

No. 878,359.

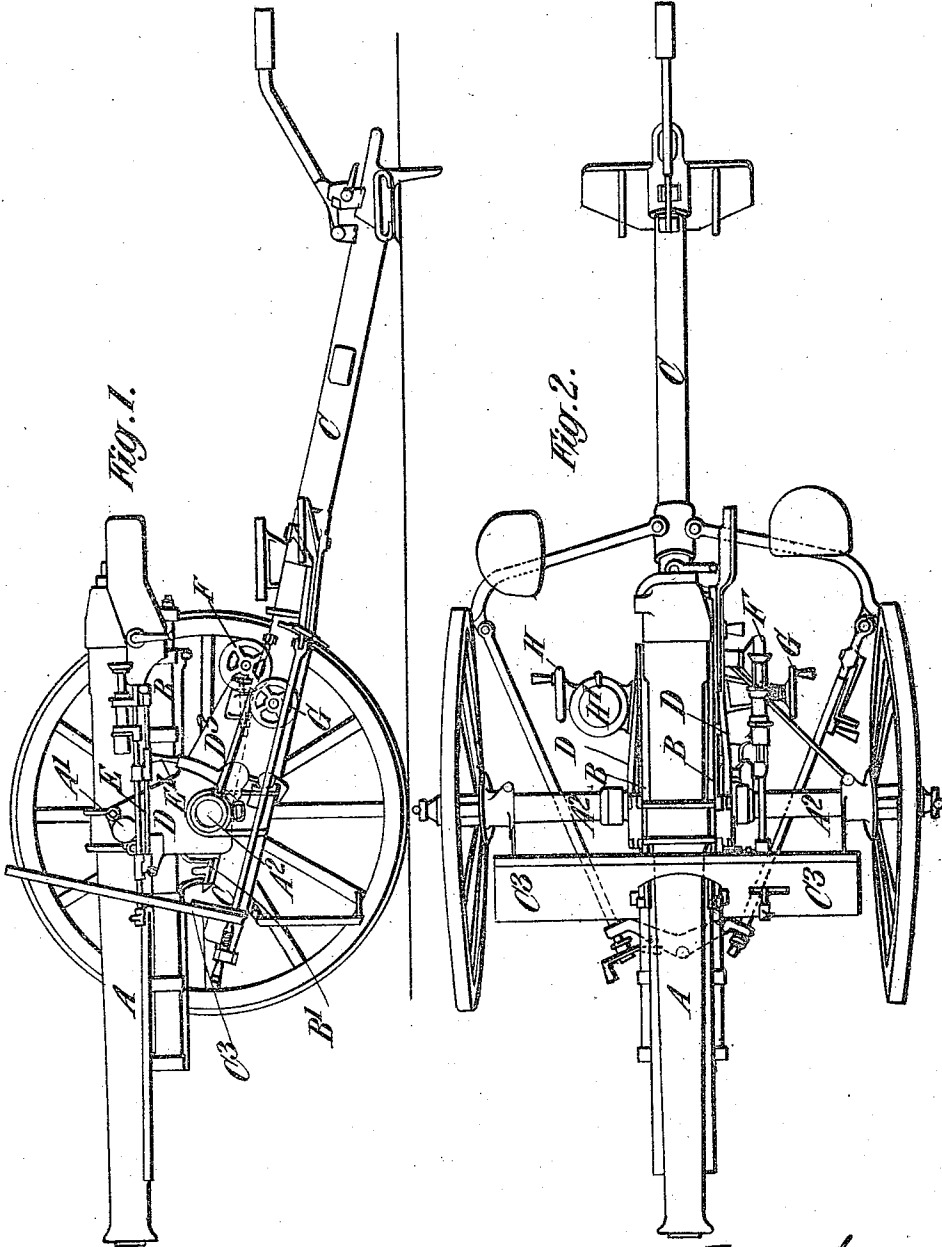
PATENTED FEB. 4, 1908.

A. T. DAWSON & G. T. BUCKHAM.

FIELD GUN CARRIAGE.

APPLICATION FILED JAN. 6, 1906.

5 SHEETS—SHEET 1.



Witnesses.  
*M. L. Boggs*  
*Robert Coville*

Inventors,  
*Arthur T. Dawson.*  
*George T. Buckham.*  
By *James L. Norris*  
*Att'y.*

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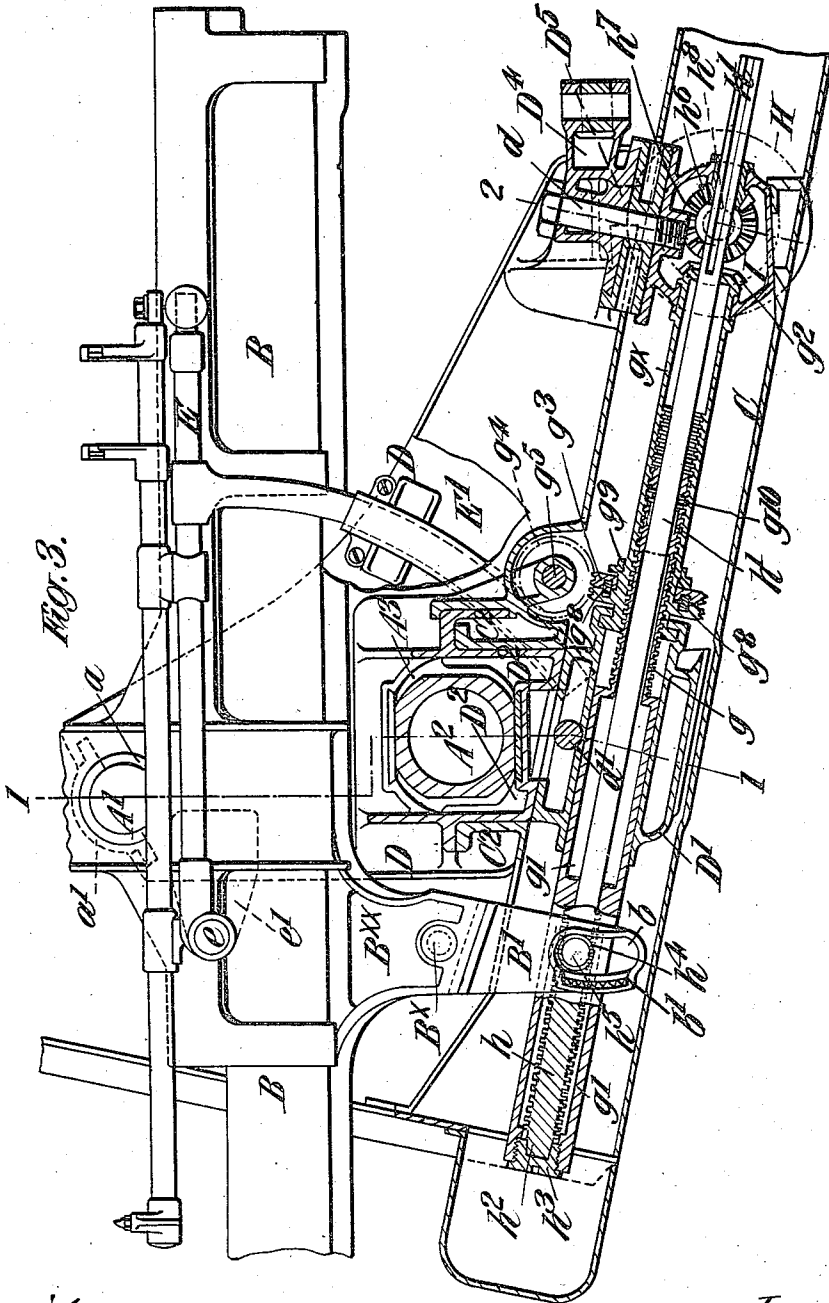
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FIELD GUN CARRIAGE.

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5 SHEETS—SHEET 2.



Witnesses.  
W. L. Brown  
Robert Covett,

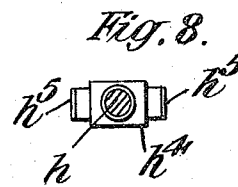
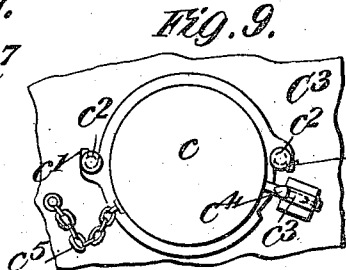
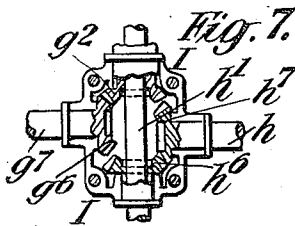
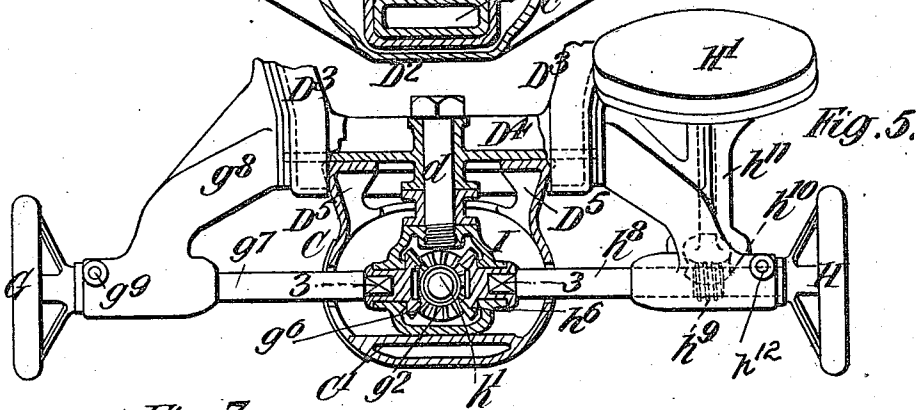
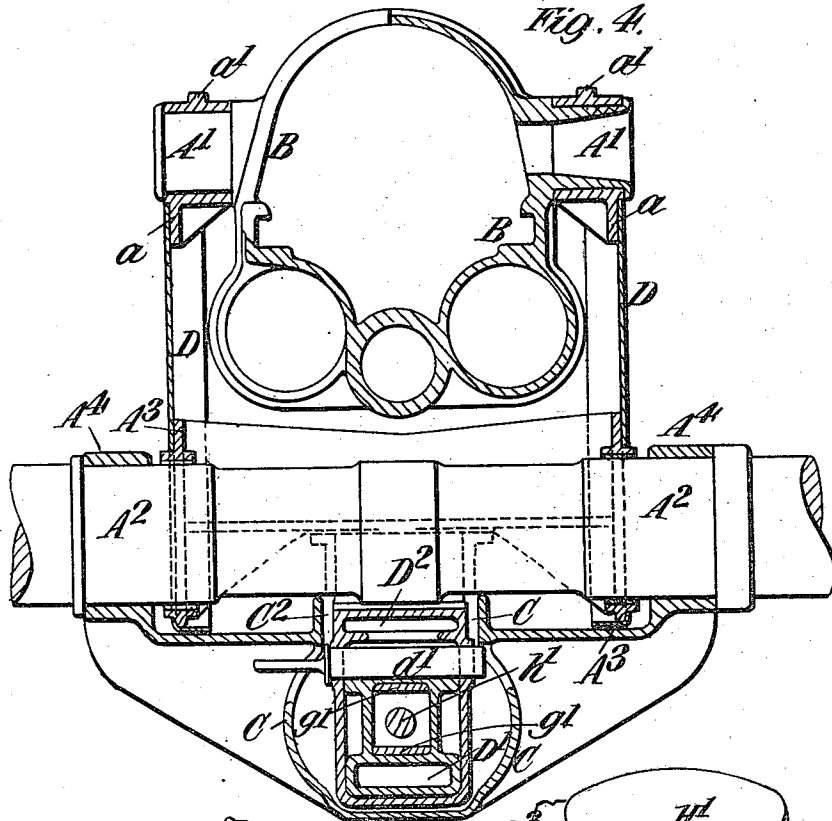
Inventors.  
Arthur T. Dawson,  
George T. Buckham.  
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FIELD GUN CARRIAGE.

APPLICATION FILED JAN. 6, 1905.

5 SHEETS—SHEET 3.



Witnesses,  
*W. T. Bryan*  
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Inventors,  
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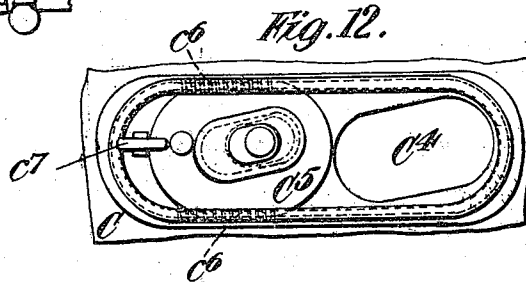
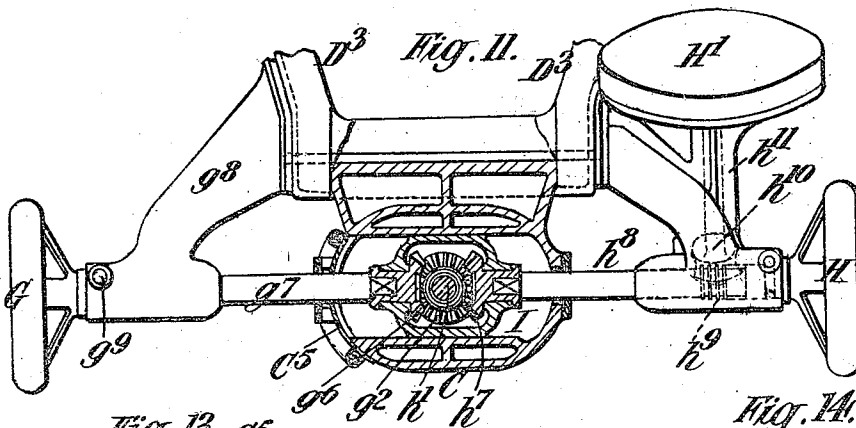
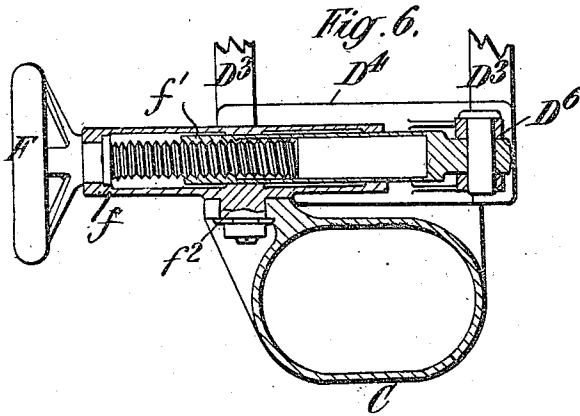
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FIELD GUN CARRIAGE.

APPLICATION FILED JAN. 6, 1905.

6 SHEETS—SHEET 4.



Witnesses.  
H. I. Progan  
Robert Condit

Inventors.  
Arthur T. Dawson.  
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Atty.

No. 878,359.

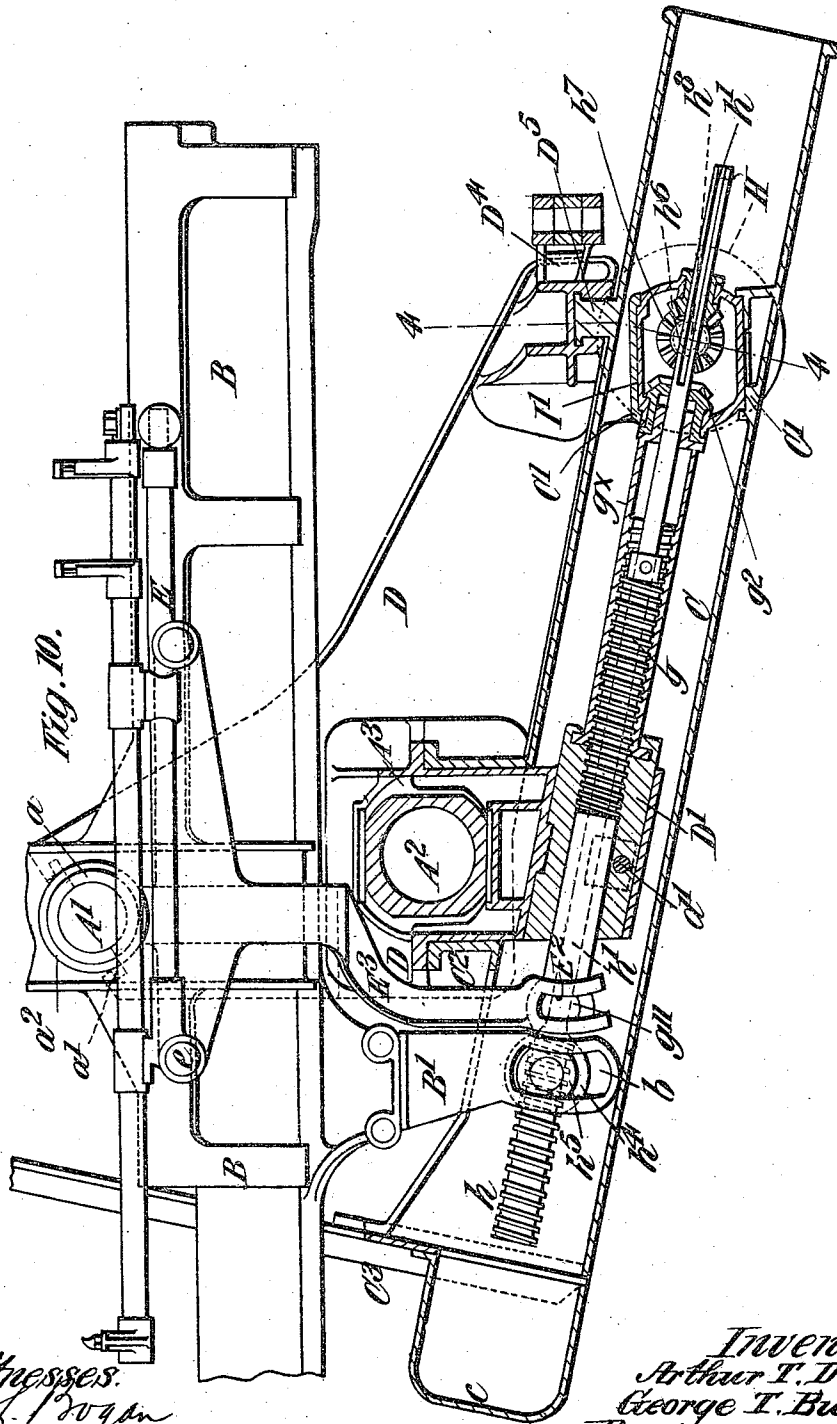
PATENTED FEB. 4, 1908.

A. T. DAWSON & G. T. BUCKHAM.

FIELD GUN CARRIAGE.

APPLICATION FILED JAN. 6, 1905.

6 SHEETS—SHEET 5.



Witnesses.  
W. L. Brown  
Robert Smith.

Inventors:  
Arthur T. Dawson,  
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By James La Norris,  
Att'y.

# UNITED STATES PATENT OFFICE.

ARTHUR TREVOR DAWSON AND GEORGE THOMAS BUCKHAM, OF WESTMINSTER, LONDON, ENGLAND, ASSIGNORS TO VICKERS SONS & MAXIM LIMITED, OF WESTMINSTER, LONDON, ENGLAND.

## FIELD-GUN CARRIAGE.

No. 878,359.

Specification of Letters Patent.

Patented Feb. 4, 1908.

Application filed January 6, 1905. Serial No. 239,928.

To all whom it may concern:

Be it known that ARTHUR TREVOR DAWSON, lieutenant of the Royal Navy, director and superintendent of Ordnance Works, and GEORGE THOMAS BUCKHAM, engineer, both subjects of the King of Great Britain, residing at 32 Victoria street, Westminster, in the county of London, England, have invented certain new and useful Improvements in and Relating to Field-Gun Carriages, of which the following is a specification.

This invention relates to field gun carriages and has for its chief object to so construct and arrange the gear for elevating and ranging the gun, that the said gear shall be effectually protected from blows and as far as possible completely inclosed. For this purpose we locate the pointing or elevating screw and the ranging screw within the trail so that they lie longitudinal with respect thereto, the said screws being connected with arms or brackets forming part of the gun-cradle and the sight-bracket respectively. The traversing gear is inclosed in a casing connected with the top carriage and trail. The hand wheels for actuating the elevating and ranging screws are situated at opposite sides of the trail and are operated one independently of the other. The hand-wheel for actuating the traversing gear is preferably situated on the same side of the trail as that occupied by the elevating hand-wheel.

The sight is worked directly from the pointing or elevating gear, the sight proper being fixed in a rigid but vertically adjustable arm or bracket in order to minimize back-lash and reduce the number of bearings or parts through which motion is transmitted to the sight and gun cradle so that when the gun has been laid on the target it will not require relaying after firing, as is at present oftentimes necessary owing to the slackness of a large number of movable parts or joints.

In order that our said invention may be clearly understood and readily carried into effect we will describe the same more fully with reference to the accompanying drawings in which:—

Figure 1 is a side elevation and Fig. 2 a plan of a field gun carriage provided with our improvements; one of the carriage-wheels having been removed in Fig. 1 for sake of clearness. Fig. 3 is a longitudinal central section on a larger scale showing, more par-

ticularly, one arrangement of the elevating and ranging screws within the trail and their connection with the gun-cradle and sight-bracket. Fig. 4 is a transverse vertical section taken approximately on the line 1. 1. of Fig. 3. Fig. 5 is a transverse section taken approximately on the line 2—2 of Fig. 3. Fig. 6 is a vertical section of the traversing gear inclosed in its casing. Fig. 7 is a horizontal detail section on the line 3. 3 of Fig. 5. Fig. 8 is an elevation of the nut of the ranging screw. Fig. 9 is a front view of a door and its fastening at the forward end of the trail. Fig. 10 is a longitudinal central section, similar to Fig. 3, showing an alternative arrangement of the aforesaid elevating and ranging screws. Fig. 11 is a transverse section taken approximately on the line 4. 4. of Fig. 10. Fig. 12 is a side elevation of a door at the side of the trail and Fig. 13 is a sectional plan of the fastening device used therewith to keep this door in the open position when required. Fig. 14 is a transverse section of the nut of the ranging screw employed in the arrangement shown in Fig. 10.

Like letters of reference indicate similar parts in all the figures.

A is the gun and B the cradle in which it recoils.

C is the trail.

D is the top carriage in which the cradle B is trunnioned.

E is the sight bar or bracket.

F is the hand wheel of the traversing or training gear, G the hand wheel of the elevating gear and H the hand wheel of the ranging gear.

Referring more particularly to Figs. 1 to 9,  $g$  is the pointing or elevating screw and  $h$  is the ranging screw. These two screws are arranged co-axial with respect to each other and are located longitudinally within the trail C which is made tubular or hollow in cross-section. The threads of the elevating screw are formed on the exterior of the cylindrical rear end of a slotted sliding bar  $g^1$  which is cylindrical in cross-section and is adapted to slide longitudinally in a bearing  $D^1$  that is situated inside the trail and forms part of or is connected with the vertical pivot  $D^2$  of the top carriage D. The said threaded cylindrical end of the elevating screw engages with corresponding threads formed on the interior of a sleeve or long nut  $g^x$  which terminates at the rear end in a bevel pinion  $g^2$

or has a square end fitting into a corresponding recess in the said pinion  $g^2$ . The said nut has near its forward end a worm  $g^3$  that gears with a worm wheel  $g^4$ , which is mounted on an axle  $g^5$  carrying a toothed pinion that engages with a toothed segment  $E^1$  extending downwardly from the sight bar E, so that by the rotary movement of the nut  $g^x$ , the sight bar is angularly displaced about its pivot  $e$  (which is carried by a bracket  $e^1$  affixed to the top carriage) and thus changes the angle of elevation of the sights.

The threads of the ranging screw  $h$  are formed on the exterior of the forward end of a spindle  $h^1$  which extends through the elevating screw  $g$ , its sliding bar  $g^1$ , and its nut  $g^x$ , the said forward end being provided with a cylindrical extremity  $h^2$  rotatably mounted in a screw threaded plug  $h^3$  which is carried by the sliding bar  $g^1$  and serves as a bearing for the said forward end of the ranging screw. Engaging with the threads of the said ranging screw is a nut  $h^4$  having trunnions  $h^5$  that enter slots  $b$  in a forked arm or bracket  $B^1$  projecting from the underside of the gun-cradle B, said arm being situated at a point in advance of the gun trunnions  $A^1$  and operating by its movement to angularly displace the gun about said trunnions for changing the angle of elevation when the said ranging screw is revolved and the nut  $h^4$  thereby traversed along the screw. The rear end of the said spindle  $h^1$  of the ranging screw extends through a bevel pinion  $h^6$  which has a feather engaging with a groove in said spindle, so as to permit the latter to slide without becoming disconnected from the pinion  $h^6$ . Gearing with the respective pinions  $g^2$  and  $h^6$  are pinions  $g^6$  and  $h^7$  which are respectively connected with transverse shafts  $g^7$   $h^8$ , the shaft  $g^7$  carrying the elevating hand wheel G and the shaft  $h^8$  carrying the ranging hand wheel H.

The aforesaid bevel pinions  $g^2$  and  $h^6$   $g^6$  and  $h^7$  are mounted in bearings formed in a box or casing I which is attached to the cross piece or segment  $D^4$  of the rearwardly extending arms  $D^3$  of the top carriage, by means of a screw bolt  $d$ . This box or casing is adapted to slide on a segmental surface  $C^1$  within the trail, which surface through the intervention of the box or casing I, partly supports the said segment  $D^4$  of the top carriage. The segment  $D^4$  is further guided and supported by a T-bar  $D^5$  which is formed on the top of the trail and which engages with a corresponding radial slot in the segment  $D^4$ .

The top carriage has two side pieces or cheeks to which are fixed the trunnion-bearings  $a$  and cap squares  $a^1$ . The axis of the trunnions is arranged at a suitable angle to the horizontal for giving the usual permanent drift allowance. Underneath the trunnions and attached to the top-carriage side-pieces or cheeks is the pivot  $D^2$  around which

the gun-cradle and top carriage turn. This pivot fits into a bearing or recess  $C^2$  in the trail, or in a bracket secured to the trail, and is made so that the top carriage is supported both laterally and vertically by the pivot. The upper surface of the bearing  $C^2$  may be fitted with roller or ball bearings if desired.

The aforesaid bearing  $D^1$  for the elevating and ranging screws is connected with the pivot  $D^2$  by a transverse bolt  $d^1$  so that it may, by the removal of said bolt, be disconnected from the pivot. When the said bolt is in place it firmly secures the bearing to the pivot so that when the gun and its cradle are traversed, the said bearing and the elevating and ranging screws  $g$   $h$ , and the parts immediately connected therewith, move around the axis of said pivot which is situated vertically with respect to the axis of the wheel-axle  $A^2$ .

The segment  $D^4$  which the top carriage has at the rear end, is provided with traversing gear (see Fig. 6) comprising a hand wheel F which operates to revolve a screw located within a casing  $f$  and which gears with a screw nut  $f^1$  adapted to slide in said casing. The casing is pivoted at  $f^2$  to the trail and the end of the stem  $f^1$  is pivotally connected with a projection  $D^6$  on the segment  $D^4$  of the top carriage, thereby enabling the said carriage to be traversed about the axis of the pivot  $D^2$  when the hand wheel F is operated. Instead of a screw nut and screw stem we may employ a worm and rack arrangement as is well understood. The top carriage has an opening at each side through which the wheel-axle  $A^2$  passes, and these openings are provided with brushes  $A^3$ , so that when the top carriage is moved by the traversing gear, these bushes slide on the axle, and also prevent the top carriage from rising when the gun is fired.

At each side of the trail is a bracket  $A^4$  through which the axle passes, said axle being securely attached to the trail by means of a collar and nut in the usual way. The said brackets may either be part of the trail as shown in Fig. 4 or be rigidly fixed to it, or they and the center pivot bearing may be in one piece connected to the trail.

In connection with the ranging gear, which is operated by the right-hand-side hand-wheel H, is a large graduated drum or disk  $H^1$  on which is marked the range in the usual manner. This drum is actuated from the ranging gear screw by a worm  $h^9$  on the spindle  $h^8$  (see Fig. 5) gearing with a worm wheel  $h^{10}$  on a spindle connected with the said drum and supported by a bracket  $h^{11}$  which is fixed to the outside of the top carriage in a convenient position for the drum to be seen by the manipulator of the ranging gear hand-wheel. The said drum may lie with its face practically in a horizontal plane, as shown in the drawings and may be situ-

ated immediately above the ranging hand-wheel H.

In order to enable the elevating and ranging screws  $g$   $h$  to be readily removed from the trail, the shield  $C^3$  at the forward end of the trail is formed with an opening which is provided with a dome shaped door  $c$  having slotted lugs  $c^1$  for engaging with fixed studs  $c^2$  on the shield (see Fig. 9) by an angular movement, the said door being retained in its closed position by a spring catch  $c^3$  entering a notch in the door when the latter is turned into its fully closed position. The said catch has a thumb-piece  $c^4$  for enabling it to be disengaged with the notch. A chain  $c^5$  connecting the door with the trail, insures that said door shall not become completely detached or lost. When this door is removed from the opening in the shield, and the arm  $B^1$  disconnected from the cradle by removing the bolt  $B^x$  and the screw bolt  $d$  the transverse bolt  $d^1$  and the spindles  $g^7$   $h^8$  are detached, the two screws  $g$  and  $h$  together with the gear casing I can be withdrawn from the trail through said opening in the shield, for inspection or repair. In order to enable the said arm  $B^1$  to be disconnected as above stated, it is made in two sections or halves, one being situated at each side of the screw  $h$  and engaging with the said trunnions  $h^5$  and nut  $h^4$ . The upper ends of the said two sections or halves are adapted to enter a recess made in a projection  $B^{x^x}$  of the cradle and to be there secured by the said bolt  $B^x$ .

For the purpose of taking up backlash and preventing the sighting from being unduly disturbed on firing the gun, the aforesaid worm  $g^3$  is made in two parts with springs  $g^8$  interposed between them, the said parts being kept together by a nut  $g^9$  screwing into the long nut  $g^x$ . Similarly the threaded portion of the elevating screw  $g$  is made in two lengths with a spring  $g^{10}$  between them. Furthermore the slotted portion of the depending arm  $B^1$  that embraces the nut  $h^4$  may be provided with a resilient side  $b^1$  if required.

Referring now to Figs. 10 to 14, which show an alternative arrangement, the elevating screw  $g$  is formed at its forward end with lateral pins or projections  $g^{11}$  that engage with the slotted end  $E^2$  of an arm or bracket  $E^3$  depending from the sight bracket E which is adapted to swing vertically about bearings  $a^2$  provided outside the trunnion bearings  $a$ . In addition to providing an opening in the shield for the removal of the elevating and ranging screws, we have shown the trail formed with a lateral opening  $C^4$  (see Fig. 12) adjacent to the gear box or casing I, so that said box or casing can be removed through such opening if desired. This opening is normally kept closed by a sliding door  $C^5$  which is so arranged that it will close automatically by the action of

springs  $c^6$  when a catch  $c^7$  is released. In this case also the screw bolt  $d$  shown in Fig. 5, for connecting the aforesaid box or casing I to the segment  $D^4$  on the rearwardly extending arms  $D^3$  of the top carriage, is dispensed with, the connection being effected by means of the brackets  $h^{11}$  and  $g^8$  which are attached to the carriage cheeks, and the hand-wheel spindles  $g^7$  and  $h^8$  are secured to the brackets by means of large split pins  $g^{12}$  and  $h^{12}$ . This connection in conjunction with the turning action of the spindles  $g$  and  $h^1$  and the long nut  $g^x$  of the elevating screw, causes the casing I to traverse in unison with the top carriage around the pivot  $D^2$  and in this instance the casing may have a bearing surface above and below, working on corresponding surfaces  $C^1$  of the trail. In other respects the arrangement is similar to that already described.

What we claim and desire to secure by Letters Patent of the United States is:—

1. In a field gun-carriage, the combination with the gun-carriage, the sight-bar, the top-carriage and the trail; of a screw arranged longitudinally with respect to the trail and wholly within the same, means for actuating said screw, and means whereby its movement imparts angular motion to the gun-cradle about its trunnions.

2. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located longitudinally within the trail, an elevating screw co-axial with respect to said ranging screw, means for actuating the ranging screw, means for actuating the elevating screw, means whereby the actuation of the ranging screw imparts motion to the gun-cradle about its trunnions, and means whereby the actuation of the elevating screw imparts simultaneous motion to the said gun-cradle and sight-bar, substantially as described.

3. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located longitudinally within the trail, an elevating screw co-axial with respect to said ranging screw, means for actuating the ranging screw from one side of the carriage, means for actuating the elevating screw from the other side of the carriage, means whereby the actuation of the ranging screw imparts motion to the gun-cradle about its trunnions, and means whereby the actuation of the elevating screw imparts simultaneous motion to the said gun-cradle and sight-bar, substantially as described.

4. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located longitudinally within the trail, an elevating screw co-axial with respect to said ranging screw, toothed gearing located with-

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in the trail for operating said screws independently, means for actuating said toothed gearing from opposite sides of the carriage, means whereby the actuation of the ranging screw imparts motion to the gun-cradle about its trunnions, and means whereby the actuation of the elevating screw imparts simultaneous motion to said gun-cradle and sight-bar, substantially as described.

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5. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located longitudinally within the trail, an elevating screw concentrically situated around the ranging screw, a longitudinal bearing for the elevating screw situated within the trail and adapted to turn about the pivotal axis of the top-carriage, toothed gearing located within the trail for actuating the ranging screw, toothed gearing also located within the trail for actuating the elevating screw and the ranging screw simultaneously, means for operating the two sets of said toothed gearing independently of each other from opposite sides of the carriage, means whereby the actuation of the ranging screw imparts motion to the gun-cradle about its trunnions, means whereby the actuation of the elevating screw imparts simultaneous motion to the gun-cradle and sight-bar, a gear-casing carrying said two sets of toothed gearing and adapted to slide transversely within the trail, means for connecting said gear-casing with the rearward extension of the top-carriage, and means for traversing said top carriage about its pivot, substantially as described.

6. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located within the trail, an elevating screw concentrically situated around the ranging screw, a longitudinal bearing for the elevating screw situated within the trail and detachably connected with the pivot of the top-carriage, toothed gearing located within the trail for actuating the ranging screw, toothed gearing also located within the trail for actuating the elevating screw and the ranging screw simultaneously, means for operating the two sets of said toothed gearing independently of each other from opposite sides of the carriage, means whereby the actuation of the ranging screw imparts motion to the gun-cradle about its trunnions, means whereby the actuation of the elevating screw imparts simultaneous motion to the gun-cradle and sight-bar, a gear-casing carrying said two sets of toothed gearing and adapted to slide transversely within the trail, means for detachably connecting said gear-casing with the rearward extension of the top-carriage, means for traversing said top-carriage about its pivot, and means whereby access can be had to the interior of the trail for the removal

of the screws and their gearing substantially as described. 65

7. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located longitudinally within the trail, a depending arm on the gun-cradle, a trunnioned nut adapted to travel on the ranging screw and engaging with the said depending arm, an elevating screw concentrically situated around the ranging screw, a longitudinal bearing for the elevating screw situated within the trail and adapted to turn about the pivotal axis of the top-carriage, a rotary nut engaging with the elevating screw and adapted to cause it and the ranging screw to slide in the aforesaid longitudinal bearing, gearing connecting said nut with the toothed segment of the sight-bar, toothed gearing for actuating the elevating screw and the ranging screw from opposite sides of the carriage, a gear-casing carrying said toothed gearing, means for detachably connecting said gear-casing with the rearward extension of the top carriage, and means for traversing said top-carriage about its pivot, substantially as described. 70  
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8. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located longitudinally within the trail, a spindle on said ranging screw, an elevating screw concentrically situated around said spindle, a slotted sliding bar on said elevating screw, a longitudinal bearing for said sliding bar situated within the trail, means for detachably connecting said longitudinal bearing with the pivot of the top-carriage, a nut engaging with the ranging screw, trunnions on said nut engaging with the said slotted bar, a depending arm on the gun-cradle engaging with said trunnions, a long nut engaging with the elevating screw and rotatably connected with the said longitudinal bearing, gearing connecting said longitudinal nut with the toothed segment of the sight-bar, toothed gearing for actuating the elevating screw and the ranging screw from opposite sides of the carriage, a gear casing carrying said toothed gearing, means for detachably connecting said gear-casing with the rearward extension of the top-carriage, means for traversing the top-carriage, and means whereby access can be had to the interior of the trail for the removal of the screws and their gearing substantially as described. 95  
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9. In a field gun-carriage, the combination with the gun-cradle, the sight-bar, the top-carriage and the trail; of a ranging screw located longitudinally within the trail, a spindle extending rearwardly from said ranging screw, an elevating screw concentrically surrounding a portion of the said 125

spindle, a slotted sliding bar extending forwardly from said elevating screw, a bearing at the front end of said slotted sliding bar for the ranging screw, a longitudinal bearing for said sliding bar of the elevating screw situated within the trail, means for detachably connecting said longitudinal bearing with the pivot of the top-carriage, a nut engaging with the ranging screw, trunnions on said nut for engaging with the said slotted sliding bar, a slotted depending arm on the gun-cradle engaging with said trunnions, a long nut engaging with the elevating screw and rotatably connected with the said longitudinal bearing, gearing connecting said long nut with the toothed segment of the sight-bar, a laterally movable gear-casing situated within said trail, means for detachably connecting said gear-casing with the rearward extension of the top-carriage, means for actuating the top-carriage, a protective casing inclosing said actuating means, a bearing in said gear-casing for the rear end of said long nut, a bevel pinion on said long nut within the gear-

casing, a hollow bevel pinion co-axial with respect to the first mentioned bevel pinion, a bearing in the gear-casing for said hollow bevel pinion, a groove and feather for connecting said hollow bevel pinion to said spindle of the ranging screw, bevel pinions engaging respectively with the aforesaid bevel pinions of the long nut and of the ranging screw spindle, shafts carrying said pinions and extending transversely from said gear-casing in opposite directions, actuating hand-wheels on said shafts, and doors on the trail for giving access to the screws and gearing within the trail substantially as and for the purpose described.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses this twenty-first day of December, 1904.

ARTHUR TREVOR DAWSON.  
GEORGE THOMAS BUCKHAM.

Witnesses:

HENRY KING,  
ALFRED PEAKS.