Nov. 4, 1958 M. C. HARRING ET AL 2,858,740

GUN CARRIAGE ROTATABLE THROUGH 360°

Filed Aug. 1, 1952 4 Sheets-Sheet 1

Fig. 4.

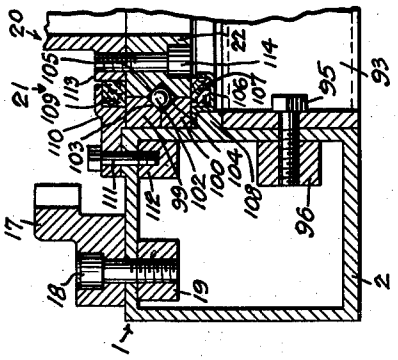
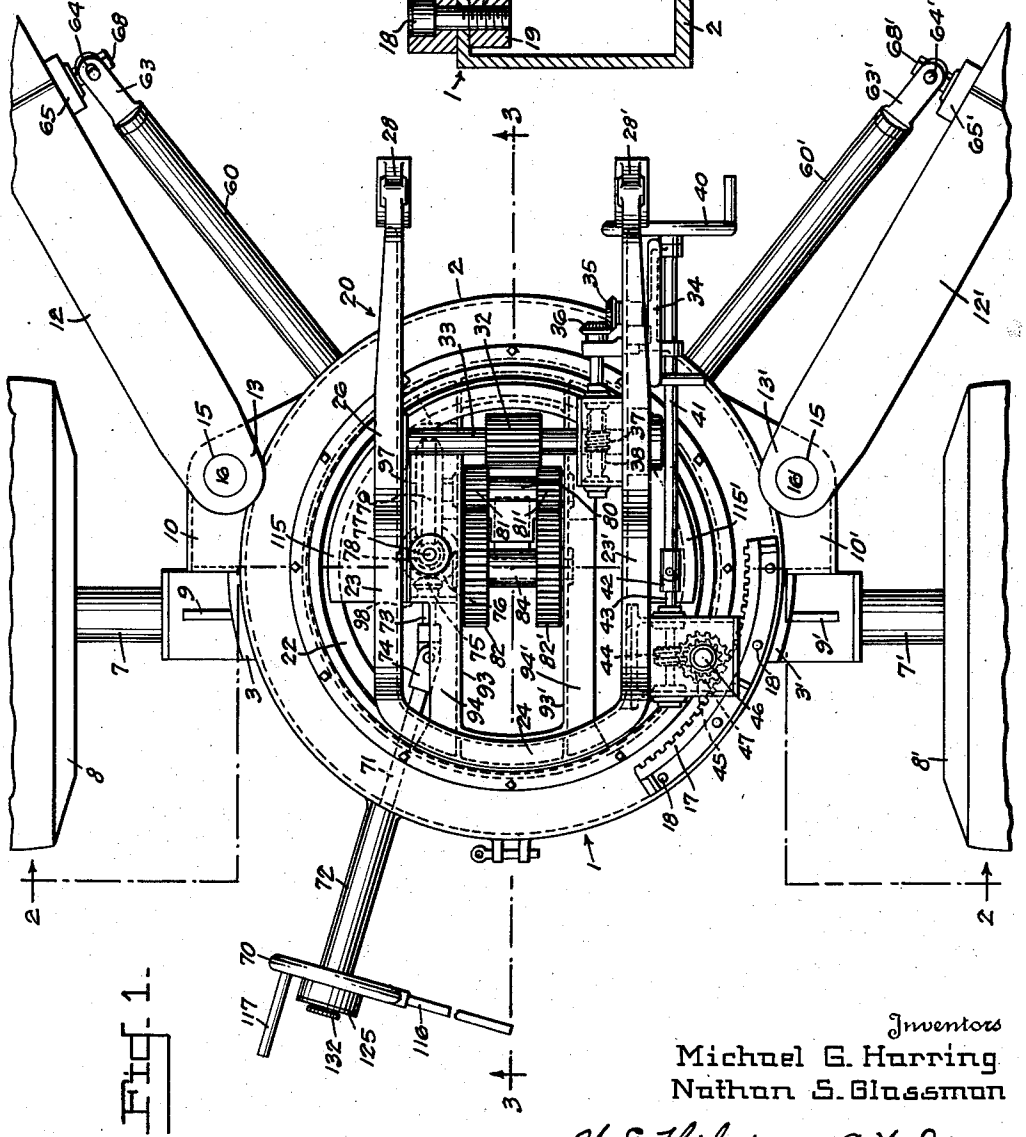


Fig. 1.



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GUN CARRIAGE ROTATABLE THROUGH 360°

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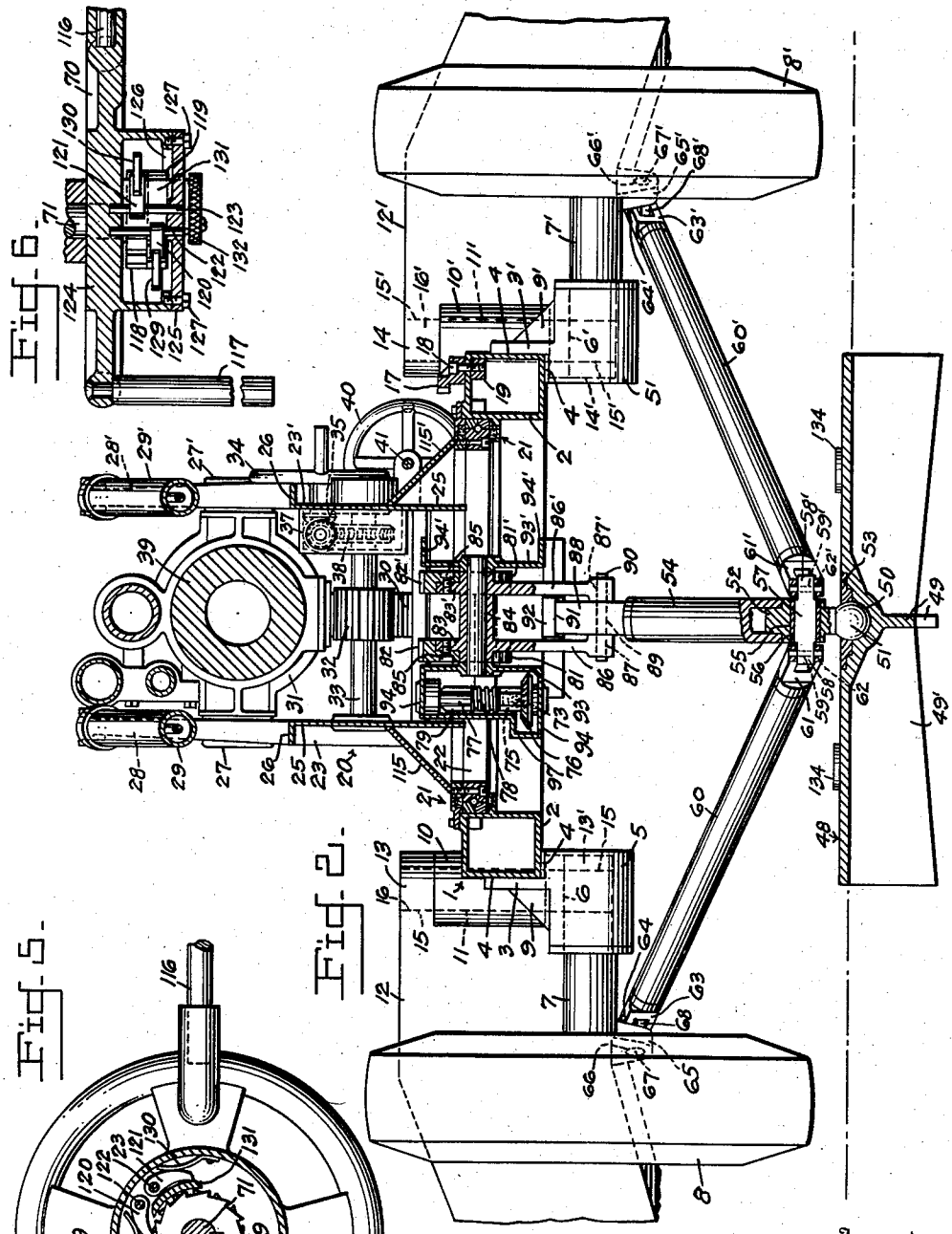


Fig. 6.

Fig. 5.

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GUN CARRIAGE ROTATABLE THROUGH 360°

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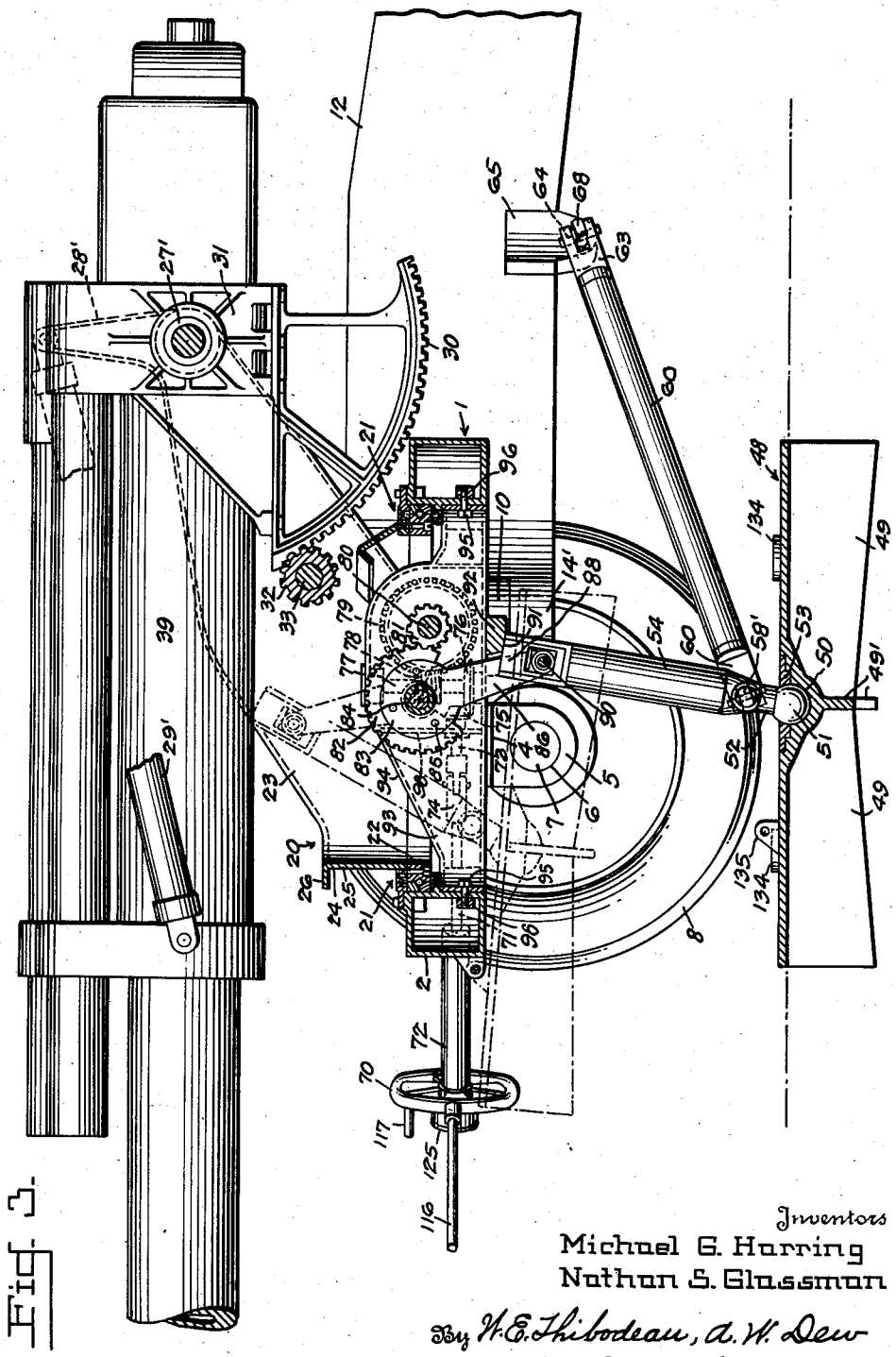


Fig. 3.

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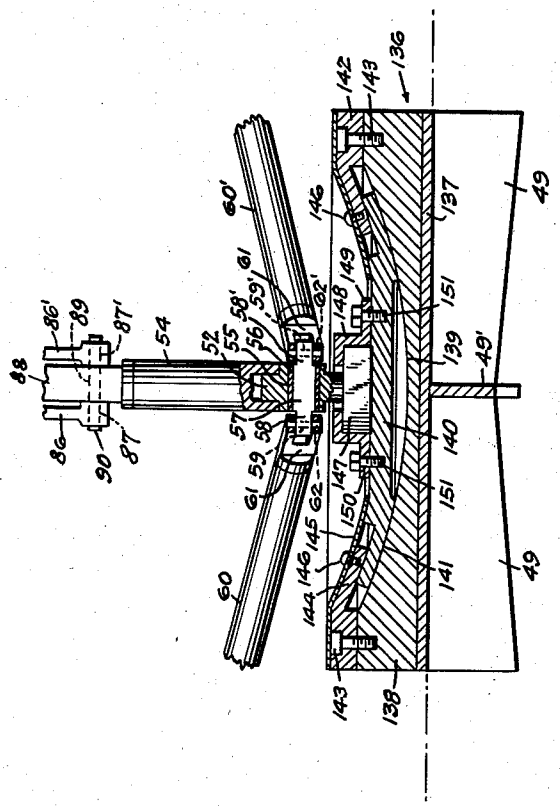
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Nov. 4, 1958 M. C. HARRING ET AL 2,858,740

GUN CARRIAGE ROTATABLE THROUGH 360°

Filed Aug. 1, 1952 4 Sheets-Sheet 4

Fig. 6.



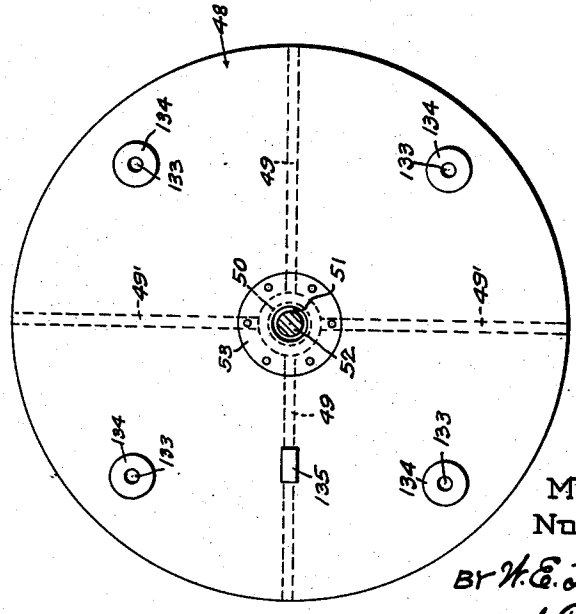


Fig. 7.

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GUN CARRIAGE ROTATABLE THROUGH 360°

Michael G. Harring, Silver Hill, Md., and Nathan S. Glassman, Falls Church, Va.

Application August 1, 1952, Serial No. 302,282

20 Claims. (Cl. 89—40)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to us of any royalty thereon.

The present invention relates to a new and improved artillery carriage. More particularly, the present invention relates to a new and improved, light-weight carriage for mobile artillery wherein the firing forces are absorbed by the firing platform carried by the lower carriage and wherein the wheels together with the gun and the carriage are raised above ground as the platform is lowered into emplacement.

It is also worth noting that the use of the firing platforms in accordance with the present invention, as illustrated in Figures 1–3, 7 and 8, permits ready adjustments for cant correction of the gun in case of its emplacement into non-level or mountainous terrain.

It is accordingly an object of the present invention to provide an improved, light weight gun carriage.

It is another object of the present invention to provide a novel gun carriage which permits 360° firing traverse.

It is a further object of the present invention to provide a gun carriage for mobile artillery which may be readily put into emplacement for firing by lowering the firing platform and which may also be readily placed into marching condition by raising the platform.

It is still another object of the present invention to provide a new and improved gun carriage which is so designed as to absorb all firing forces directly through a strut on which the lower carriage rests and which is connected to the firing platform, and wherein substantially no forces are transmitted to the trails.

A still further object of the present invention is to provide a firing platform which comprises spades forming an integral part with the firing platform.

Another object of the present invention resides in the direct connection between the lower carriage, the firing platform and the trails.

These and other objects and advantages of the present invention will become obvious from the following description when taken in connection with the accompanying drawings which show for purposes of illustration only several of the preferred embodiments of my invention and wherein:

Figure 1 is a plan view of the carriage in accordance with the present invention with the barrel removed from the trunnions thereof;

Figure 2 is a cross-sectional view of the gun carriage in accordance with the present invention taken along lines 2—2 of Figure 1;

Figure 3 is a cross-sectional view of the gun carriage in accordance with the present invention taken along lines 3—3 of Figure 1;

Figure 4 is an enlarged cross-sectional view of the upper carriage, the lower carriage and the connecting bearing therebetween of Figure 2.

Figure 5 is an enlarged front view of the hand wheel and associated mechanism used for lowering and raising the firing platform in accordance with the present invention;

Figure 6 is an enlarged, plan view of the hand wheel of Figure 5 with part of the hub broken away to show the ratchet mechanism;

Figure 7 is a plan view of the firing platform used in Figure 1;

Figure 8 is a cross sectional view of a modified form of the firing platform in accordance with the present invention.

Referring now more particularly to the drawings where like reference numerals are used in the various views thereof to designate like parts, reference numeral 1 designates the lower carriage which is circular in shape and is made of a rectangular, box-type frame 2. Attached to the peripheral surface of frame 2 are two supporting brackets 3 and 3' which may be welded as at 4 or fastened to frame 2 in any conventional manner. The lower portions 5 and 5' of brackets 3 and 3' extend outwardly and inwardly under frame 2 and are each provided with a bore 6 and 6' to receive shafts 7 and 7'. Wheels 8 and 8' are rotatably supported on shafts 7 and 7' as by means of a spindle and suitable bearings (not shown) as is well known in the prior art. Reinforcing webs 9 and 9' are provided between supporting brackets 3 and 3' and their lower shaft housing portions 5 and 5'. Trail supporting brackets 10 and 10' are secured to frame 2, brackets 3 and 3' and lower portions 5 and 5' thereof in any conventional manner as by welding. Trail supporting brackets 10 and 10' are each provided with a vertical bore 11 and 11'. Each trail 12 and 12' comprises vertically spaced, parallel extensions 13 and 14, and 13' and 14' respectively. Extension 13 and 14, and 13' and 14' are spaced apart a distance slightly greater than the vertical dimension of brackets 10 and 10' so that extensions 13 and 14, and 13' and 14' will slide over brackets 10 and 10' to form a tongue and groove arrangement therewith. Extensions 13, 13', 14 and 14' each are provided respectively with a vertical bore 15, 15', similar to vertical bores 11 and 11' and aligned therewith so as to constitute a pivotal joint for trails 12 and 12' after insertion of pins 16 and 16' through aligned bores 15, 11 and 15, and bores 15', 11' and 15'.

A segment of a gear ring 17 is secured to the upper surface of frame 2 by means of bolts 18 and nuts 19. Gear ring 17 serves to provide limited rotation of the upper carriage 20 in azimuth as will be more fully described hereinafter. Upper carriage 20 is rotatably mounted on lower carriage 1 by means of bearing 21, which may be of the divided race, radial thrust type (Fig. 4). Upper carriage 20 comprises a ring 22 to which are fastened in any conventional manner two parallel, upright brackets 23 and 23'. The forward ends of brackets 23 and 23' are joined together by a curved member 24 so as to form a horseshoe-like configuration as viewed from above in Figure 1. Brackets 23 and 23' and connecting member 24 have an inverted L-shape in cross-section, with a relatively thin, vertical member 25 extending upwardly from ring 22 and an outwardly-extending flange or leg portion 26 at right angle thereto. Brackets 23 and 23' slope upwardly in the rearward direction to house trunnions 27 and 27' and include vertically extending tails 28 and 28' in which equilibrators 29 and 29' are pivotally supported. A segmental, circular rack 30 is fastened to trunnion ring 31. Pinion 32, which meshes rack 30, is supported between brackets 23 and 23' by shaft 33 to which it is fastened in any conventional manner. Shaft 33 is driven by elevation handwheel 34 rotatably mounted in bracket 23' through meshing bevel gears 35 and 36, worm 37, and worm gear 38 which is fastened to shaft 33 whereby rotation of handwheel 34 will elevate the gun barrel 39.

Upper carriage **20** and therewith gun barrel **39** is traversed in azimuth to a limited extent to provide fine adjustment for arming by means of azimuth handwheel **40**, shaft **41**, universal joint **42**, shaft **43**, worm **44** affixed to shaft **43**, worm gear **45** mounted on shaft **46**, and pinion **47** affixed to shaft **46** which meshes with gear ring **17** (Fig. 1).

The firing platform **48** comprises downwardly extending spades **49** and **49'** at right angles to each other. A circularly-shaped recess **50** forming a socket is provided in the center of firing platform **48** for ball **51** on the end of short connecting member **52**; ball **51** is secured to firing platform **48** by means of retainer ring **53** which may be threaded into firing platform **48** or fastened thereto by bolts. Member **52** is fastened to stud **54** in any conventional manner as by welding or the like and includes a transverse bore **55** to receive bushing **56**. Shaft **57** fits slidably within bushing **56** and comprises flattened-out end portions **58** and **58'** each of which is provided with transverse bore **59** and **59'** respectively. Flattened-out end portions **58** and **58'** constitute the tongue of the tongue-and-groove connection between shaft **57** and connecting links **60** and **60'** which interconnect stud **52** with trails **12** and **12'** as will appear more fully hereinafter.

Connecting links **60** and **60'** are each provided at their forward end with a two-pronged, fork portion **61** and **61'** having transverse bores **62** and **62'** which are aligned with bores **59** and **59'** (Fig. 2) in such a way as to form a tongue-and-groove joint when assembled therewith as by means of bolts and nuts, or pins and cotterpins (not shown). The rearward ends of connecting links **60** and **60'** are also provided with a two-pronged, fork portion **63** and **63'** having transverse bores **64** and **64'** (Fig. 2). Lugs **65** and **65'** are fastened to trails **12** and **12'** and project downwardly therefrom. Each lug **65** and **65'** is provided with a bore **66** and **66'** respectively which receive shafts **67** and **67'** rotatably supported therein. Shafts **67** and **67'** each comprise flattened-out end-portions **68** **68'** having transversal bores **69** and **69'**; end portions **68** and **68'** constitute the tongues of the tongue-and-groove joint when assembled with fork portions **63** and **63'**. The last-mentioned tongue-and-groove joints together with rotatable shafts **67** and **67'** form universal joints, and may be replaced by any other universal joint, such as a ball joint, if so desired. It is thus seen that flexible universal connections are provided between the trails and the firing platform. These connections, together with the universal connection provided by ball **50** and socket **51**, and a hereinafter described pivotal connection between strut **54** and the crank mechanism for raising and lowering the firing platform, enable the entire carriage to be slewed around through 360°, or tilted to correct for cant as is readily apparent from inspection of the illustrated drawings.

The gun raising and lowering mechanism for the firing platform **48** comprises hand wheel **70** which drives shaft **71** as will be explained more fully hereinafter. Shaft **71** is rotatably supported within shaft housing **72** which is fastened to the outside of frame **2** of lower carriage **1** thereby also supporting handwheel **70**. Rotation of shaft **71** is transmitted to shaft **73** through universal joint **74**. A bevel gear **75** is affixed to the end of shaft **73**. Bevel gear **75** meshes another bevel gear **76** affixed to vertical shaft **77** which carries worm **78** (Figs. 2 and 3). Worm **78** drives worm gear **79** which is fastened to shaft **80**. Affixed to shaft **80** are two pinions **81** and **81'** which mesh with segmental gear racks **82** and **82'** which are fastened to flanges **83** and **83'** of shaft **84** as by means of screws **85**. Cranks **86** and **86'** extend downwardly from flanges **83** and **83'** through the cut-out portions of segmental racks **82** and **82'** as best shown in Figures 2 and 3. Cranks **86** and **86'** are provided with aligned transverse bores **87** and **87'** respectively. Upper portion **88** of stud **54** also includes a transverse bore **89** and is of lesser thickness than the spacing between cranks **86** and **86'** so that upon assembly with pin **90**, cranks **86**, and **86'** and upper portion **88** form a tongue-and-groove joint.

When the gun is in firing position the top **91** of upper portion of strut or stud **54**, which is substantially flat, rests against the lower surface of block **92**, which has a predetermined incline and which is affixed to the underside of lower carriage **1**, as seen in Figure 3.

Shafts **80** and **84** of the raising and lowering mechanism for the firing platform are journaled between two vertical side plates **93** and **93'** which are best shown in Figure 2. Outwardly-facing horizontal top and bottom plates **94** and **94'** are affixed at right angle to vertical side plates **93** and **93'** and form therewith channel-type beams, which run parallel to upright brackets **23** and **23'** and are fastened to the inner surface of frame **2** at their forward and rearward ends as by means of bolts **95** and nuts **96** best shown in Figure 4. In order to protect bevel gears **75** and **76**, shaft **77**, worm **78** and worm gear **79** side cover plate **97**, and front cover plate **98** are provided. The contour of the upper horizontal plates are best shown in Figure 3 by the solid and parallel dotted lines representing the same. It is understood that all rotating parts of the raising and lowering mechanism for the firing platform as well as the rotating parts of the elevation and traversing mechanism may be journaled in appropriate bearings.

Referring to Figure 4 which shows the details of the divided race, radial thrust bearing **21**, which permits free rotation between the upper carriage **20** and the lower carriage **1**, reference numerals **99**, **100** and **22** designate the rings which form the race for the balls **102**. Rings **99** and **100** each have bevelled edges **103** and **104** respectively whereas ring **22** comprises a V-shaped groove **105**. As shown in Figure 4, bevelled edges **103** and **104** and groove **105** are of such dimension and so arranged as to form a race substantially square in cross-section which will receive balls **102**.

In the assembly of the bearing, seal retainer **106** including seal **107** are first placed into position on flange **108** which forms an integral part with frame **2**. Next ring **100** is superimposed on retainer **106** which will be retained in its predetermined position by the weight thereof. Ring **22** is emplaced next, following which balls **102** are poured into the race which is thereupon closed by placing ring **99** on ring **100** as shown in the drawing. Seal **109** is kept in place by seal retainer **110** which is fastened to the top of frame **2** by means of bolts **111** and nuts **112**. Ring **22** is fastened to the base plate **113** of upper carriage by means of threaded bolts **114**. Webs **115** and **115'** are provided between base plate **113** and upright brackets **23** and **23'** of upper carriage **20** for purposes of reinforcing the structure of upper carriage **20**.

In view of the fact that the raising and lowering of firing platform **48** places the weight of the gun on stud **54** and temporarily on cranks **86** and **86'**, a ratchet mechanism is provided with handwheel **70** as shown in Figures 5 and 6 to facilitate rotation thereof by means of handle **116** which extends radially from handwheel **70** and which consequently may be made of greater length thereby increasing the available torque over that obtained with the conventional handle **117** mounted in the rim of handwheel **70** at right angle thereto. The ratchet mechanism comprises two ratchet wheels **118** and **119** fastened to shaft **71** in any conventional manner, which have their respective ratchet teeth in opposite direction as shown in Figure 5. Two ratchet pawls **120** and **121** are pivotally supported on shafts **122** and **123** respectively which are mounted between hub **124** of handwheel **70** and cover plate **125** fastened to flange **126** of hub **124** by means of screws **127**. Ratchet pawls **120** and **121** which face in opposite directions, are normally forced into engagement with ratchet wheels **118** and **119** by click springs **129** and **130**.

In order to provide for alternate operation of the

ratchet mechanism in one or the other direction so as to raise or lower the firing platform **48**, a small detent **131** is provided which is affixed to knurled knob **132** in any conventional manner. In order to permit limited rotation of detent **131** within flange **126**, cover plate **125** includes a segmental, cut-out portion (not shown) which is sufficiently large to allow predetermined circular motion of the connection between detent **131** and knob **132**. Knob **132** is rotatably mounted in cover plate **125**. Detent **131** alternately disengages ratchet pawls **120** and **121** from ratchet wheel **118** and **119** depending only on its manually adjusted position.

Firing platform **48** includes four symmetrically spaced bores **133** and reinforcing plate **134** (Fig. 7) to adequately secure the firing platform **48** to the ground even in hard or rocky terrain by driving appropriate stakes (not shown) into the ground through bores **133**. Lug **135** is provided on top of firing platform to secure it in its raised position to lower carriage **1**.

The firing platform **136**, which is illustrated in Figure 8, is a modified form of firing platform **48**; similar reference numerals are used in this figure to indicate parts similar to those used with firing platform **48**. Firing platform **136** comprises four spades **49** and **49'** at right angles to each other extending downwardly from horizontal plate **137**. Fastened in any conventional manner to the top of plate **137** is base **138** which has a spherical recess **139** in its upper surface constituting the bearing surface for bearing member **140** which is shaped spherically at its lower bearing surface **141** complementary to spherical recess **139**. A retainer plate **142** is fastened to base **138** by means of bolts **143** and comprises a circumferential, spheroidal segment **144** having its center coincidental with the center of spherical surfaces **139** and **141** so as to confine member **140** to rotative movement and prevent all except limited radial displacement therefrom as for example when correcting for cant. Such radial displacement is provided by limiting the diametral dimensions to an extent to provide annular clearances or spaces between the peripheral edges of bearing member **140** and the upstanding walls formed by the opposing faces of retainer plate **142** and spheroidal segment **144**, as plainly seen in Figure 8. A dust cover **145** is fastened to retainer plate **142** by means of bolts **146**.

In the embodiment of Figure 8 the short connecting member **52** is provided at its lower end with a rectangular boss **147** which is secured to bearing member **140** in nonrotative relation by retainer cap **148** which is of substantially similar rectangular configuration as boss **147** so as to fit over boss **147**. Retainer cap **148** comprises a circumferentially extending, horizontal flange **149** having vertical bores **150** to receive bolts **151** which are used to fasten retainer cap **148** to bearing member **140**. It is thus seen that the particular form and features of the parts in firing platform **136** effectively provide a universal joint between the gun properly speaking including the lower carriage **1**, the upper carriage **20**, etc., and the firing platform properly speaking including spades **49** and **49'**, horizontal plate **137** and base **138**. While the firing platform illustrated in Figure 8 may be somewhat heavier than the one shown in Figures 2 and 3, it offers the advantage of greater ease of correction for cant and exhibits increased stability especially in mountainous terrain since it provides a greater surface of contact between those parts forming the universal joint between the firing platform and the lower carriage.

In the operation of emplacing the gun for firing, at first the split trails **12** and **12'** are spread apart. Due to the linkage existing between trails **12** and **12'** and stud **54** through connecting links **60** and **60'**, the firing platform **48** or **136** will move slightly backwards in such a way as to describe an arc around the center of pin **90**, which is stationary for the time being, as necessitated by the position of the trails **12** and **12'**. Next handwheel **70** is rotated by means of conventional handle **117**, to lower the firing platform **48** or **136** from its marching position indicated in Figure 3 in dotted lines until the spades **49** and **49'** touch the ground. In order to force cranks **86** and **86'** further downward additional torque is required to rotate handwheel **70** since further downward movement of cranks **86** and **86'** effectively raises the gun and, therefore, requires lifting of the entire weight ordinarily carried by wheels **8** and **8'** and about to be transplanted to and carried by the firing platform and stud **54** after the wheels **8** and **8'** are raised above ground.

This is accomplished by inserting handle **116** which extends radially from handwheel **70** and adjusting the ratchet mechanism by turning knurled knob **132** in the proper direction to assure that the correct ratchet pawl engages its corresponding ratchet wheel to assure proper lowering operation of the firing platform.

Rotation of handwheel **70** is continued with the aid of handle **116** until the gun is in firing position with upper portion **88** of stud **54** resting against the underside of block **92** which necessitates turning cranks **86** and **86'** beyond their vertical position as shown in Figure 3. If necessary stakes may be driven through bores **133** in order to further anchor the platform. All forces resulting from firing of the gun are absorbed by the firing platform in firing position, since such forces are transmitted from the barrel through the trunnions **27** and **27'** to upper carriage **20**, from upper carriage **20** through bearing **21** to lower carriage **1**, from lower carriage **1** through block **92** to stud **54**, and to firing platform **48** or **136**. Substantially no forces are transmitted to and absorbed by trails **12** and **12'** while substantially all recoil and counterrecoil forces are absorbed only by the firing platform.

In order to raise the firing platform **48** and **136** it is only necessary to effectuate in reverse order the steps taken for lowering the same by rotating handwheel **70** in the opposite direction.

While we have shown and described only two preferred embodiments of our invention it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes or modifications without departing from the spirit thereof, and we desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

We claim:

1. A two wheeled gun carriage comprising a first support member forming a lower carriage, an upper carriage supported for limited horizontal rotation on said lower carriage, a firing platform carried by said lower carriage and including spade means affixed to the underside thereof for supporting said carriage on the ground when said carriage is in firing position, a raising and lowering mechanism for said firing platform and means including a universal joint connecting said firing platform to said raising and lowering mechanism, said universal joint providing a cant correction for said gun carriage and permitting 360° rotation of said gun carriage about a vertical axis.

2. The combination in claim 1 including a gun barrel fixed to a horizontal shaft trunnioned on said upper carriage, means including a gear train on said upper carriage for aiming said gun in elevation, and means including a gear train on said upper carriage and a segmental gear ring on said lower carriage for limiting rotation of said upper carriage.

3. The combination in claim 1 wherein said universal joint comprises a ball secured to said strut and received in a socket formed in the upper surface of said firing platform.

4. The combination in 1 wherein said universal joint includes a first spherically shaped plate having an upstanding peripheral wall secured to the upper surface of said firing platform, a second complementary spherically-shaped plate secured to said strut and intimately engag-

ing said first named plate, said second plate having a diametrical dimension to provide a small annular space between its peripheral surface and said upstanding wall, and cover means for securing said first and second plates together in sliding relation.

5. In an artillery piece, a two-wheeled carriage comprising an annular support member forming a lower carriage, an upper carriage, bearing means between said upper and lower carriage for rotatably supporting said upper carriage on said lower carriage, means on said lower carriage cooperating with said upper carriage to limit rotation of said upper carriage in azimuth to a predetermined small angle, a gun barrel pivotally supported by said upper carriage, a firing platform carried by said lower carriage and comprising spade means at the underside thereof to contact the ground when said artillery piece is in firing position, means including crank mechanism on said upper carriage for raising and lowering said firing platform, and means including a universal joint connecting said firing platform to said raising and lowering mechanism, said universal joint providing a cant connection for said artillery piece and permitting 360° horizontal rotation of said artillery piece.

6. The combination in claim 5 including an emplacement member comprising a pair of divisible trails pivotally connected to said lower carriage, a pair of support rods, and linkage means including universal connections for connecting one end of each rod to said universal joint and the other end to a corresponding trail whereby substantially all forces of recoil and counterrecoil are absorbed by said firing platform.

7. In combination with an artillery piece, a two-wheel gun carriage comprising an annular support member forming a lower carriage, an upper carriage supported for limited horizontal rotation on said lower carriage, an emplacement member comprising a pair of divisible trails pivotally connected to said lower carriage, a firing platform, a strut, a universal joint connecting one end of said strut to said firing platform, crank mechanism rotatable on a horizontal shaft mounted on said upper carriage, means pivotally connecting said crank to the other end of said strut and actuable to move said firing platform from stowed to firing position, a pair of support rods, linkage means including universal connections for connecting one end of each support rod to said universal joint and the other end of each rod to a corresponding trail whereby substantially all forces of recoil and counterrecoil are absorbed by said firing platform, said universal joint permitting cant correction and 360° horizontal rotation of said gun carriage.

8. The combination in claim 7 and including a gun barrel fixed to a horizontal shaft trunnioned on said upper carriage, means including a gear train on said upper carriage for aiming said gun in elevation, and means including a gear train on said upper carriage and a segmental gear ring on said lower carriage for limiting rotation of said upper carriage.

9. The combination in claim 7 wherein said universal joint comprises a ball secured to said strut and received in a socket formed in the upper surface of said firing platform.

10. The combination in claim 7 and including a first spherically shaped plate having an upstanding peripheral wall secured to the upper surface of said firing platform, a second complementary spherically-shaped plate secured to said strut and intimately engaging said first named plate, said second plate having a diametral dimension to provide a small annular space between its peripheral surface and said upstanding wall, and cover means for securing said first and second plates together in sliding relation.

11. A two-wheeled gun carriage for a mobile artillery piece comprising a lower carriage, an upper carriage, means for rotatably supporting said upper carriage on said lower carriage means on said lower carriage engaging said upper carriage and actuable to limit rotation of said upper carriage, a pair of trails each, having one end pivotally supported on said lower carriage, the other ends of each said trail adapted to be spread apart and to rest upon the ground when said gun carriage is in firing position, a firing platform carried by said lower carriage and adapted to rest up on the ground when said artillery piece is in firing position, means on said upper carriage for raising and lowering said firing platform, a universal joint connecting said firing platform to said raising and lowering means, and links providing a flexible and universal connection between said joint and said trails whereby substantially all forces of recoil and counter recoil are absorbed by said universal joint permitting cant connection and 360° horizontal rotation of said artillery piece.

12. The combination in claim 11 and including a gun barrel fixed to a horizontal shaft trunnioned on said upper carriage, means including a gear train on said upper carriage for aiming said gun in elevation, and means including a gear train on said upper carriage and a segmental gear ring on said lower carriage for limiting rotation of said upper carriage.

13. The combination in claim 11 wherein said universal joint comprises a ball secured to said strut and received in a socket formed in the upper surface of said firing platform.

14. The combination in claim 11 wherein said universal joint includes a first spherically shaped plate having an upstanding peripheral wall secured to the upper surface of said firing platform, a second complementary spherically-shaped plate secured to said strut and intimately engaging said first named plate, said second plate having a diametral dimension to provide a small annular space between its peripheral surface and said upstanding wall, and cover means for securing said first and second plates together in sliding relation.

15. An artillery piece comprising a lower carriage, a pair of wheels supported on diametrically opposed sides of said lower carriage, an upper carriage, bearing means between said upper and lower carriage for supporting said upper carriage on said lower carriage for limited horizontal rotation, a gun barrel pivotally mounted on said upper carriage, a firing platform adapted to engage the ground when said artillery piece is in firing position, a strut, a universal joint connecting one end of said strut to said firing platform, crank mechanism rotatable about a horizontal shaft on said upper carriage, a ratchet mechanism for actuating said crank mechanism, and means pivotally connecting the other end of said strut to said crank mechanism whereby said platform is shifted from stowed position to firing position, said universal joint permitting cant correction and 360° horizontal rotation of said artillery piece.

16. In combination with an artillery piece, a lower carriage, an upper carriage mounted on said lower carriage for limited rotation relative thereto, a pair of trail members, means pivotally connecting one end of each said trail members to said lower carriage, a firing platform, means pivotal on said upper carriage and extending through said lower carriage to provide a flexible connection with said firing platform, means on said upper carriage and including said flexible connection for moving said firing platform between stowed position adjacent the lower surface of said lower carriage and emplacement position on the ground, and means providing a universal connection between said firing platform and said flexible connection means whereby said gun may be corrected for cant and slewed about through 360°.

17. In combination with an artillery piece, an annular support member forming a lower carriage, an upper carriage concentric within and rotatably mounted on said lower carriage, means on said lower carriage providing limited rotation of said upper carriage through a small angle, a strut, crank mechanism mounted for rotation about a horizontal shaft supported on said upper carriage, means pivotally connecting the free end of said crank

mechanism to one end of said strut, a firing platform adapted to support said artillery piece upon the ground, and means forming a universal connection between the upper surface of said firing platform and the other end of said strut, said last named means providing cant correction for said artillery piece and permitting rotation of said artillery piece through 360°.

18. The combination of claim 17 and including, an emplacement member comprising a pair of divisible trails adapted to be spread apart when said artillery piece is changed from travelling to firing position, each said trail member having one end adapted to be supported on the ground, and the other end pivotally mounted on said lower carriage, and support rods extending between each said trail and said strut, each said rod having one end providing a universal connection with said strut and the other end providing a similar connection with a corresponding trail.

19. The combination of claim 17 and including a pair of wheels rotatably supported on said lower carriage.

20. The combination of claim 17 and including a firing piece supported on a horizontal shaft trunnioned on said upper carriage, and means on said carriage to aim said piece in elevation.

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