H. H. CUMMINGS.

TARGET PRACTICE APPARATUS.

APPLICATION FILED JULY 23, 1904.

920,029.

Patented Apr. 27, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

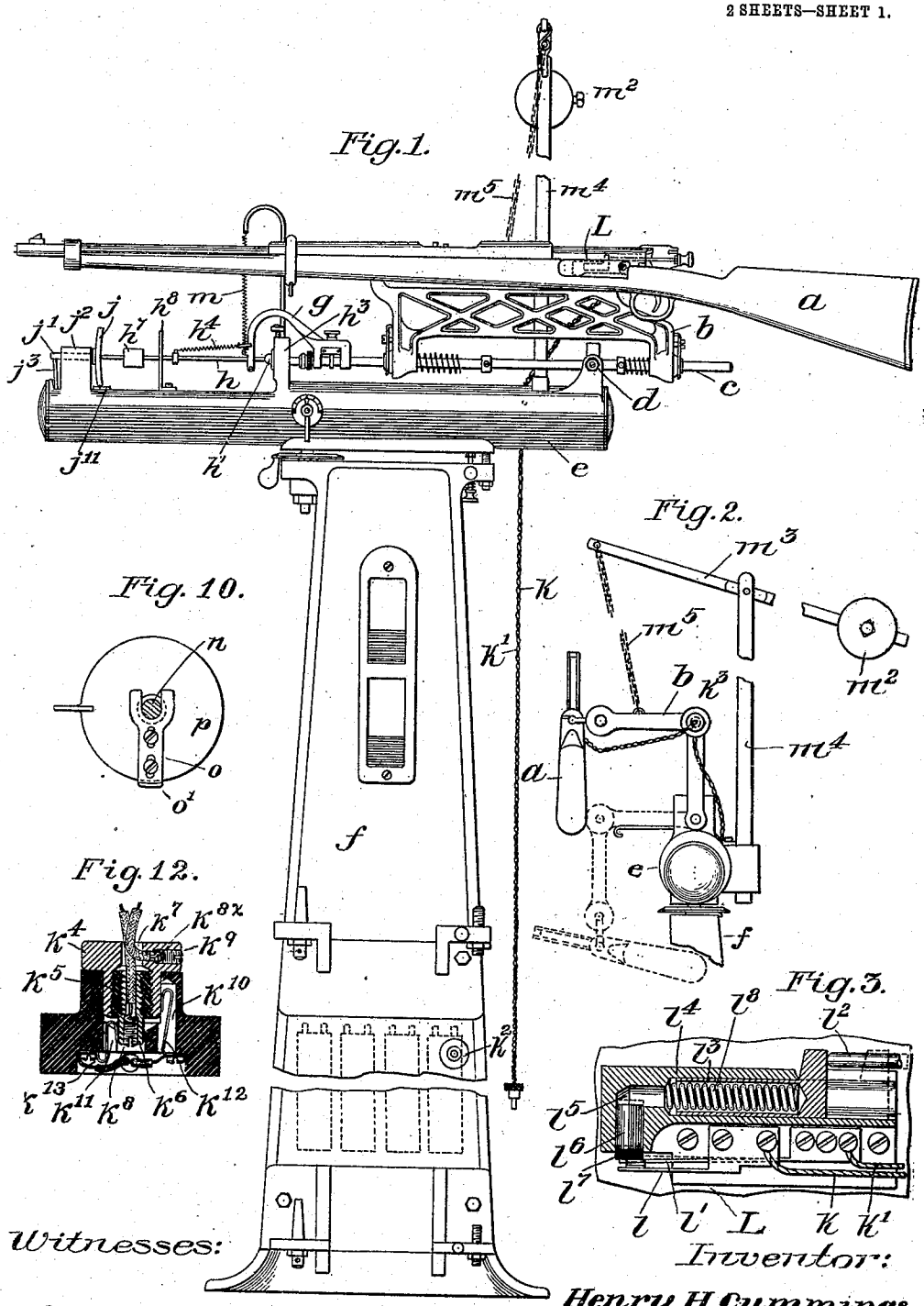


Fig. 2.

Fig. 10.

Fig. 12.

Fig. 3.

Witnesses:

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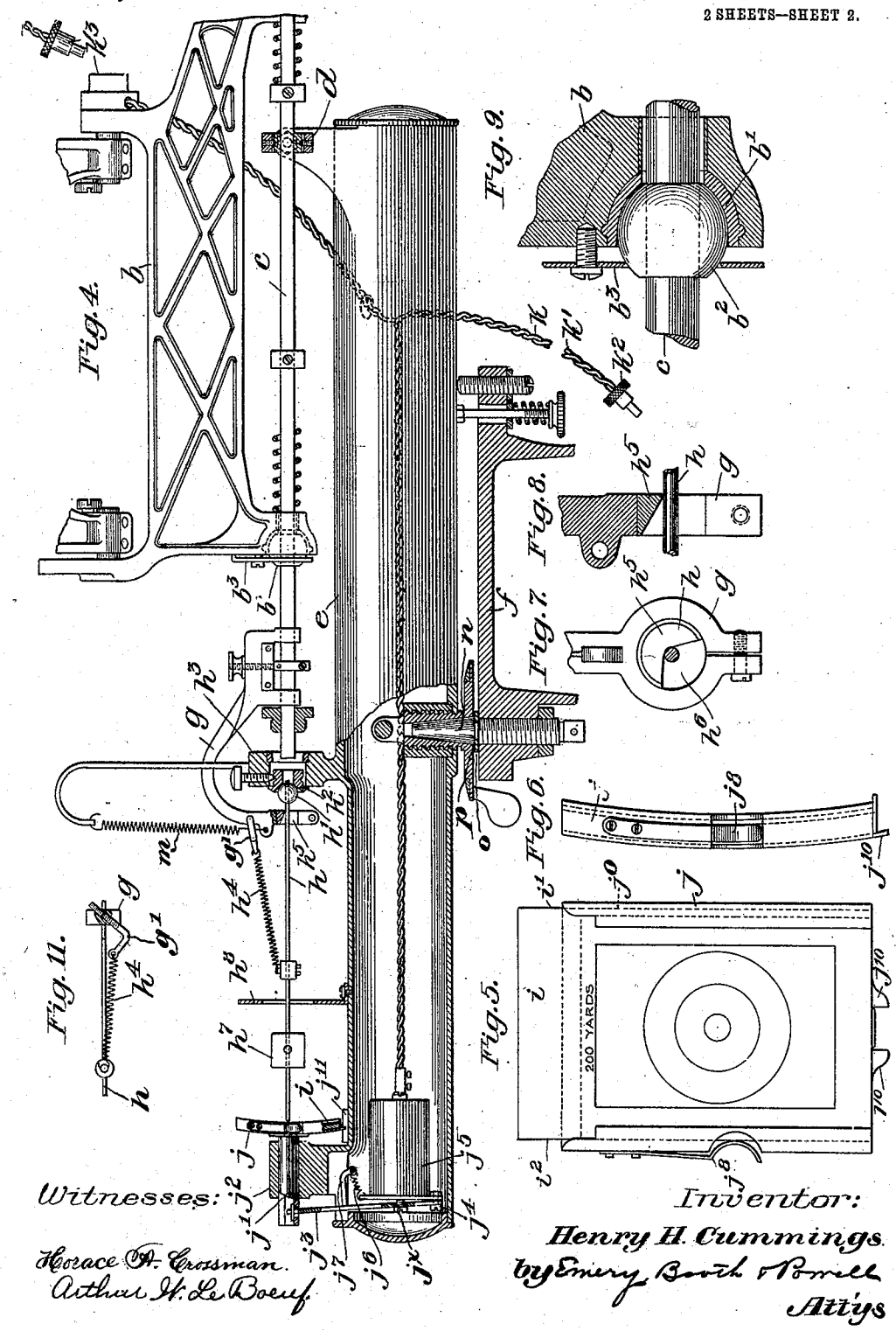
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UNITED STATES PATENT OFFICE.

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TARGET-PRACTICE APPARATUS.

No. 920,029. Specification of Letters Patent. Patented April 27, 1909.

Application filed July 23, 1904. Serial No. 217,779.

To all whom it may concern:

Be it known that I, HENRY H. CUMMINGS, a citizen of the United States, residing at Malden, in the county of Middlesex, Commonwealth of Massachusetts, have invented an Improvement in Target-Practice Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention consists in improvements in target practice apparatus, particularly in improvements over that form of apparatus described in my prior patent No. 739,778, dated September 22, 1903.

In the patent referred to there is specifically disclosed a target practice apparatus employing an aiming device, therein a gun, adapted to be aimed at a main distant target, but so connected with following means, including a recording needle, that the latter is caused to follow the aiming movements of the aiming device relatively to a secondary or miniature target upon the same support as the aiming device. At the time of firing, whether actual or simulated, the aim is permanently recorded upon the secondary target through movement of the latter toward and against the point of the recording needle and without the necessary issuance of any projectile from the gun, the relations between the aiming device, the main target, the needle and the secondary target being such that the line of sight of the aiming device relatively to the main target is at all times faithfully reproduced by the needle with reference to the secondary target.

In the patent aforesaid it was shown how the target practice apparatus there illustrated simulated conditions of actual range practice. No aiming point of rest is afforded the marksman, and the latter being relieved of substantially all the weight of the parts connected to the gun, handles the latter precisely as if unattached to the following mechanism; while no deviation of the line of gun sight can take place without a corresponding deviation of the recording needle, yet perfect freedom is obtainable in positioning the gun by movement up or down, sidewise or toward and from the main target.

While simulated firing only, without the discharge of a projectile, is necessary to practice with the apparatus described in the said patent, it is sometimes desirable to imitate even more exactly the actual conditions of range practice, and to produce at the time of firing both an explosion and a recoil of the gun, such as actually occurs when the marksman fires a service charge upon the range; for, although neither the explosion nor the recoil upon the range alters the record of the aim actually taken by the marksman at the time of firing (the projectile having left the gun before recoil occurs, however sudden the latter may appear to be,) the effect upon the marksman is to unsteady his nerves, making him expectant of the explosion which is to follow and rendering him more or less unfit for properly and carefully sighting the gun, until, through continued practice, he has become accustomed to the shock and sound which are to follow.

Although the recoil, as above pointed out, does not, in actual range practice, interfere with the record of the aim which has already been taken, since the recoil is not as quick as the travel of the projectile out of the gun, it has been found in practice that the production of recoil in an aiming device, such as is described in my prior patent where record is made by a needle upon a sub-target, is apt to interfere with an accurate record of the aim, since the movement of the gun after recoil is communicated to the recording needle instantly and often before the recording mechanism can act, thus recording the aim of the gun after the instant of firing and recoil instead of at the instant of firing and before recoil.

The exact conditions of practice as to recoil and explosion can be produced very simply by firing blank service charges of ammunition in the gun, since any standard type of gun, as has been pointed out, may be easily adapted for use with the apparatus described.

One object of my present invention is to provide means for eliminating from the recorded aim upon the secondary target the effect of the recoil of the gun, when the latter is actually fired during practice. This is accomplished in the selected embodiment of my invention illustrated herein, specifically by causing the sudden movement of the gun following recoil to be followed by a corresponding but retarded movement of the needle. The retardation, although comparatively slight, is sufficient to permit completion of the record before the gun recoil can

cause movement of the needle, the recording mechanism herein being capable of instantaneous actuation on the initial movement of the firing mechanism.

A further object of my invention is to improve the recording mechanism and the control thereof; also the construction of the follower parts connected to and following the movement of the aiming device, as well as other features which will more fully hereinafter appear.

My invention will be best understood by reference to the following description taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings,—Figure 1 is a side elevation, partially broken away, of the selected embodiment of my invention; Fig. 2 is an end elevation showing the counter-weighting of the gun connections; Fig. 3 is a detail of the pneumatic controlling mechanism for the recording device; Fig. 4 is an enlarged sectional elevation, partially broken away, showing the details of the recording mechanism and the following devices; Figs. 5 and 6 are details of the target holder; Figs. 7 and 8 are details of the connection between the needle and gyratory rod; Fig. 9 is a detail of the sliding ball connection between the gun holder and the gyratory rod; Fig. 10 is a detail of the carrier latch; Fig. 11 is a plan of the needle tension spring; and Fig. 12 is a sectional detail of the plug switch.

Referring to the drawings, and more particularly to Figs. 1 and 2, the aiming device *a*, herein a gun of standard pattern, is mounted for aiming movement by means of a jointed holder *b*, upon a gyratory rod *c*, the latter having a universal support at *d*, upon the beam or carrier *e*, the latter being adjustably mounted upon a supporting pedestal *f*. Adjustably connected to the free end of the rod *c* is the yoke *g*, the opposite end of which engages with the universally mounted recording needle *h* and acts to move the latter in correspondence with the movements of the gyratory rod *c*, which in turn follows the aiming movement of the gun in the hands of the marksman. The recording needle *h* (Fig. 4) is provided with a spherical bearing *h'*, seated in the conical seat h^2, adjustably carried by the bracket h^3 upon the beam *e*, the needle being forced to its seat by the backward pull of the tension spring h^4, connected at one end to the needle and at the other to the free end of the yoke *g*, by the finger *g'*. The spring h^4 not only pulls the needle to its seat, but also holds it in engagement with the edge of the cut-away circular guide h^5 (Figs. 7 and 8) clamped in the eye of the yoke *g*.

The walls of the V-shaped opening h^6 in the guide h^5 diverge downwardly and outwardly and away from the marksman. It will be observed that the inclination of the spring h^4, is both upwardly and outwardly toward the gun (Figs. 4 and 11), causing the needle normally to seat in the point of the V-shaped opening h^6, and follow the aiming movement of the gun, whether the latter is moved upwardly or outwardly toward the marksman.

The construction of the follower parts described will permit the accurate following movement of the recording needle, corresponding to all intentional aiming movements of the marksman, which will usually be conducted with comparative deliberation. When the gun is actually fired in practice, as by the firing of a blank cartridge, in order to permit completion of the record before the sudden, sharp, involuntary movement following gun recoil is impressed upon the needle and therefore upon the record, I preferably retard the transmission of the sharp recoil movement to the needle to permit a slight interval to elapse before the latter moves in response to the recoil of the gun. This interval, while slight, is sufficient to complete the record of the aim, showing the position of the needle at the instant of firing and before the recoil of the gun. To this end the weight h^7 is attached to the needle to increase the mass and inertia thereof, being preferably secured near the free end thereof, thereby permitting the use of a comparatively small weight. The proportions between the weight h^7 and the spring h^4, are such that the needle is caused to seat against the circular guide h^5 and follow all normal movements of the gun, but on sudden or sharp movement of the latter, as on recoil, the mass of the needle is too great to permit it instantly to follow the gun and the yielding connection afforded by the spring h^4 permits it to remain for an instant in the position assumed prior to recoil, the edges of the guide h^5 momentarily withdrawing from the shank of the needle. The needle is stationary only for a moment, for the spring quickly seats it again against the guide h^5 and it assumes a position corresponding to that assumed by the gun after recoil. The interval, however, is sufficient to permit completion of the record and to eliminate the effect of recoil therefrom.

Since the recoil of the gun will normally be away from the support, and the gun will normally be held by the marksman a little above and to the left of the gyratory rod *c*, when looking toward the target, the guide h^5 is cut away in the manner shown in Fig. 7, to permit the advance movement of the gun over that of the needle to take place freely in the direction of probable gun recoil.

While I have referred to the use of blank ammunition as a simple means to produce the effect of explosion and recoil, it will of

course be understood that any method of producing or initiating the actual conditions of firing, or any one or more of those conditions, may be employed, the employment of my invention, however, resulting in the accurate record of the aim under firing conditions.

A limiting frame h^8, similar to that described in my prior patent, may here be employed to confine the movement of needle point to the face of the target, permitting, however, excess movement of the gun in the hands of the marksman through displacement of the ball h' from its seat, which the yielding of the spring, h^4, will allow should the gun be moved after restriction of needle movement by the limiting frame.

The secondary target, i, upon which record is made, is carried in the movable holder j. The latter is secured to the target pin, j', which is slidable in the bracket j^2 upon the gun carrier e, and is fastened to the end of the armature lever j^3. The opposite end of the lever j^3 is loosely fulcrumed upon the screw j^4, secured to the frame of the magnet j^5, the latter being adapted, when energized to attract the armature lever j^3 and force the target holder with its contained target from its normal position shown in Fig. 4, against the needle point to effect record of the aim. An adjusting screw, $j^\times$, permits adjustment of the armature relatively to the magnet j^5. The target is automatically returned to its normal position, and there maintained, by the tension spring j^6, secured to the finger j^7, the latter being attached to the armature lever j^3, thus automatically re-setting the target in position for another record.

It will be noticed that the face of the target holder is curved to correspond generally with the arc described by the needle point in its upward or downward movement. This causes a puncture or record to be made in one of the outer rings of the marking under the same conditions as a record on the bull's-eye, for the face of the target at that point, is also perpendicular to the needle and at the same distance therefrom. The target holder may also be curved laterally, or in other words be made truly concave, but for simplicity of construction, and also because the majority of shots are vertically displaced, rather than laterally displaced from the bull's-eye, I have shown the holder with a vertical curvature only.

In using a series of targets it is desirable that the marking on each successive target should have the same relation to the target holder and to the needle, in order to avoid the necessity of adjustment of the apparatus with each fresh target used. In practice it is found convenient accurately to gage the marking upon the target with reference to one of the target edges and to rely upon the proper seating of that edge against a wall in the target holder to insure repeatedly the same relation between the target marking and the needle.

Referring particularly to Fig. 5, the target marking is accurately located with reference to the edge i' of the target and said edge is caused to engage with the walls j^9 of a slot at the right-hand edge of the holder j, as seen in Fig. 5; the opposite edge of the holder having a corresponding slot, but provided with a spring j^8. The walls of the slot beneath the spring j^8 are cut away to permit the latter to lie within the same and act as a yielding wall engaging the edge i^2 of the target to press the latter against the locating edge i', thus insuring a fixed and definite position of the target marking relatively to the needle, irrespective of slight variations in size of successive members of a target series.

The holder j is provided with depending lugs j^{10}, which are in sliding contact with the guide j^{11} upon the carrier e thereby to guide the target holder in its movement and prevent the displacement thereof.

Flexible conductors k and k' connect the battery, which herein is located near the base of the pedestal f with the magnet j^5 and the circuit closing device L upon the gun. A plug and socket connection k^2 is employed between the conductors where they emerge from the pedestal. The conductors then pass to the carrier e and enter the hollow interior thereof to connect with the magnet and lead thence to a similar plug and socket switch k^3, the socket member of which is secured to the jointed holder b and the plug member to flexible conductors leading into the body of the gun and to the contacts l and l' in the contact mechanism L. Thus the connections between the gun and the carrier, or the carrier and its pedestal, may be easily made or broken for the purposes of transportation or to permit substitution of a new gun or a new carrier.

Referring to Fig. 12, the plug member k^4 of the plug switch has threaded into its tip an insulating bushing k^5, into which is threaded in turn the projecting stud k^6 of conducting material. The said stud is bored to permit one of the plug connecting wires, which enters a central hole k^7 in the plug cap, to be drawn through the stud and the bared and bunched end thereof secured by the set screw k^8 threaded into the tip of the stud. A similar connection is made between the other plug connecting wire and the body of the plug by drawing the said wire through the central opening, k^7, and into the lateral hole $k^{8\times}$, where it is secured by the screw k^8. The socket member which is of insulating material is bored and counterbored to receive the plug tip and the insulated projecting stud and is recessed and cut away at k^{10} and k^{11} to receive the contacts k^{12} and k^{13}, respectively, connected to the socket connecting wires and

adapted to contact, when the plug is seated in the socket, with the plug body and the stud k^6, respectively, thereby to complete the circuits.

Referring to the contact and firing mechanism shown in Figs. 1 and 3, the contacts l and l' are closed and record thereby made through the medium of an actuating pin l^2 attached to the firing pin of the gun so that it moves immediately on release of the latter to force the piston l^3 from the dotted line position indicated in Fig. 3 into the full line position within the cylinder l^4. The cylinder l^4 communicates with the passage l^5 in which is a sliding block l^6 attached to the washer l^7, of fiber or other insulating material, the latter resting upon the contact spring l', and the closed or firing position of the contact spring, washer and block being that shown in Fig. 3. When the trigger is pulled, the initial movement of the firing pin causes a compression of the air in the cylinder l^4, and the connecting passages, and the downward displacement of the block l^5, resulting in instantaneous contact between the contact springs l and l', and the immediate energization of the magnet j^5 and movement of the target holder j. The cylinder l^4 and its connecting passages are such that there is sufficient leakage of the compressed air therein to permit rapid restoration of the block l^5 and contact spring l' to the normal open circuit position indicated by dotted lines in Fig. 3, but not until an interval has elapsed to prolong the excitation of the magnet j^5 sufficiently to insure the full movement of the holder j and the completion of the record upon the contained target. A spring l^8 is employed to force the cylinder l^3 outward and maintain it in contact with the pin l^2. The form of record controlling mechanism here described is effective in producing a particularly rapid action of the recording mechanism on the pulling of the gun trigger, for the initial movement of the firing mechanism, immediately on release by the trigger, produces the controlling impulse which causes record to take place, without waiting for the final movement thereof, as is the case in the controlling mechanism of my prior patent where the controlling circuit is not closed until the firing pin is seated or nears its seat.

Referring to Figs. 4 and 9 there is illustrated an improved form of connection between the gun and the gyratory rod. The gun is connected to the gyratory rod through the jointed holder b, the lower member of which is caused to span the bracket d of the carrier, the rear of the holding member being broken away in Fig. 4. Each depending end of the holder is provided (Fig. 9) with a seat b', preferably of Babbitt or other fusible metal, within which is seated the sliding ball b^2 retained in its position upon the holder b by the spring b^3 secured to the holder. Each ball b^2 has a sliding fit upon the gyratory rod, but is also capable of a slight relative movement within its seat. I have found that while the wide span of the holder b brings the latter into exact alinement with the rod c, the ball joint described permits the holder in its sliding movement to conform to any slight irregularities in the length of the rod, greatly facilitating the holder movement and reducing the friction thereof.

Referring particularly to Figs. 1, 2, and 4, I have shown a tension spring m secured to the overhanging end of the yoke g and employed to counterbalance the comparatively small weight of the needle and its connected parts; substantially the entire weight of the parts connected to the gun, however, is sustained by the single counterweight m^2, carried by the overhanging lever m^3, fulcrumed on the upright support m^4, the opposite end of the said lever being secured by the flexible chain m^5 to the upper joint of the holder b at a point which is substantially at or over the center of gravity of the system of following parts. I have found in practice that this system of counterweighting provides an efficient counterbalancing means for the purpose described in my prior patent aforesaid, and it also avoids the somewhat distracting effects of a plurality of counterweights attached at different points in the system of connections, it having been found in practice that separate counterweights assume movement at different periods and sometimes produce the effect of a series of jerks when the marksman moves his gun rapidly or through a wide arc.

Referring to Figs. 1, 4 and 10, it will be observed that the carrier e removably rests upon the tapered stud n threaded into the top of the pedestal f. To secure the carrier thereto and prevent the same from tipping upward should any weight be applied to the rear of the carrier, I have provided the latch o, secured to but slidable on the bottom of the plate p which is attached to the carrier, the said latch being adapted to be moved to engage with a necked portion on the stud n (Fig. 4) when the carrier is placed on the pedestal. The latch may readily be withdrawn by the upturned end o'.

It will be obvious that my invention is susceptible of extensive modification over the form, arrangement of parts and details herein described and illustrated. Furthermore, it will be evident that the various improvements herein described may have extensive application beyond that herein referred to, but obvious to those skilled in the art.

Claims.

1. In a target practice apparatus, an aiming device, a follower to follow the aiming movement thereof, aim recording means and

means for retarding the effect upon the follower of a sudden recoil movement of the aiming device.

2. In a target practice apparatus an aiming device subject to recoil, a follower, and means coöperating therewith to effect a substantially accurate record of the aim at the instant of firing free from the recoil effect of the said aiming device.

3. In a target practice apparatus, an aiming device, a follower to follow the aiming movement thereof, aim recording means and means for retarding the effect upon the follower of a sudden impulse of said aiming device due to the recoil.

4. In a target practice apparatus, an aiming device subject to recoil, a follower for following the aiming movement thereof, means coöperating with said follower to indicate the aim of said aiming device, and means substantially to eliminate the effect of recoil from the indicated aim.

5. In a target practice apparatus, an aiming device, a follower to follow the aim thereof, said follower having means to provide a retarded movement relative to the recoil movement of the aiming device.

6. In a target practice apparatus, an aiming device and a weighted follower to follow the aiming movement thereof, whereby the follower has a retarded movement in response to the recoiling movement of the aiming device.

7. In a target practice apparatus, an aiming device, a weighted follower, and a yielding connection between said follower and aiming device, whereby the follower has a retarded movement in response to the recoiling movement of the aiming device.

8. In a target practice apparatus, an aiming device having firing mechanism and subject to recoil, a follower to follow the aim thereof, and recording means operated by the said firing mechanism to record the aim of said aiming device at the time of firing a charge, said recording means including devices to effect said record prior to the recoil movement of the said follower.

9. In a target practice apparatus employing an aiming device, means for firing ammunition therein and means independent of the issuance of the projectile for effecting a record of the aim taken by the marksman at the instant of firing before recoil, said movement being free from the effect of the recoil of the aiming device.

10. In a target practice apparatus employing an aiming device, means for simulating the gun recoil of actual practice and means independent of the issuance of the projectile for effecting a record of the aim taken by the marksman at the instant of firing and before recoil, said record being free from the effect of recoil.

11. A target practice apparatus having an aiming device subject to recoil, a follower, and means permitting a recoil movement of the aiming device without immediate corresponding movement of the follower.

12. A target practice apparatus having an aiming device subject to recoil, a follower, and means permitting a recoil movement of the aiming device in the direction of recoil without immediate corresponding movement of the follower.

13. A target practice apparatus provided with an aiming device, and a follower, and means permitting said aiming device to have an advanced movement over the follower in the direction of recoil.

14. A target practice apparatus provided with an aiming device, a recording member adapted to follow the movement thereof and a movable self-resetting target with which said recording member is adapted to engage.

15. A target practice apparatus having an aiming device, a follower to follow the aim thereof, and recording means including a target and electrical means positively to move the same to effect a record of the aim.

16. A target practice apparatus having an aiming device, a follower, a target, means for moving said target toward said follower and means for automatically maintaining said target normally at its position farthermost away from the follower.

17. In a target practice apparatus the combination with an aiming device, a recording member, and a relatively movable recording medium, electrical means for moving said recording medium to a recording position with reference to said recording member, and means automatically to restore said recording medium to its normal position.

18. In a target practice apparatus an aiming device, a follower, electrically actuated recording means, and pneumatic means associated with the firing mechanism of said aiming device to control the electrical actuation thereof.

19. A target practice apparatus having an aiming device a target or other object to be aimed at, a secondary target or reference object, recording means actuated through movement of the firing mechanism for recording the aim thereof upon the secondary target, and means for prolonging the recording impulse at the time of firing, thereby to insure the completion of the record.

20. A target practice apparatus having an aiming device adapted to be aimed at a target or other like object, a secondary target or reference object, recording means for recording the aim thereof upon the secondary target, electrical controlling means for said recording means associated with and actuated by the firing mechanism of said aiming de-

vice, and means for prolonging the action of said controlling means to insure completion of the record.

21. In an apparatus of the class described, the combination with an aiming device adapted to be aimed at a target or other like object, a secondary target or reference object, firing mechanism upon the same, recording means for recording the aim of said device upon a secondary target, and means for actuating said recording means upon the initial movement of the firing mechanism.

22. In an apparatus of the class described, the combination of an aiming device, electrically controlled recording means, and pneumatic means connected with the firing mechanism of said aiming device to control said electrical recording means.

23. In an apparatus of the class described the combination of an aiming device, electrically actuated recording means, electrical contacts in control of the same and adapted to be closed on movement of the firing mechanism, and means to prolong the closing thereof.

24. In an apparatus of the class described an aiming device a recording member having a retarded movement relative to the movement of the aiming device, and recording means having a prolonged period of actuation.

25. In an apparatus of the class described the combination with a following device and following means following the aim thereof, of counterbalancing means to relieve the marksman of the weight of the connected parts when in the act of aiming said device, said counterbalancing means engaging the connected parts at a single point.

26. In an apparatus of the class described the combination with an aiming device and following means to follow the aim thereof, of a single counterbalancing means to counterbalance substantially all the weight of the connecting parts.

27. In an apparatus of the class described, the combination with an aiming device of a rod along which said aiming device is adapted to slide, and means for adapting the sliding fit of said aiming device to irregularities in the rod.

28. In an apparatus of the class described, the combination with an aiming device, of a support therefor, a rod along which said support is adapted to slide and connections between said rod and support, including a ball joint slidably mounted on said rod.

29. In an apparatus of the class described an aiming device, means for following the movements and recording the aim thereof; a target holder adapted to receive a secondary target for the record of the aim and provided with a yielding wall to contact with said target and aline the same in the holder.

30. In an apparatus of the class described, an aiming device, means for following the movements and recording the aim thereof; a target holder, means for removably holding a target therein for the record of the aim, and means for insuring contact of a target edge with a wall of said holder, thereby to insure the assumption of a predetermined position by said target relatively to said holder.

31. In an apparatus of the class described the combination with an aiming device of a carrier therefor, a support for said carrier, an electric circuit passing between said aiming device, carrier and support, and means for making and breaking said circuit at will for the removal of said device from said carrier or from said support.

32. In an apparatus of the class described, the combination with an aiming device and means for recording the aim thereof, a carrier for the aiming device, a tapered support upon which said carrier is removably held, and sliding latch means for locking said carrier to said support.

33. In a target practice apparatus the combination with an aiming device adapted to be aimed at a main target, a secondary target, a follower to follow the aiming movement of the gun relatively to said secondary target, and means for effecting a record of the aim upon said secondary target, said secondary target presenting a curved face to said follower.

34. In an apparatus of the class described, an aiming device for aiming at a main target, a follower for following the aiming movement thereof, recording means, and inertia means to render said follower irresponsive to a sudden movement of the aiming device before completion of the record.

35. A target practice apparatus having an aiming device subject to recoil, a follower connected with the aiming device, and means permitting a recoil movement of the aiming device without immediate corresponding movement of the follower.

36. A target practice apparatus having an aiming device subject to recoil, a follower connected with the aiming device, and means permitting a recoil movement of the aiming device in the direction of recoil without immediate corresponding movement of the follower.

37. A target practice apparatus of the class described, having an aiming device, a follower to follow the aim of said aiming device, and means connected with said follower to retard the following movement thereof consequent upon the recoil movement of said aiming device.

38. In a target practice apparatus of the class described, an aiming device having a gyratory follower to follow the aim of said aiming device provided with means to increase the mass and inertia of said follower for varying its responsiveness to the move-

ment of said aiming device upon recoil of the latter.

39. In a target practice apparatus of the class described, an aiming device subject to recoil, a gyratory needle, means connected with said aiming device having a disengageable connection with said needle, and means connected with the latter for normally holding it in engaging and operative relation with said needle to cause the latter normally to follow the aiming movements of said aiming device and its connecting means, but permitting disengagement and retarded movement of said needle upon recoil movement of said aiming device.

40. In a target practice apparatus of the class described, an aiming device subject to recoil, a gyratory needle, means connected with said aiming device having a disengageable connection with said needle, and means connected with the latter for normally holding it in engaging and operative relation with said needle to cause the latter normally to follow the aiming movement of said aiming device and its connecting means, but permitting disengagement and retarded movement of said needle upon recoil movement of said aiming device, said means including a spring connecting said follower with a point on said needle at one side of its center of gyration.

41. In a target practice apparatus of the class described, an aiming device subject to recoil, a gyratory needle, means connected with said aiming device having a disengageable connection with said needle, and means connected with the latter for holding it in engaging and operative relation with said needle to cause the latter normally to follow the aiming movement of said aiming device, and its connecting means but permitting disengagement and retarded movement of said needle upon recoil movement of said aiming device, said means comprising a spring connecting said needle and said follower and a weight carried by said needle at one side of its center of gyration.

42. In a target practice apparatus of the class described, a support having a tapered stud, N, a carrier pivoted thereon, a plate, *p*, adjustably secured to said carrier, and a latch, *o*, slidably mounted on said plate for locking said carrier to its support.

43. In a target practice apparatus of the class described, an aiming device, a holder therefor, a support, a follower pivoted thereon having balls b^2 adapted to fit in sockets formed in said holder, and yielding means, b^3, for retaining said balls in said sockets.

44. In a target practice apparatus of the class described, an aiming device, a target holder provided with side flanges, edge forming grooves for retaining a target therein, one of said flanges having an edge slot, and a spring having a portion yieldingly maintained in said slot and adapted to engage the edge of an inserted target and center it in said holder.

45. In a target practice apparatus of the class described, an aiming device, a gyratory needle to follow the aim thereof, and means connected with said aiming device for guiding said needle and causing it to follow the aim of said aiming device, said means including a needle guide h^5 having an opening, h^6, of approximate V-shape, the needle engaging sides or edges of said opening diverging outwardly and downwardly, away from said aiming device.

46. In an apparatus of the class described, the combination with an aiming device, of means for recording the aim thereof, including a member having a retarded movement.

47. In an apparatus of the class described, the combination with an aiming device, of a single counter-balancing means to counterbalance substantially all the weight of the connected parts.

48. The combination with an aiming device to be taken in the hands of the marksman and given a free aiming movement at a main target or other object, and aim recording mechanism comprising a card or other recording member upon which record of the aim may be effected, and a pointed following member having a movement corresponding to that of the aiming device, while the latter is in the hands of the marksman, one of said members being mounted for free sliding movement toward the other but normally out of contact therewith, a member to actuate said sliding member and cause said pointed following member to embed itself in the recording member, devices connected with the trigger of said aiming device for moving said actuating member against the sliding member to effect movement of the latter, and a spring to retract the sliding member to its normal position where it is again adapted to be moved by the actuating member on the pulling of the trigger.

49. In a target practice apparatus, an aiming device subject to recoil, a follower and means coöperating therewith to effect a substantially accurate record of the aim subsequent to the recoil of the aiming device but prior to the consequent following movement by the follower.

50. The combination with an aiming device to be taken in the hands of a marksman and given a free aiming movement at a main target or other object, and aim recording mechanism comprising a recording member upon which record of the aim may be effected, and a pointed member having a movement corresponding to that of the aiming device, one of said members being mounted for free sliding movement toward the other, but normally out of contact therewith, a trigger and a trigger actuated member to cause said pointed member to embed itself in the re-

cording member, and automatic retracting means to retract the sliding member to its normal position where it is again adapted to be moved on the pulling of the trigger.

51. In an apparatus of the class described, the combination with the aiming device *a*, of the follower needle *h*, the sub-target *i*, positioned coöperatively with relation thereto, connections *g* and h^4 between the needle and the aiming device, and the weight h^7 attached to the needle.

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

HENRY H. CUMMINGS.

Witnesses:
RALPH C. POWELL,
THOMAS B. BOOTH.