closing such circuit and an armature adapted to be moved by such electromagnet when energized and to open then the said contact device, an inclined projection on such armature, a pin on the said lever adapted to engage with such inclined projection whereby the contact is closed as the lever is moved in its open position, as and for the purpose described.

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

LUDWIG JOSEF MAUTNER.

Witnesses:

T. GEORGE STANLEY.

ALVESTO S. HOGUE.