Aug. 14, 1928. 1,680,902

N. E. METHLIN

SETTING DEVICE FOR TIME FUSES

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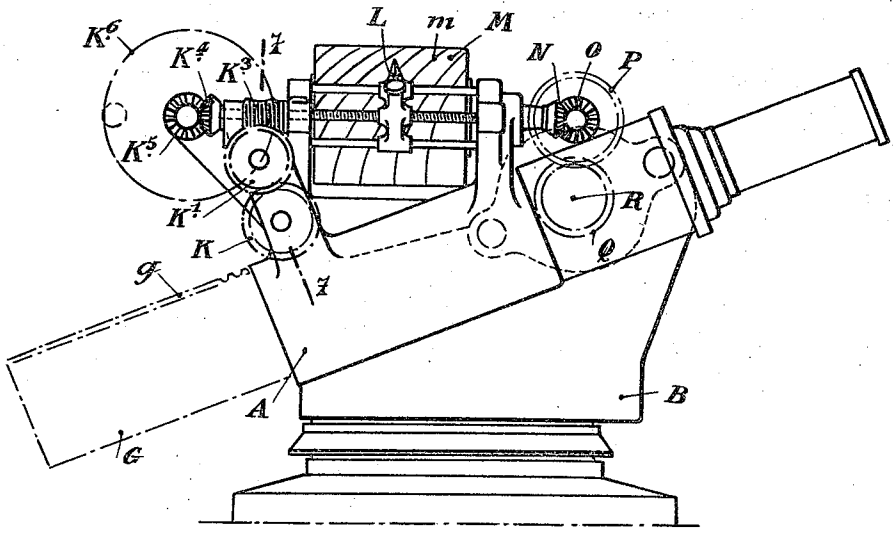
Fig. 1.



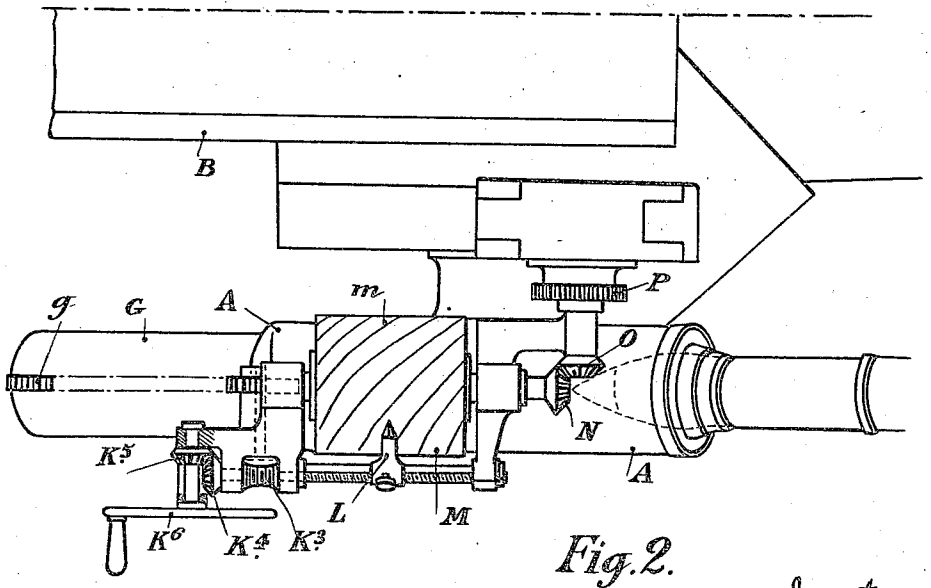


Fig. 2.

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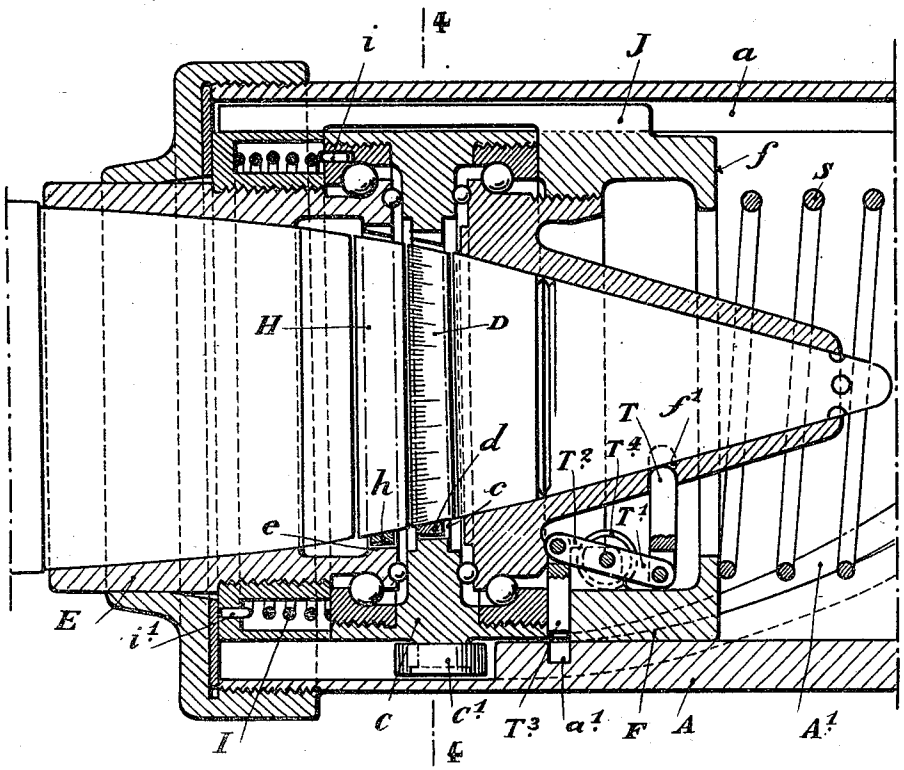
Fig. 3.



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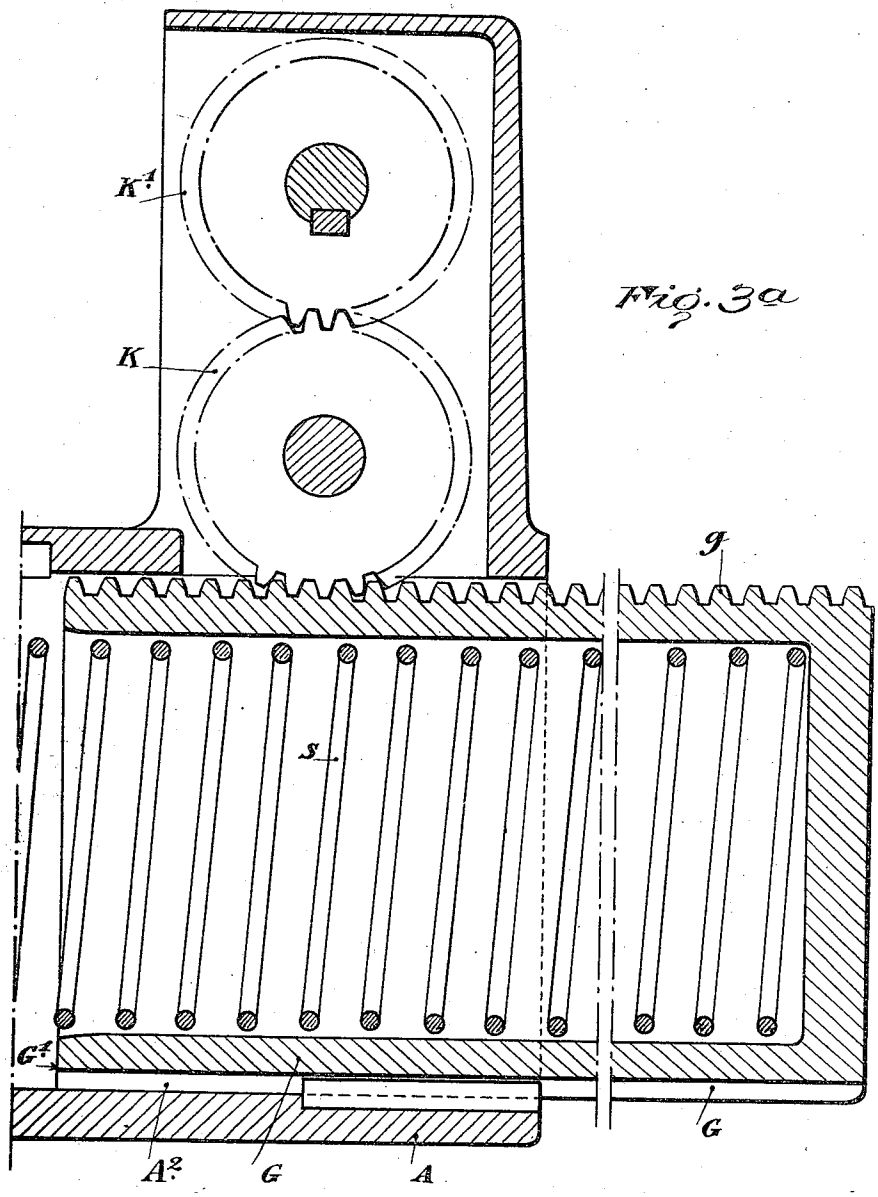

Fig. 3a

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Fig. 4.

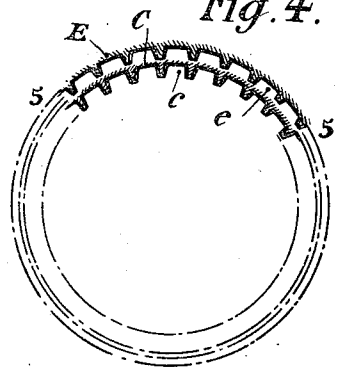
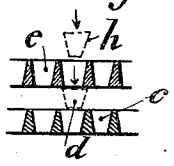


Fig. 5.



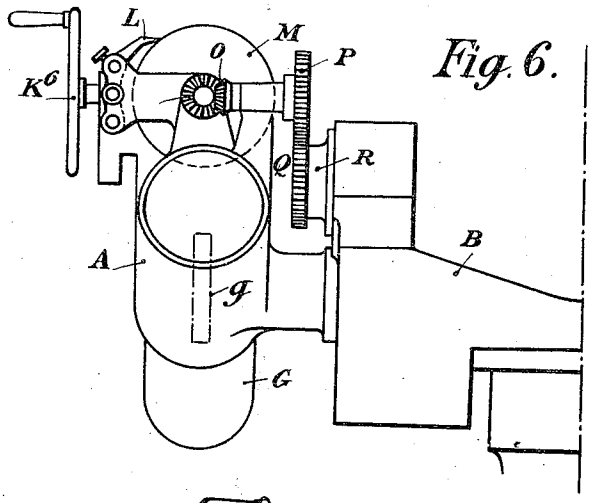


Fig. 6.

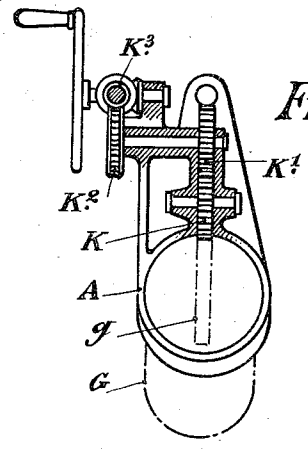


Fig. 7.

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Patented Aug. 14, 1928. 1,680,902

UNITED STATES PATENT OFFICE.

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SETTING DEVICE FOR TIME FUSES.

Application filed April 12, 1927, Serial No. 183,161, and in France May 19, 1926.

The subject of this invention is a setting device for time fuses which is more particularly adapted for use in combination with a quick firing gun.

It is known that the setting of time fuses of the known type comprising a time ring which is movable angularly relatively to a fixed mark on the projectile, which mark is most usually engraved upon a fixed time ring, necessitates, for each setting, two consecutive angular displacements which are effected by the gun server who makes use of the setting device.

The gun server first of all displaces, through an angle varying according to the range, a member of the setting device before engaging the fuse therein; then he manipulates angularly another member of the setting device in order to carry along a stud provided on the movable time ring, producing a rotation of the projectile and of the fixed stud. These operations take up a great deal of time and moreover, include a movement of rotation of the projectile.

The device forming the subject of the invention permits the fuse setting to be effected with much greater speed without necessitating any movement of rotation of the projectile.

According to the invention the angular displacement of the movable time ring only is obtained by guiding this ring along a helical generating line of the setting device, the magnitude of this displacement being limited by the preliminary rectilinear displacement of a stop, which displacement varies according to the range chosen.

The setting device constructed so as to embody these essential features is, preferably, arranged in such a way that the displacement of the movable stop is effected by a gun server who for this purpose actuates a transmission system by means of which he simply brings a reference mark into agreement with the particular range or altitude curve chosen, which curves are traced upon a rotatable graph carrying drum the movements of which are tied to those of the elevating mechanism of the gun.

In practice the fuse is set by simply sliding the projectile and consequently the movable time ring, into a member of the setting device which is suitably guided along a helical guide in the body of the setting device, the setting being effected when the inward movement is stopped upon encounter with the movable stop, the position of which is itself adjusted independently of the projectile.

In fact, a gun server may, under these conditions, be given the whole of the work of setting the fuse and loading the projectile into the gun and in order to set the fuse he will simply have to push the projectile into the setting device until a stop is encountered, then withdraw the projectile with its fuse thus set and proceed immediately to load the projectile into the bore of the gun barrel.

A practical embodiment of the invention is illustrated by way of example in the accompanying drawings in which:

Fig. 1 is an elevation showing a general arrangement of the setting device and the mechanisms connected to the latter, mounted upon the gun carriage of a gun for firing against aircraft. The figure shows the connection between the mechanism serving for producing the displacements of the movable stop and one of the trunnions of the cradle, the latter being itself movable, in the known manner, by means of the elevating mechanism.

Fig. 2 is a plan view of a part corresponding to Fig. 1.

Figs. 3 and 3[a] show in sectional elevation a detail of the setting device proper to a larger scale.

Fig. 4 is a diagrammatic plan section of a part, the section being taken along the line 4—4 in Fig. 3, showing the parts of the sleeve-box in which engage the fixed time ring and the movable time ring of the fuse respectively.

Fig. 5 is a developed and diagrammatic section of a part taken along the line 5—5 in Fig. 4.

Fig. 6 is a side elevation of a part of the arrangement shown in Fig. 1.

Fig. 7 is a sectional elevation taken along the line 7—7 in Fig. 1.

The setting device proper comprises a setting device body A which may be mounted in any suitable place upon the gun carriage and, in the example shown, is carried by a platform or saddle B (Figs. 1 and 2) forming a top carriage and adapted, in the known manner, to turn upon a lower carriage of any known type.

In the body A of the setting device is formed a helical guide A[1] which serves for

guiding the member C^1 which carries along in its movement the stud d formed upon the movable time ring D of the fuse. This member C^1 communicating its motion to the projecting stud d may, for example, be formed by a roller carried upon a ring C forming one of the parts of a box E—C—F in which the nose of the projectile is placed. This box comprises three parts two of which E, F are fixed; one of these parts F acts as a lodgment for the nose of the projectile or, more exactly, the fuse body, and is adapted to abut by means of its front face f against the adjustable stop G; the other fixed part E comprises a crown of notches e for engaging with the stud h which forms a projection upon the fixed time ring H of the fuse. The ring C forms a member for communicating a movement to the stud d of the movable time ring D; it is disposed between the two fixed parts E, F. A return spring I is secured at one end i to the ring C and at the other end i^1 to the part E. The two parts E, F are made rigid with each other by a key J guided in a groove a in the body A of the setting device.

The ring C is provided with a crown of notches c for engaging with the stud d of the movable time ring D.

As shown in Figs. 4 and 5 the studs h and d are trapezoidal in shape with the larger base of the trapezium on the outside and they engage easily between the corresponding notches, the space between these being of corresponding trapezoidal shape.

The body A of the setting device provides a longitudinal guide, by means of a groove A^2, for a rack g formed upon the cylinder G, the inner edge G^1 of which is adapted to form a stop, the position of which can be adjusted, for the inner face of the part F of the sleeve-box. The rack g engages the teeth of a pinion K the shaft of which may be carried upon the body A of the setting device, which pinion forms one of the elements of a transmission system $K—K^1—K^2—K^3—K^4—K^5$ adapted to be actuated by a handwheel K^6. Upon one of the members K^3 of this transmission system, the whole of which may be carried upon the body A of the setting device, is transmitted the longitudinal movement made by a pointer L moving in front of a graph carrying drum M. Upon this drum are traced curves m which correspond to the various ranges or altitudes. The drum is made to follow the elevating movements of the gun by means of a transmission gear N—O—P comprising a toothed wheel P which engages with a wheel Q which is integral or virtually integral with one of the trunnions R of the cradle of the gun.

A spring S presses at one end against the buffer f formed by the sleeve-box and, at the other end against the end of the socket G upon which is provided the rack g and the inner face G^1 of which forms an adjustable stop.

A gun server actuating the handwheel K^6 has to keep the needle L continually on the range curve m of the drum M which has been chosen, which drum itself moves automatically with the cradle during the elevating of the gun barrel. The displacement of the handwheel K^6, produces, through the transmission gear ending in K, the displacement of the rack g and consequently of the stop G^1 which occupies at all moments the required position for producing a suitable setting of the fuse of the projectile which is to be loaded into the gun.

The gun server who has to make this setting engages the projectile in the sleeve-box E—C—F. The studs h and d which are opposite each other thus engage respectively the one h in a notch e of the fixed part E of the box and the other d in a notch c of the movable ring C.

The gun server at the same time as he slips the projectile into the box pushes it into the body of the fuse setting device, thus compressing the spring S. The projectile, in being engaged in the box, causes a safety device shown in Fig. 3 to be disengaged. The nose of the fuse body pushes outwards a lever T one end of which engages in an orifice f^1, forming a catch, of the part F of the box; it is pivotally connected at its other end to one of the arms of a rocking lever $T^1—T^2$, the other arm of which is pivotally connected to a bolt T^3 which when at rest is driven to the action of a spiral spring T^4 into a recess a^1 formed in the body A of the fuse setting device.

The projectile in being slipped into the sleeve box disengages, as will be seen from the drawing, the bolt T^3 which normally holds the sleeve-box E in a stationary position. The pushing in of the arrangement formed by the projectile and the sleeve-box produces, on account of the engagement of the roller C^1 in the guiding groove A^1, the angular displacement of the movable time ring D, through an angle limited by the encounter between f and G^1.

When the gun server in pushing in the projectile meets the resistance of the stop G^1, he disengages the projectile. The movement of withdrawal is effected without immediately producing the expansion of the spring S the tension of which is insufficient to return the sleeve-box and rotate back the arrangement formed by the ring C and the time ring D. But as soon as the studs d and h are disengaged from the notches c and e, the spring S can expand and it then returns the box E—C—F into its initial position, and the roller C^1, which is compelled to follow the groove A^1, is itself returned into its initial position.

As will be seen, the gun server who effects

the setting can introduce the projectile into the sleeve-box without having to consider the position of the studs *h* and *d* relatively to the notched crowns. The said gun server has simply and solely to push in and withdraw the projectile which he can, after withdrawal, place immediately in the chamber of the gun barrel if the fuse setting device is, as is the case in the example shown, suitably arranged near the breech.

The spring I which is compressed during the displacement of the roller C^1 towards the stop G^1, expands during the reverse return movement and ensures a perfect bearing of the roller upon one of the sides of the groove during this movement.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In apparatus of the class described, the combination of a body, a member displaceable therein and shaped to fit the nose of a projectile, said member comprising a rotatable part adapted to engage the fuse-setting mechanism of said projectile, and means operatively connecting said body and rotatable part to cause rotation of the latter on displacement of said member.

2. A fuse-setting device comprising a body, a displaceable member in said body comprising two parts one of which is rotatable relative to the other, said parts being shaped to receive a projectile, and motion-converting means interconnecting said body and rotatable part whereby displacement of said member causes rotation of said part.

3. In a fuse-setting device, the combination of a projectile-receiving member adapted to be displaced on inserting a projectile therein, said member comprising means for engaging the nose of said projectile and means for engaging fuse-setting mechanism, and motion-converting means to convert displacement of said member into rotation of said last-named means.

4. A fuse-setting device comprising in combination a body, a displaceable member in said body comprising two parts one of which is rotatable relative to the other, said parts being adapted to receive a projectile, means converting motion of said member into rotation of said rotatable part, and a stop limiting displacement of said member.

5. A device of the class described comprising in combination a body, a displaceable member in said body comprising two parts one of which is rotatable relative to the other, said parts being shaped to receive a projectile, means converting linear motion of said member into rotation of said rotatable part, a stop limiting displacement of said member, and means adjusting said stop to a desired position.

6. A device of the class described comprising in combination a body, a displaceable member in said body comprising two parts one of which is rotatable relative to the other, said parts being shaped to receive a projectile, helical guide means interposed between said body and said displaceable member, and means limiting the displacement of said member.

7. A device of the class described comprising in combination a body, a displaceable member in said body comprising two parts one of which is rotatable relative to the other, said parts being shaped to receive a projectile, and helical guide means interposed between said body and said displaceable member to cause a combined linear and rotary movement of said rotatable part relative to said body.

8. In a fuse-setting device, the combination of a body, a displaceable member therein comprising three parts shaped to receive a fuse carrying projectile, one of said parts being rotatable relative to the others, a helical guide interposed between said rotatable part and said body, and straight guides interposed between said other parts and said body whereby displacement of said member causes rotation of said rotatable parts relative to said other part.

9. In a fuse-setting device, the combination of a body, a displaceable member therein comprising three parts shaped to receive a fuse carrying projectile, one of said parts being rotatable relative to the others, a helical guide interposed between said rotatable part and said body, straight guides interposed between said other parts and said body, and a stop to simultaneously limit the displacement of said member and the rotation of said rotatable part.

10. In a fuse-setting device, the combination of a body, a displacement member therein comprising three parts shaped to receive a fuse carrying projectile, one of said parts being rotatable relative to the others, resilient means opposing displacement of said member, a helical guide interposed between said rotatable part and said body, and straight guides interposed between said other parts and said body, whereby displacement of said member causes rotation of said rotatable part relative to said other parts.

11. In a fuse-setting device, the combination of a body, a displaceable member therein comprising three parts shaped to receive a fuse carrying projectile, one of said parts being rotatable relative to the others, resilient means normally opposing displacement of said member, a helical guide interposed between said rotatable part and said body, whereby displacement of said member causes rotation of said rotatable part relative to said other parts, straight guides interposed between said other parts and said body, resilient means normally opposing ro-

tation of said rotatable part, and a stop to simultaneously limit the displacement of said member and the rotation of said part.

12. In a fuse-setting device, the combination of a substantially cylindrical body, having a helical groove on the inner face thereof, a member displaceable in said body and comprising three parts one of which is rotatable relative to the other parts, a projection on said rotatable part engaging said groove, and a stop normally preventing displacement of said member and adapted to be withdrawn on insertion of a projectile into said device.

13. In a device of the class described, the combination of a substantially cylindrical casing comprising two telescoping parts, a member longitudinally displaceable in said casing and shaped to receive the nose of a fuse carrying projectile, resilient means opposing displacement of said member, a stop normally preventing the displacement of said member, and adapted to be withdrawn on insertion of a projectile into said device, said member comprising non-rotatable means engaging the fixed parts of the fuse-setting mechanism and relatively rotatable means adapted to engage the rotatable parts of said fuse-setting mechanism, a helical groove in the inner face of said casing, and a projection on said rotatable means engaging said groove, whereby the insertion of a projectile into said device displaces said member and causes rotation of said rotatable means to set the fuse.

14. In a device of the class described, the combination of a substantially cylindrical casing comprising two telescoping parts, a member therein adapted to engage the nose of a projectile and displaceable in said casing by the insertion of a projectile therein, resilient means normally opposing such displacement, said member comprising non-rotatable means to engage the nose of the projectile, a non-rotatable ring having a series of notches on its inner periphery to engage the fixed member of the fuse-setting mechanism, and a rotatable ring having notches on its inner periphery to engage the rotatable parts of said fuse-setting mechanism, a lug on said rotatable ring engaging a helical groove in said casing, resilient means normally opposing rotation of said rotatable ring, and means for adjusting the inner telescopic part of said casing as a function of the range.

15. In apparatus of the class described, the combination of a body, a displaceable member in said body comprising two parts one of which is rotatable relative to the other, said parts being shaped to receive a projectile, motion-converting means to convert displacement of said member into rotation of said rotatable part, a stop to limit displacement of said member, and means automatically adjusting said stop as a function of the range.

16. In apparatus of the class described, the combination of a body, a displaceable member in said body comprising two parts one of which is rotatable relative to the other, said parts being shaped to receive a projectile, motion-converting means to convert displacement of said member into rotation of said rotatable part, a stop to limit displacement of said member, and common means for simultaneously elevating the gun and adjusting said stop as a function of the range.

In testimony whereof I have signed this specification.

NICOLAS EMILIEN METHLIN.