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TRAIL CARRIAGE GUN MOUNTED ON ENDLESS TRACKS FOR VARYING THE HEIGHT  
OF THE LINE OF FIRE OF THE GUN.

APPLICATION FILED JULY 10, 1922,

Patented Sept. 12, 1922.

13 SHEETS—SHEET 2.

1,429,109.

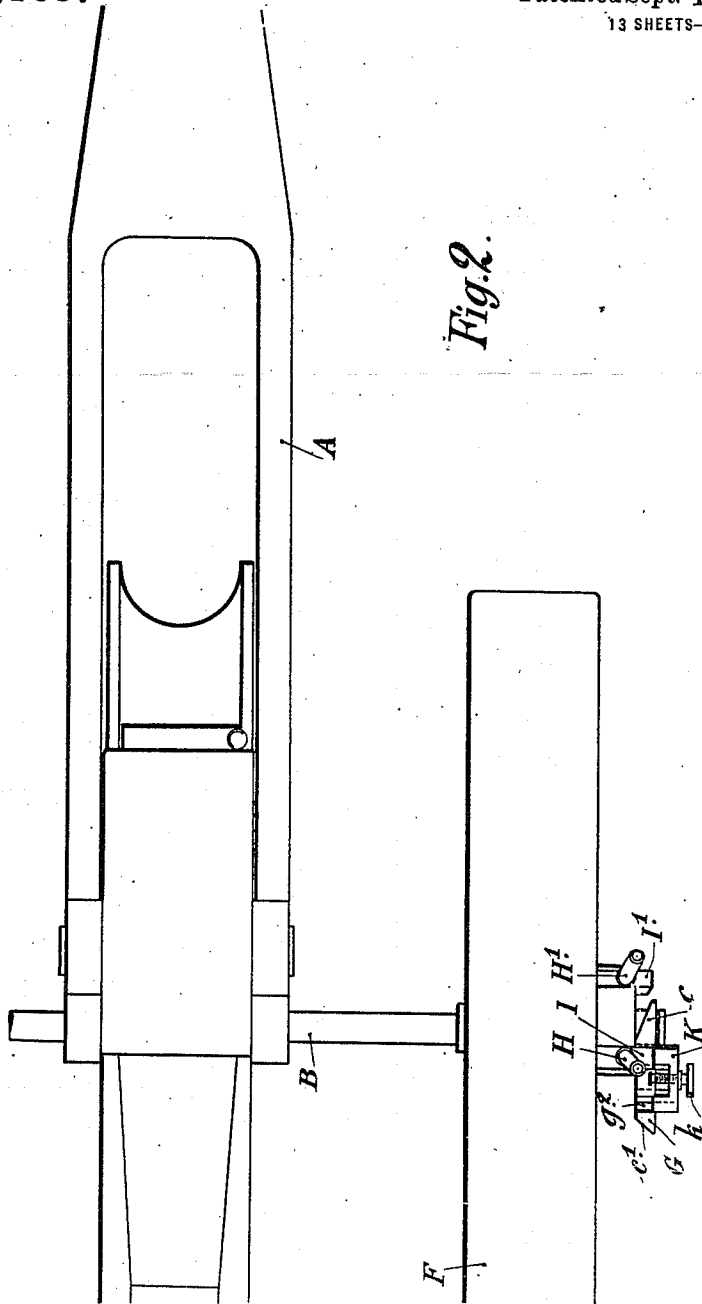


Fig. 2.

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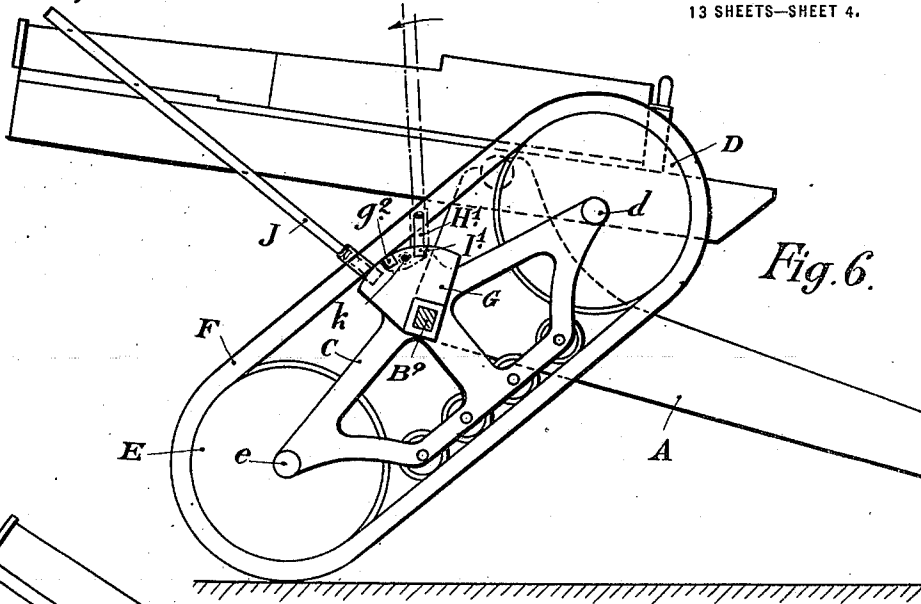


Fig. 6.

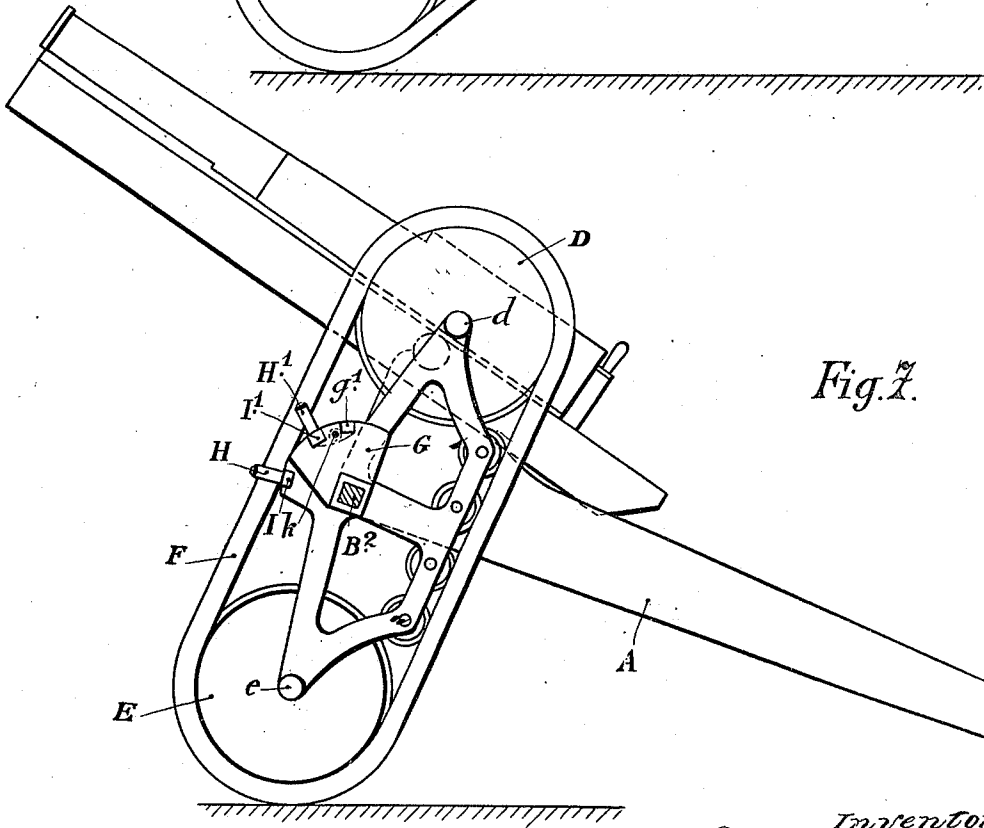


Fig. 7.

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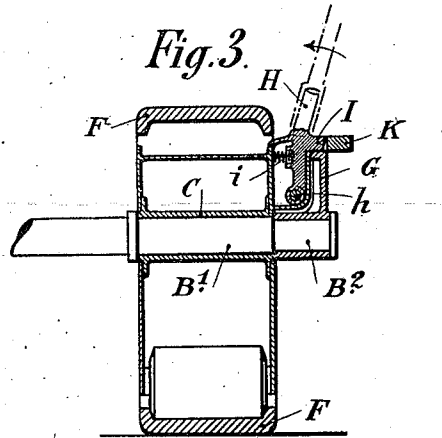


Fig. 4.

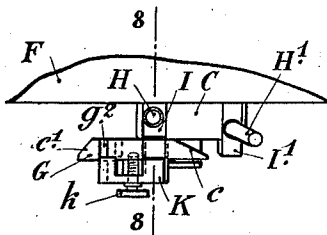
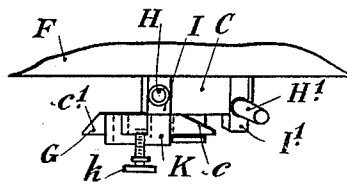


Fig. 5.



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13 SHEETS—SHEET 5.

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Fig. 8.

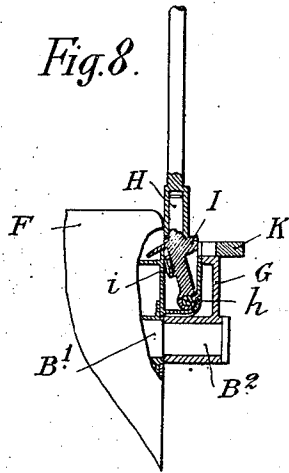


Fig. 9.

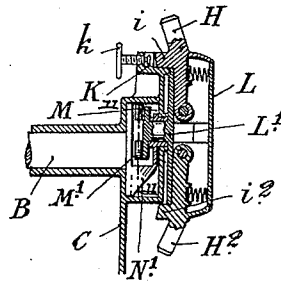


Fig. 11.

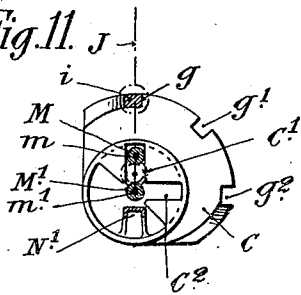


Fig. 10.

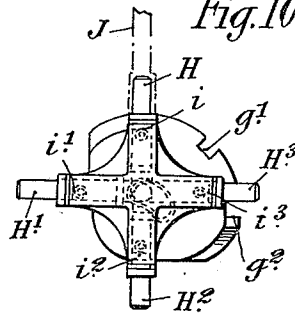
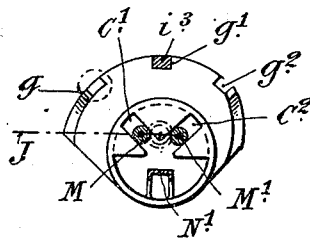


Fig. 12.



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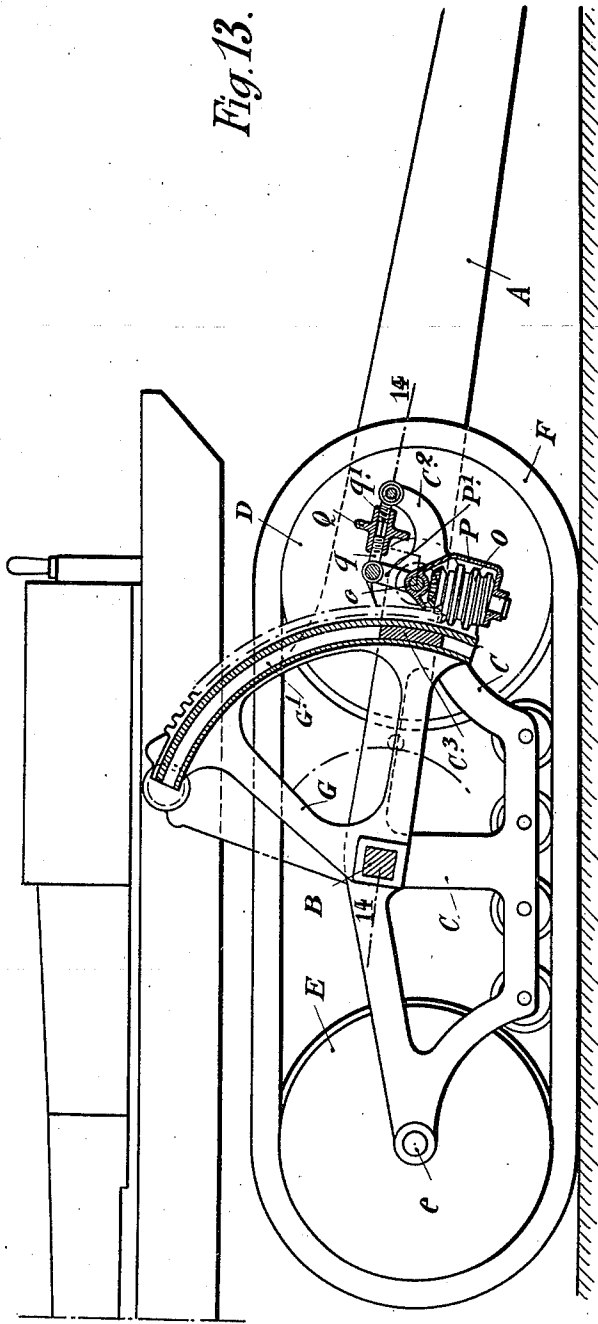
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13 SHEETS—SHEET 6.

Fig. 13.



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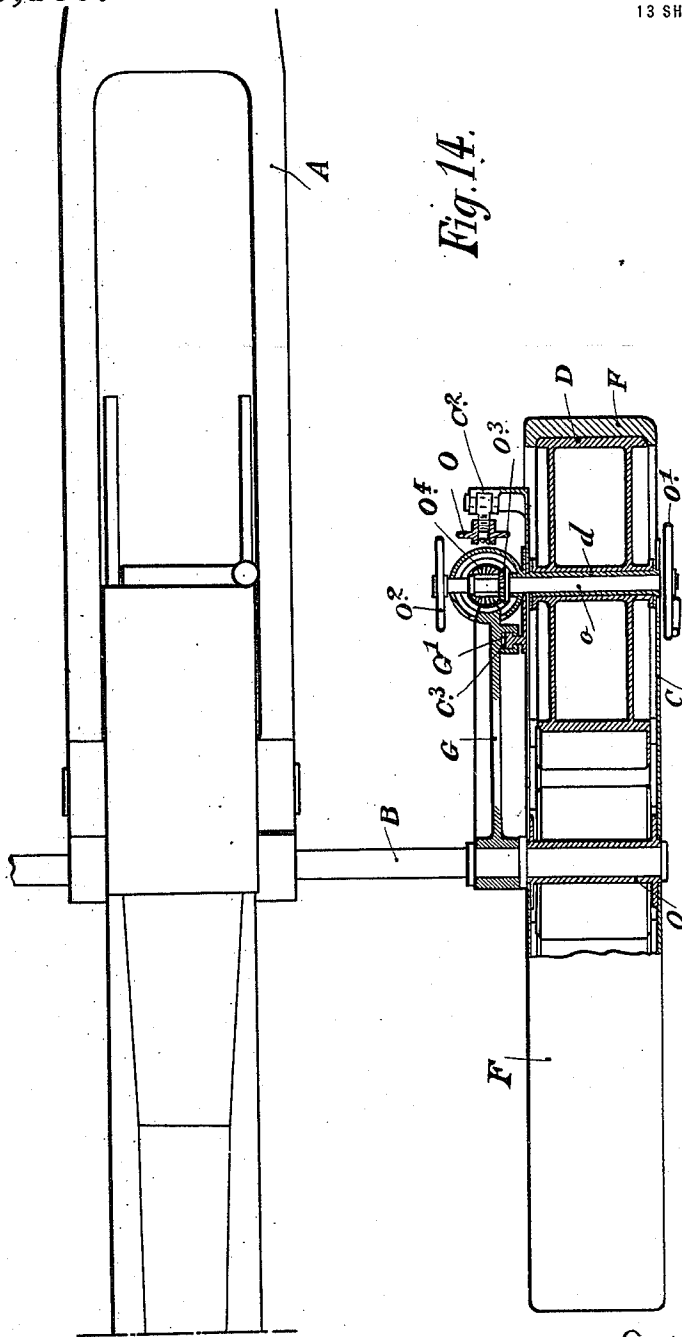


Fig. 14.

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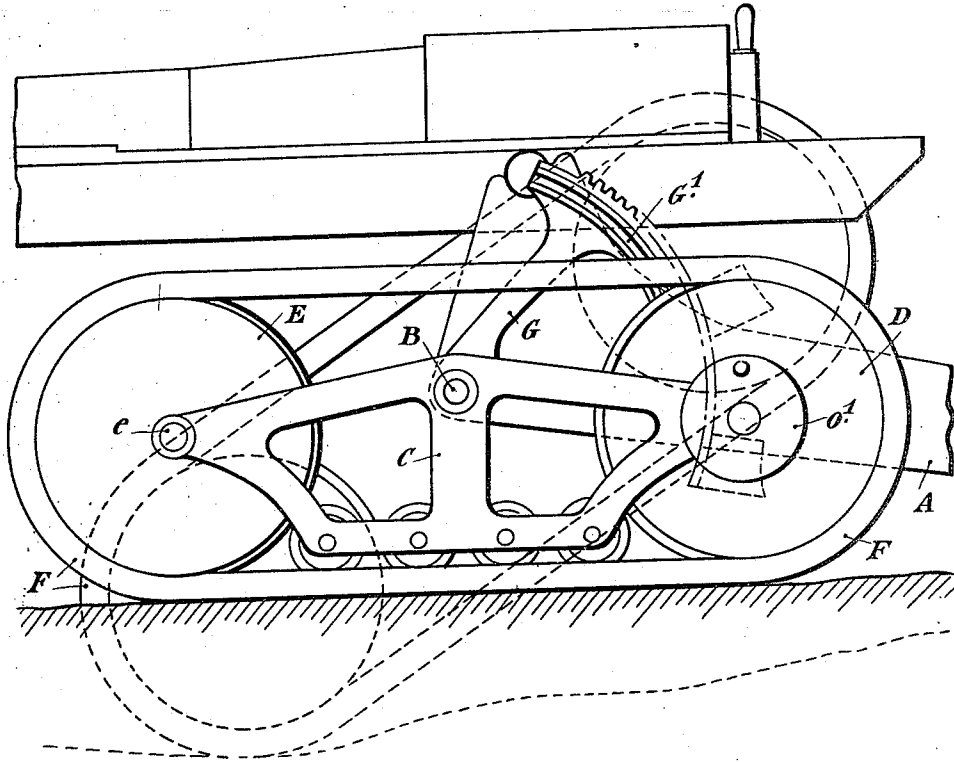
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Fig. 16.



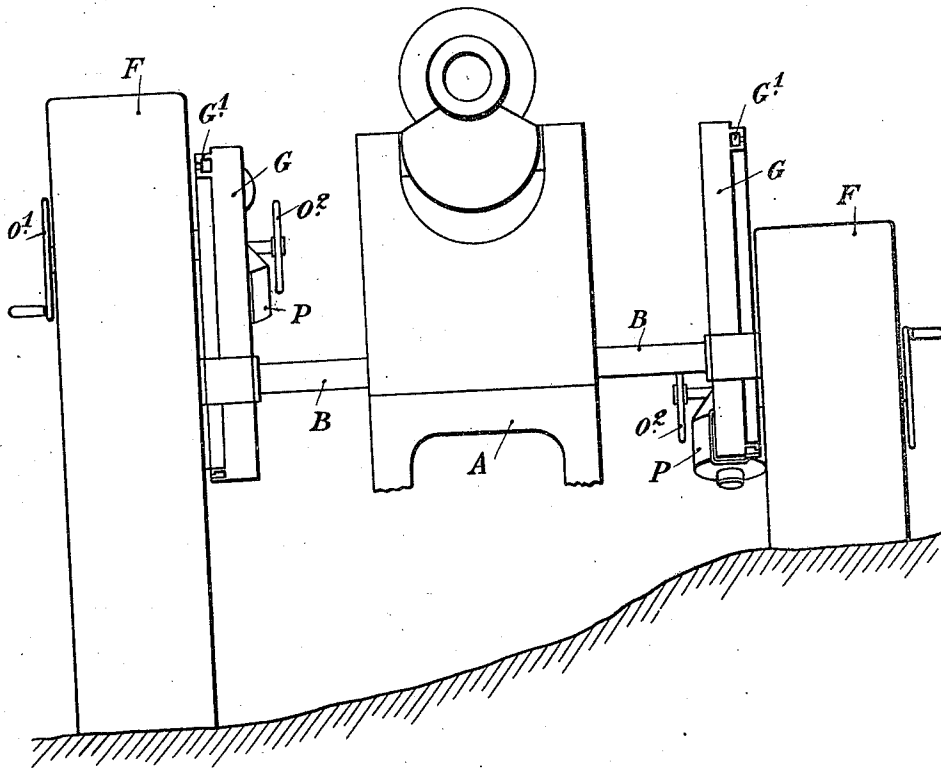
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13 SHEETS—SHEET 10.

Fig. 17.



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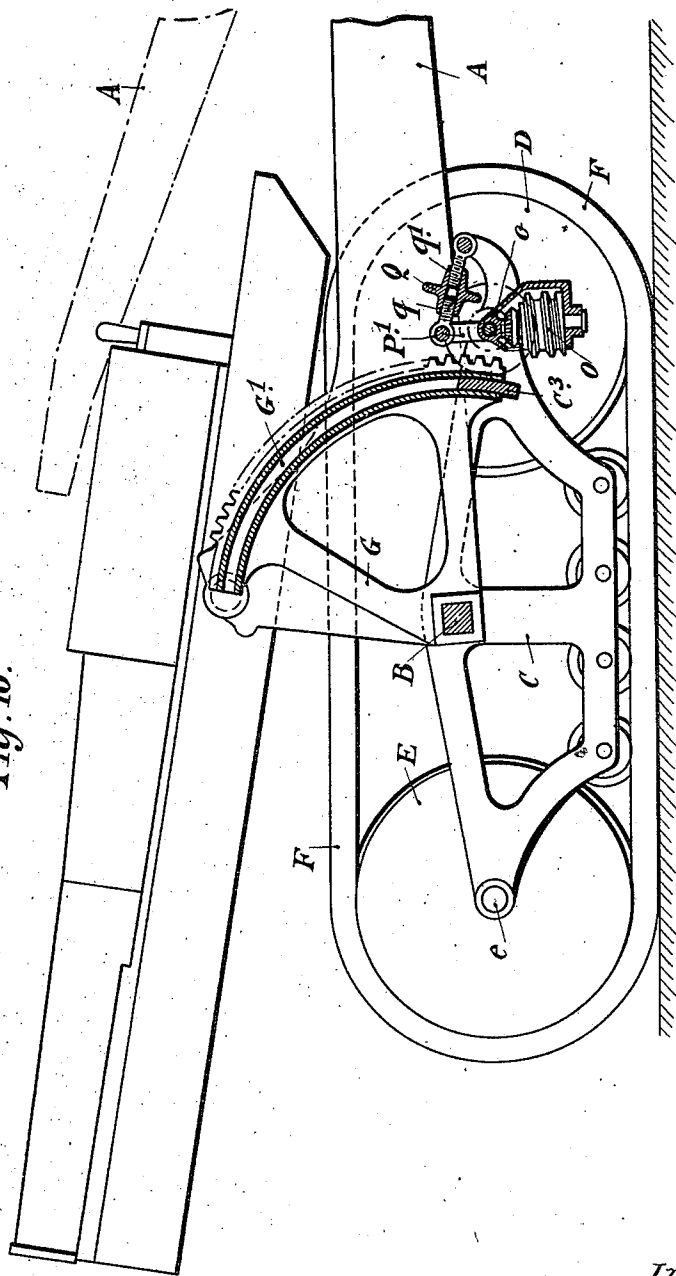
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Fig. 18.



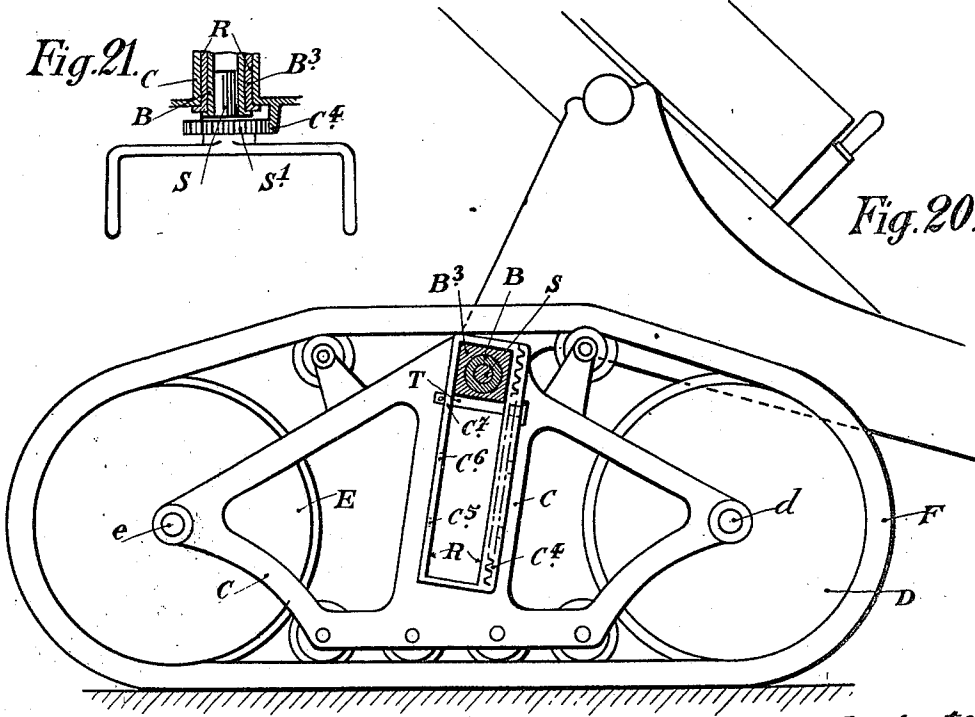
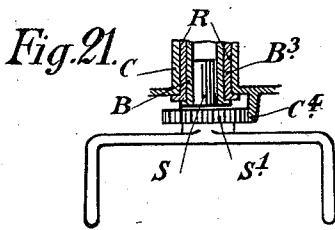
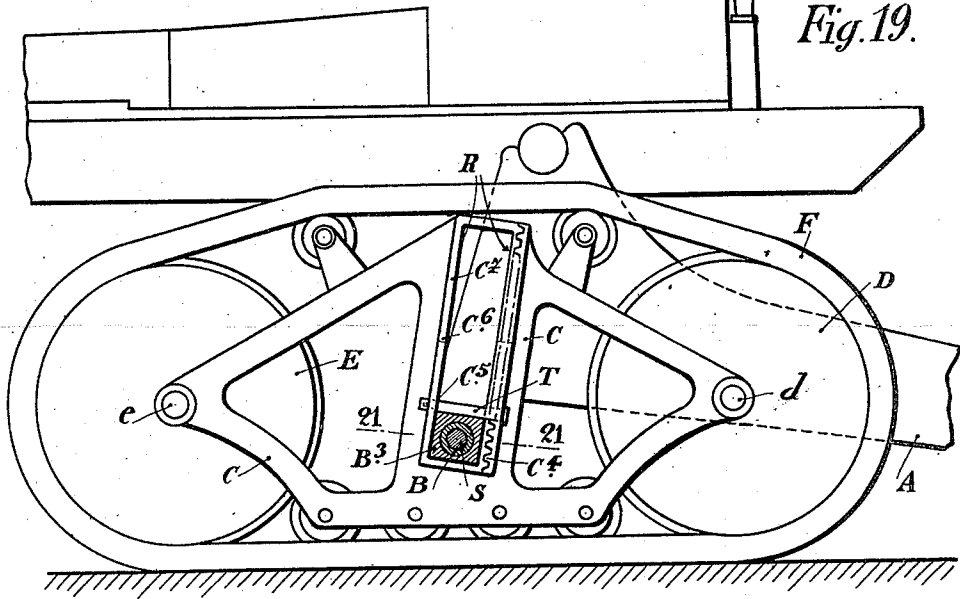
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13 SHEETS—SHEET 12.



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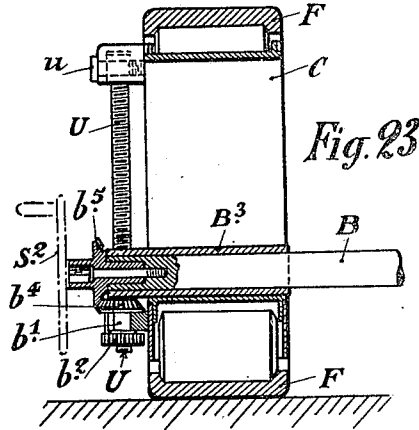
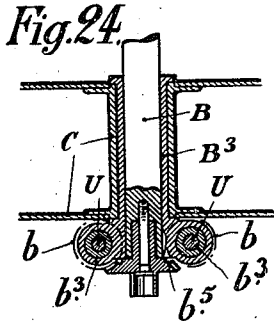
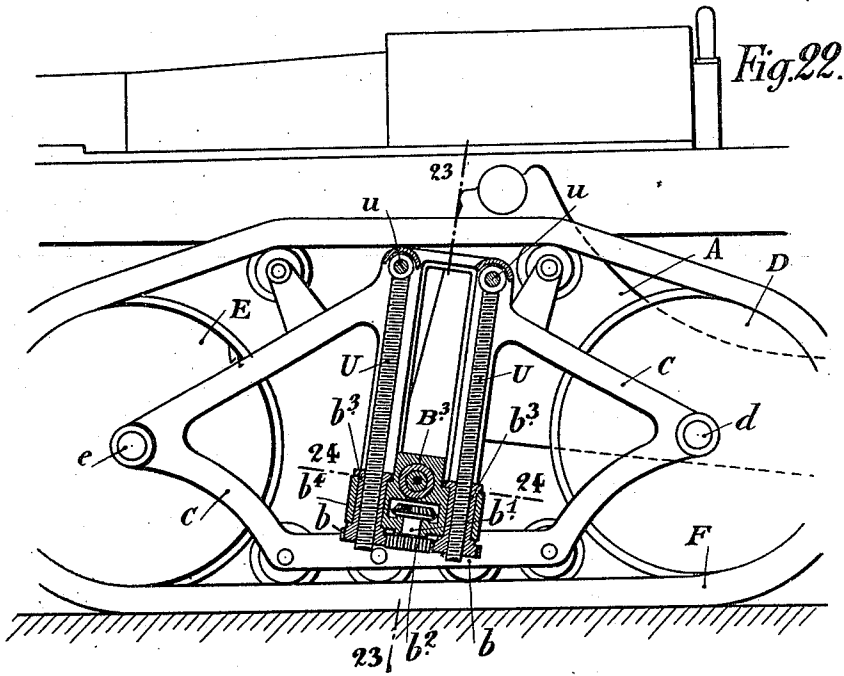
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13 SHEETS—SHEET 13.

1,429,109.



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# UNITED STATES PATENT OFFICE.

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TRAIL-CARRIAGE GUN MOUNTED ON ENDLESS TRACKS FOR VARYING THE HEIGHT OF THE LINE OF FIRE OF THE GUN.

Application filed July 10, 1922. Serial No. 573,877.

*To all whom it may concern:*

Be it known that I, EUGENE SCHNEIDER, a citizen of the Republic of France, residing at Paris, France, have invented new and useful improvements in apparatus in and relating to trail-carriage guns mounted on endless tracks for varying the height of the line of fire of the gun, which is fully set forth in the following specification.

10 This invention has for its object to provide improved apparatus for varying the height of the line of fire of a gun comprising a trail carriage mounted on endless tracks.

15 According to this invention an intermediate mechanism is interposed between the gun carriage proper (or any member fixed to the said gun carriage) and the endless track trucks. For the purpose of varying the height of the line of fire, the gun carriage is caused to turn around the point of support of the carriage trail tail on the ground, by the action of the aforesaid interposed mechanism when the latter is actuated. In this manner a change of relative position is produced between the gun carriage head and the endless tracks, either by a turning movement of the endless tracks around the carriage axle (in which case the endless tracks bear upon one of their two wheels) or by the carriage axle being raised in the trucks which are adapted for this purpose.

In the accompanying drawings:—

35 Figures 1 to 8 illustrate a first constructional example of the invention.

Figure 1 is a longitudinal elevation of the gun carriage in its lowest position.

Figure 2 is a corresponding plan.

40 Figure 3 is a section taken along the line 3—3 of Figure 1.

Figures 4 and 5 are partial plans showing the mechanism for raising the line of fire in different positions of operation.

45 Figures 6 and 7 are longitudinal elevations showing the gun carriage respectively in an intermediate position and in the position of maximum rise of the line of fire.

Figure 8 is a partial section taken along the line 8—8 of Figure 4.

50 Figures 9 to 12, inclusive, illustrate a modified form of the intermediate mechanism that is interposed between the gun carriage and the endless track trucks.

Figure 9 is a partial sectional elevation

of an endless track truck and the intermediate mechanism. 55

Figure 10 is a corresponding front elevation.

Figure 11 is a section taken along the line 11—11 of Figure 9. 60

Figure 12 is a similar section showing the relative change in the positions of some of the mechanism during operation.

Figures 13 to 18 illustrate a second constructional example of the invention. 65

Figure 13 is a longitudinal elevation of the gun carriage in battery position with its lowest line of fire.

Figure 14 is a plan partly in section taken along the line 14—14 of Figure 13. 70

Figure 15 is an elevation of the gun carriage in battery position with the gun barrel at its highest elevation.

75 Figures 16 and 17 are respectively a longitudinal elevation and an end view of the gun carriage situated in battery position on very uneven ground, the horizontal position of the carriage axle being assured nevertheless, by a suitable adjustment of one of the endless track trucks by means of the intermediate mechanism forming the subject-matter of the invention. 80

Figure 18 is an elevation of the gun carriage put into condition for road transport.

85 Figures 19 and 20 illustrate in longitudinal elevation a third constructional example in two different positions.

Figure 21 is a detail section taken along the line 21—21 of Figure 19.

90 Figure 22 is a longitudinal elevation of a modified form of the constructional example just above described.

95 Figures 23 and 24 are part sections taken respectively along the lines 23—23 and 24—24 of Figure 22.

Referring to Figs. 1 to 8, inclusive, A is the gun carriage trail in the head of which the carriage axle B is mounted by means of its square portion. B' are cylindrical portions of the said axle on which the trucks C can turn, which support the axles *d* and *e* of the two wheels D, E, that serve as guides for the endless chains or tracks F.

105 The intermediate mechanism by means of which the height of the line of fire can be varied, comprises in this example a pair of sectors G which are fixed on the projecting

ends  $B^2$  of the carriage axle and are formed with notches  $g'$   $g^2$ .

To each truck C there is articulated a pair of tenons H, H', extending radially with relation to the carriage axle, or more strictly speaking, movable each in an axial radial plane of the carriage axle, around pivot pins  $h$ ,  $h'$ . Each of these tenons carries a lug I, I' respectively, which a spring  $i$ ,  $i'$  has a tendency to push outwards into engagement with that one of the notches  $g'$   $g^2$  opposite which it has been brought. An operating lever J can be fitted upon the tenons H, H' by means of a corresponding socket. Each sector G comprises two inclines  $a$ ,  $a'$  arranged at the opposite ends of the track of the nibs I, I'. For travelling over the ground, the notches  $g'$   $g^2$  may be covered up by the limbs of a forked part K which is operable by means of screw  $k$  mounted in the corresponding sector G.

This position is shown in Figure 5. The truck C of the endless track is thus able to rock freely in front of the sector G without the lugs I, I' being able to enter the notches  $g'$ ,  $g^2$ ; the inclines  $a$ ,  $a'$  always acting to push back the lugs as they pass.

Figures 1, 2 and 3 show the gun carriage in battery position with its lowest line of fire.

When it is desired to raise the line of fire, first the forked member K is unscrewed and placed into the position shown in Figure 4. Instantly the lug I is caused by the action of its spring  $i$ , to enter the notch  $g'$  (Figures 1, 2 and 3). The operating levers J are then fitted on to the tenons H (Figure 3), and tilted in the direction of the arrow into the position shown in Figures 8 and 4.

On then moving the lever in the direction of the arrow in Figure 1, the respective endless track is caused to turn around the point where the wheel E is bearing upon the ground.

It is to be understood that these operations are performed simultaneously for the two endless tracks. While the endless tracks are turning around the carriage axle the latter rises together with the gun carriage which turns on the trail tail as a centre. When the lugs I' have come opposite the notches  $g'$  they will enter the latter, and the parts will at this moment be in the position shown in Figure 6.

If it be desired to raise the line of fire still more, the levers J are removed from the tenons H, and are fitted on to the tenons H'; this position is indicated in dot and dash lines in Figure 6. Then, starting from this position, the levers can be moved in the direction of the arrow in Figure 6 after they have been tilted inwardly in order to disengage the lugs from the notches  $g'$ . When the lugs

I' have entered the notches  $g^2$  the parts will have assumed the positions shown in Figure 7.

Referring to Figs. 9 to 12, inclusive, the characteristic feature of the modification illustrated therein is the interposition between the endless tracks and the articulated tenons (serving for the operative engagement of the operating levers) of a speed-reducing gear for enabling the operating lever to describe an angle that is a multiple of the angle described by the truck. In the example shown, the gear, which is known per se, is such that the angle described by the lever is twice the angle described by the truck C around the axis of the carriage axle. For this purpose the tenons, four in number H, H', H<sup>2</sup>, H<sup>3</sup> are articulated in a box L which is pivoted by means of a pivot pin L' in a bracket N' fixed to the carriage axle. This pivot pin L' is eccentric to the axis of the carriage axle B, and carries two rollers M, M' that are rotatably mounted on pins  $m$ ,  $m'$ , equidistant from the pivot pin L'. These rollers are always engaged in one or the other of right-angled slot guides C', C<sup>2</sup> fixed to the truck C. The truck C has notches  $g$ ,  $g'$ ,  $g^2$  into which enter successively the lugs  $i$ ,  $i'$ ,  $i^2$ ,  $i^3$ , projecting from the tenons engaging the operating levers.

Normally, when the gun carriage has been brought into battery position with the lowest line of fire, the parts occupy the positions shown in Figures 9, 10 and 11. The notch  $g$  which, for travelling over the ground, is covered up by a fixing member K operable by means of a screw  $k$  mounted in the truck C, is uncovered when it is desired to operate the intermediate position for the purpose of raising the line of fire. Each lever J is then fitted upon the corresponding tenon H which is tilted outwardly or to the right, as viewed in Figure 9. Then the lever J is turned to the left, or counter-clockwise, as viewed in Figure 10. When the levers J have been turned through 90° the lugs of the tenons H<sup>3</sup> will have entered the notches  $g'$ . Owing to the speed-reducing gear interposed between the tenon-carrier L and the truck C, the latter will have turned only through an angle of 45°; since the rollers M, M' have assumed, relatively to the truck C, the position shown in Figure 12.

If it is desired to continue to raise the height of the line of fire, the levers J are removed from the tenons H and are fitted upon the tenons H<sup>2</sup>, the operation just above described is repeated. Then by actuating in succession the tenons H<sup>2</sup> and H' the displacement of these tenons will cause the gun carriage to rise to the position for the maximum height of the line of fire.

In the embodiment illustrated in Figs. 13 to 18, inclusive, the intermediate mechanism interposed between the gun carriage and the

endless track trucks, comprises, on the carriage axle B (which is fixed with relation to the carriage head), two helically toothed quadrants G centred on the axis of the carriage axle on which they are fixed. With the teeth of these quadrants there can be brought into mesh worms O supported by spindles  $o$  which are in their turn carried by the trucks C, being mounted for instance, in the hollow axle  $d$  of one of the wheels D of the respective truck. The meshing of a worm O with its respective quadrant G, can be effected at will by turning the supporting box P of the worm around the spindle  $o$  by means of a swivelling adjusting screw Q, one of the screwed stems  $q$  of which is pivoted to a link P' fixed to the box P whereas the other screwed stem  $q'$  is pivoted to a bracket C<sup>2</sup> fixed to the truck.

If it is desired to raise the line of fire, when the parts are in the position shown in Figures 13 and 14 where the worm O is shown in mesh with its respective toothed quadrant, it is sufficient to cause the worms O to travel over their quadrants by actuating them for this purpose by means of hand-wheels O' O<sup>2</sup> fixed on the spindle  $o$ , so that they transmit the motion imparted to the latter, to a pinion O<sup>3</sup> meshing with a pinion O<sup>4</sup> fixed to the worm O.

As the worms O travel along their quadrants G, the trucks C turn on the points of support of the endless track wheels E upon the ground as centres. At the same time these points of support move towards the rear of the gun carriage, so that the latter is caused to turn around its anchoring point as a centre. A mutual guidance may be provided between each truck C and its quadrant G, for instance, as shown in the drawings, by means of a rib C<sup>3</sup> of the truck which remains always in engagement in an arc-shaped slot G' of the quadrant.

If the gun carriage is placed in battery position on perfectly flat ground, the two worms O must be moved preferably both at the same time, through equal angles along their respective toothed quadrants in order that the carriage axle B shall remain horizontal in all the raised positions of the line of fire.

If, on the contrary, the gun carriage is placed in battery position on very uneven grounds, a horizontal position of the carriage axle B can always be assured by inclining the two trucks C through different angles by suitably actuating the respective intermediate mechanism O—G.

In this respect Figures 16 and 17 show one of the endless chains or tracks resting upon substantially horizontal ground, whereas the other endless track is inclined by a suitable angle to restore the horizontal position of the carriage axle B notwithstanding the very irregular cross-sectional contour of the

ground. Similarly if the carriage axle should happen to assume an inclination to the horizontal during the firing of a shot, the said axle can be returned into its proper horizontal position.

For travelling over the ground (Figure 18) the worms O are disengaged from the toothed quadrants O by operating the swivelling adjusting screws Q in the proper direction. The trucks C are then free to rock around the carriage axle B in order to adapt themselves to the varying longitudinal contour of the ground.

The pivotal spindle of the worms O need not necessarily be mounted in the axle of the guide wheel D of the respective endless chain or track. A suitable support may be provided for it at a suitable point of the truck nearest the axis of the carriage axle B; thus allowing the use of toothed quadrants G of smaller radius, as indicated in dot-and-dash lines in Figure 13.

Referring to the embodiment illustrated in Figs. 19 to 21, the intermediate mechanism interposed between the gun carriage and the endless track trucks, comprises in this example, in each truck C, a slot guide R serving to guide an axle box B<sup>3</sup>, in combination with devices by means of which the said axle box can be moved up and down in its slot guide, and can be held in place at any desired point of the latter. For the purpose of raising the line of fire, each axle box, as shown in Figures 19 to 21, may contain a removable stub shaft S fitting in the axle box or in the hollow carriage axle B, and provided with a pinion S' which, when inserted, meshes with a rack C<sup>4</sup> formed on the truck parallel to the slot guide R.

The holding of the axle boxes in the desired positions may be assured by means of holding keys T which are inserted in sockets C<sup>5</sup>, C<sup>6</sup>, C<sup>7</sup>, provided at different levels in the respective trucks C. Figure 20 shows the gun carriage when it has been moved into the position where the line of fire is highest.

Another embodiment of the constructional example just above described is illustrated in Figs. 22 to 24, inclusive.

In this example the axle boxes B<sup>3</sup> serve as lodgments for two nuts  $b^3$  in which work actuating screws U pivoted at their upper ends  $u$  to their respective trucks C. Each nut  $b^3$  carries a pinion  $b$ . The two pinions  $b$  can be actuated both at the same time for screwing the nuts along their screws U, by means of a gear comprising a pinion  $b^2$  meshing with the two pinions  $b$  and fixed on a stub shaft  $b'$  journaled in the axle box B<sup>3</sup>. The same shaft  $b'$  carries a bevel pinion  $b^4$  meshing with a pinion  $b^5$  journaled in the carriage axle B. This pinion  $b^5$  can be actuated by means of a detachable hand-wheel S<sup>2</sup> fitting with a square portion in a sleeve fixed to the pinion  $b^5$ .

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

5 1. A trail gun carriage mounted on endless-track trucks, comprising an axle rotatably mounted on said trucks for supporting said carriage, members mounted on said axle and having operative engagement with  
10 said trucks, and manually operable means whereby the trucks may be turned about said axle.

2. In a gun carriage, the combination of an endless-track truck, an axle rotatably  
15 mounted on said truck, a trail secured to said axle, a carriage head supported on said trail, a member secured to said axle, and means secured to said truck and operatively engaging said member whereby a relative  
20 displacement between the carriage head and said truck may be produced.

3. In a gun carriage, the combination of a truck, an axle mounted in said truck, a trail secured to said axle, a carriage head  
25 mounted on said trail, a notched quadrant secured to said axle and means secured to said truck and operatively engaging said quadrant whereby said truck may be turned around said axle.

30 4. In a gun carriage, the combination with an axle of a trail secured to said axle, an endless track truck mounted on said axle, means operatively engaging said truck to raise and lower said axle whereby said carriage  
35 may be turned in a substantially ver-

tical plane on the bearing point of the trail on the ground, and means for locking the carriage and trail in different relative positions.

5. In a gun carriage, the combination of 40 an axle, a trail secured to said axle, an endless track truck movably mounted on said axle, and means operatively engaging said truck to raise and lower said axle whereby the carriage may be moved about the bearing  
45 point of said trail on the ground to vary the height of the line of fire.

6. A trail gun carriage comprising an endless track truck, an axle mounted on said truck for supporting said carriage, a trail  
50 secured to said axle and providing a fixed bearing point on the ground, and means operatively engaging said truck to raise and lower said axle for relatively displacing said carriage and truck about said bearing point  
55 to vary the height of the line of fire.

7. A trail gun carriage comprising an endless track truck, an axle mounted on said truck, a trail secured to said axle and providing a fixed bearing point on the ground,  
60 and means secured to said truck for turning the truck in a substantially vertical plane about said axle.

Dated this 16th day of December, 1921.

In testimony whereof I have signed this  
65 specification.

EUGÈNE SCHNEIDER.

Witnesses:

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LOUIS GARDET.