

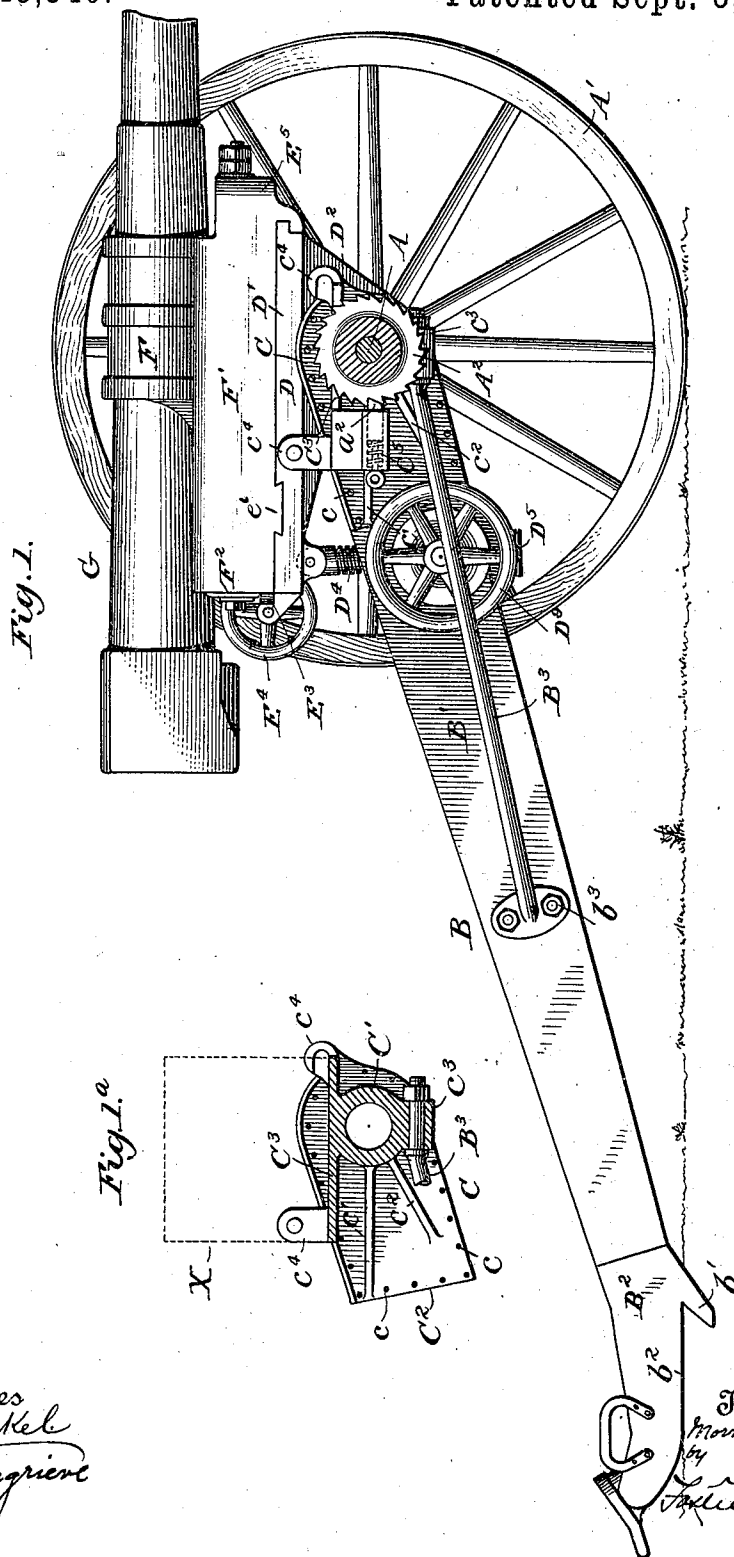
(No Model.)

3 Sheets—Sheet 1.

M. F. SMITH.
HYDRAULIC RECOIL GUN CARRIAGE.

No. 545,540.

Patented Sept. 3, 1895.



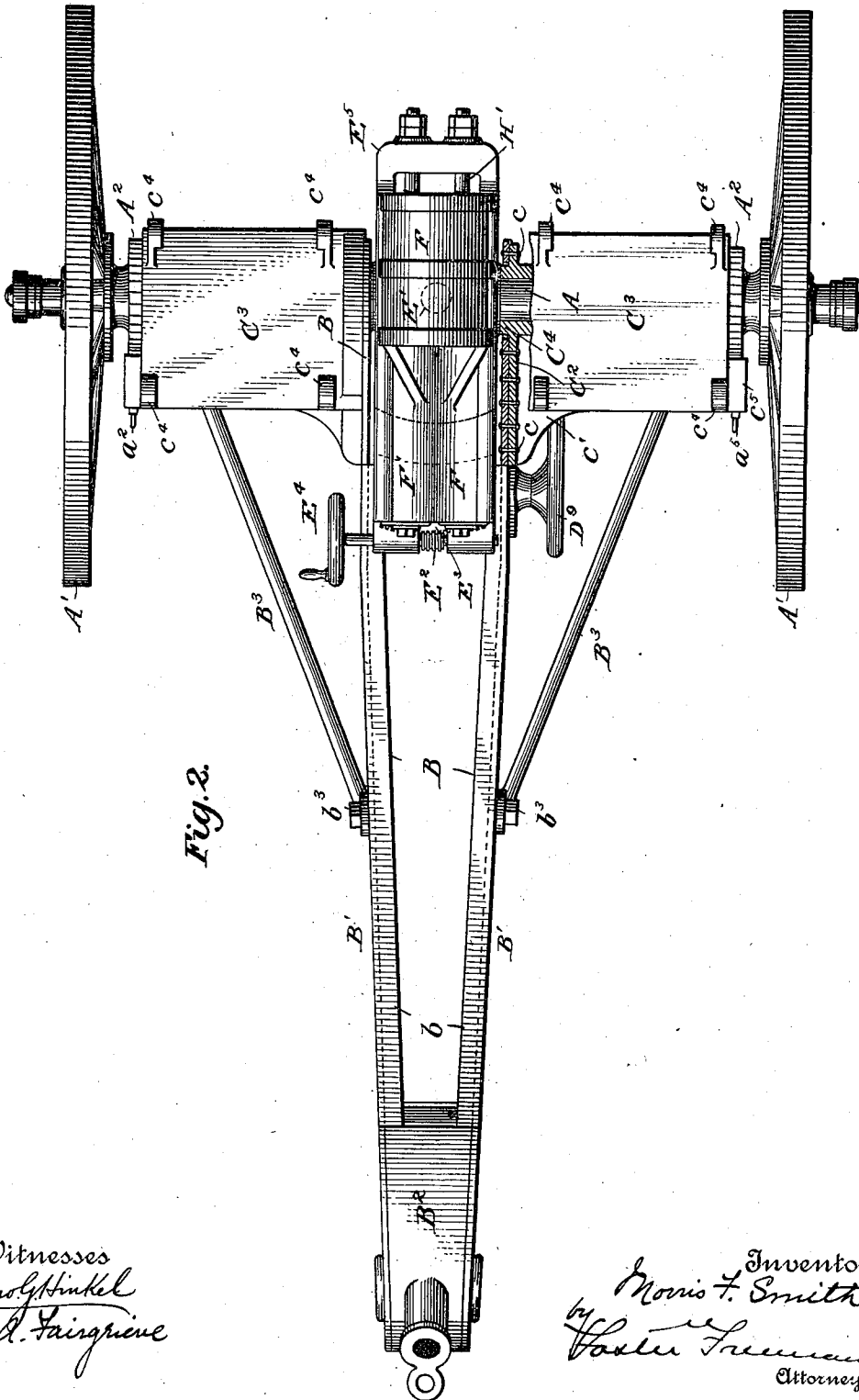
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Patented Sept. 3, 1895.



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(No Model.)

3 Sheets—Sheet 3.

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Fig. 3

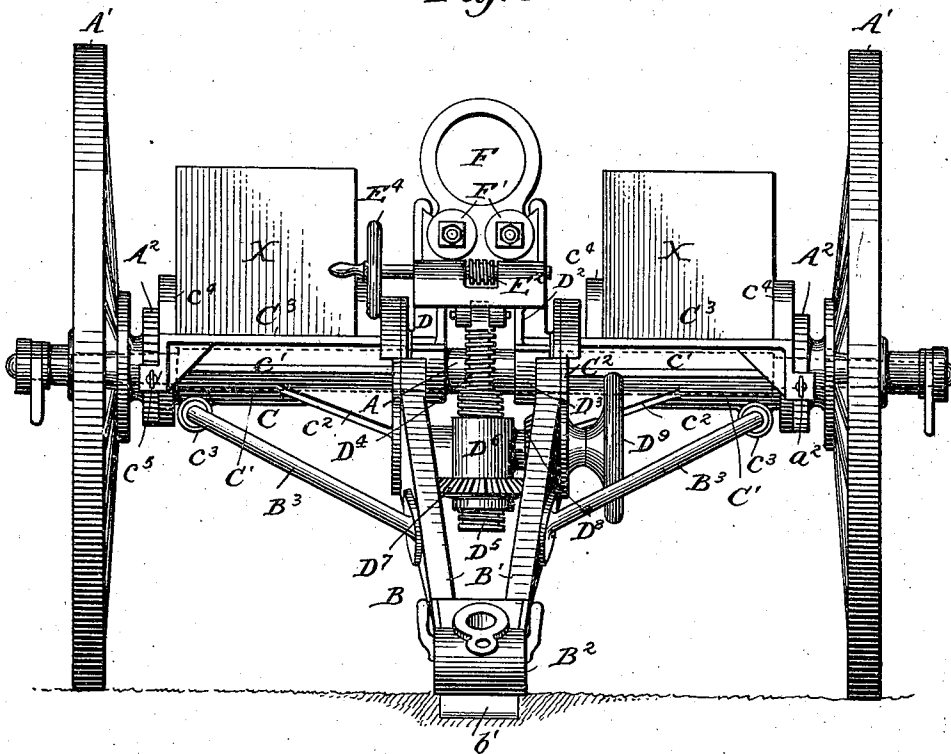
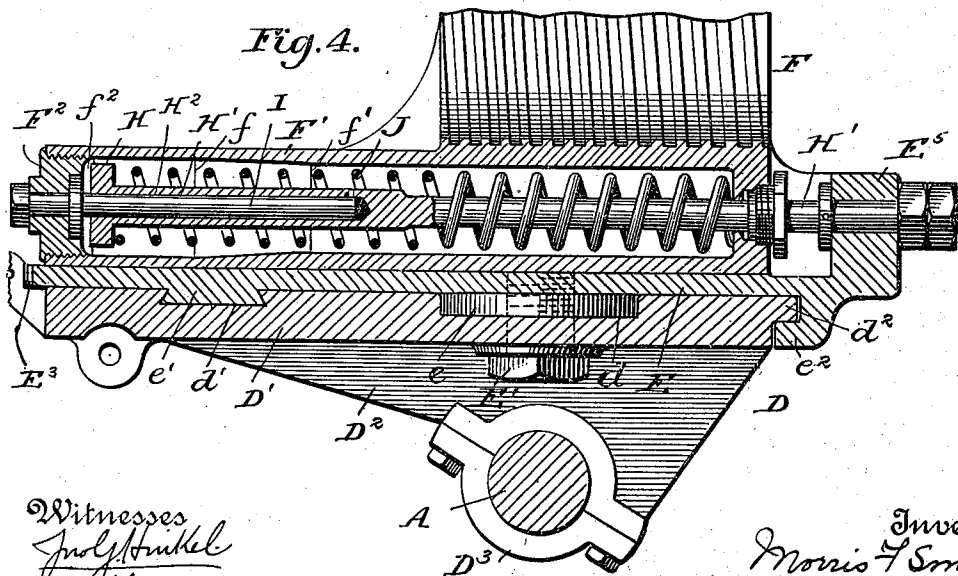


Fig. 4.



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UNITED STATES PATENT OFFICE.

MORRIS F. SMITH, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE WILLIAM CRAMP & SONS SHIP AND ENGINE BUILDING COMPANY, OF SAME PLACE.

HYDRAULIC-RECOIL GUN-CARRIAGE.

SPECIFICATION forming part of Letters Patent No. 545,540, dated September 3, 1895.

Application filed March 4, 1895. Serial No. 540,492. (No model.)

To all whom it may concern:

Be it known that I, MORRIS F. SMITH, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hydraulic-Recoil Gun-Carriages, of which the following is a specification.

My invention relates to hydraulic-recoil field or land carriages for rapid-fire guns, and it has for its object to improve and simplify the construction of such carriages to better adapt them for the uses for which they are intended, especially in connection with relatively large guns; and to this end my invention consists in the various features of construction and arrangement of parts having the mode of operation substantially as hereinafter more particularly set forth.

In the accompanying drawings, wherein I have illustrated one preferred embodiment of my invention, Figure 1 is a side view of the carriage, one of the wheels being removed the better to show the remaining parts. Fig. 1^a is an enlarged detail view of one of the axle-supports. Fig. 2 is a plan view, some of the details being in section. Fig. 3 is a rear end view of the carriage, and Fig. 4 is an enlarged sectional view showing one of the recoil-cylinders.

In the use of rapid-fire guns, especially in connection with field-carriages, it is desirable that the carriage should be made as light as possible and at the same time should have the greatest practical rigidity, in order that the various parts can successfully withstand the strains brought to bear upon them in the operation of the gun, and it is also desirable that the recoil of the gun should be properly taken up in such a manner as to prevent displacement of the carriage, injury thereto, and more especially to prevent the jumping or rising of the muzzle of the gun, and it is with the object of furnishing a carriage which will overcome these and other objections that my present invention is made, and I will now proceed to describe in detail the construction and arrangement of parts illustrated in the accompanying drawings.

The carriage, as is usual in this class, com-

prises an axle A, which is made of steel or other suitable material and is supported in the wheels A', and in the present embodiment of the invention I prefer to make these wheels somewhat less in diameter than is usual for this class of carriages, in order that the gun when mounted as hereinafter set forth will be at a convenient height for operation, and also to aid in preventing the displacement of the carriage during the recoil, and it will be seen hereinafter that by thus constructing the carriage certain advantages accrue without any corresponding disadvantages. Thus, for instance, the trail B may be made in such a way as to normally lie in more nearly parallelism to the earth, and thus furnish a better resistance and support for the gun.

As the gun is usually mounted about the center of the axle, the greatest strain during recoil is exerted on the axle at this part, and it has a tendency to bend or distort the axle, often rendering the carriage inoperative, and it is one of the essential features of my invention to provide means to overcome this difficulty without the necessity of making an exceedingly strong and therefore expensive axle, and this I do by not only making the trail exceedingly strong in itself and providing it with ribs and connections with the axle, which will tend to brace the same and support it against recoil, but I also provide what I have termed axle "supports" or "brackets," which are secured to the trail and are mounted on the axle in such a manner as to aid in taking up the resistance of the recoil and relieving the axle of a greater portion of its strain and produce the greatest resistance by the least amount of metal.

The trail B is preferably made of sheet-steel plates B', having their edges flanged or bent inwardly, as at b, which may be suitably braced and are preferably united to an end piece or casting B², to which are attached links or sockets, &c., for manipulating the trail, and for attaching it to the limber in the usual way. This end piece is made in a peculiar way, in that the lower surface b² is extended to a considerable extent, practically parallel with the ground, so as to furnish a substantial bearing

or the trail, and which will aid in preventing its being driven into the ground on the recoil, and further to prevent the carriage being driven backward I provide the end piece with a spade b' , which is cast or formed integral with the end piece, and extends downward at an acute angle, substantially as indicated, so that it will embed itself in the ground, and further aid in maintaining the position of the carriage. By thus constructing the bearing surface of the end piece and attaching the spade in the manner indicated I improve upon the usual construction of trails and accomplish the results stated in a most satisfactory manner. The sides B' of the trail extend forward and are mounted on the axle A , they being perforated to receive the axle, and are preferably arranged so as to embrace the axle adjacent the sides of the gun-supporting frame, hereinafter described.

In order that the axle may be strengthened in the manner indicated, I provide what I have termed "supports" or "brackets" C , which comprise a sleeve C' , fitting the axle, which is formed with or attached to an end plate C^2 , which is preferably of a contour substantially corresponding with the ends of the side pieces of the trail, and which are securely attached thereto by bolts or rivets c , so as to practically become a part of the trail. The bracket is further provided with ribs c^3 , which aid in strengthening or bracing the same, and I also provide extensions c^3 on the under side for the reception of the brace or stay-piece B^3 , which is attached to the sides of the trail by any suitable means, as by bolts b^3 . Mounted on the sleeve and forming a part thereof is the bracket-plate C^3 , which is preferably cast in one piece with the sleeve and the plate C^2 , and not only serves as a support for the ammunition-box X , but also acts as a stiffening-plate for the axle. In order that the supports or brackets may be more securely attached to the sides of the trail, I preferably provide the sleeve C' with an extension C^4 , which fits into an opening in the sides of the trail, as best seen in section in Fig. 2. The bracket-plate is provided with suitable hooks and lugs c^4 to furnish a ready means of attaching the ammunition-box. From this construction it will be seen that the supports or brackets embrace the axle on both sides of the gun-supporting frame and furnish a practically rigid support therefor which will prevent distortion thereof, owing to the fact that the plate C^3 is relatively very wide compared to its thickness, giving great strength in the line of distortion, and, further, owing to the ribs and braces, which all co-operate in connection with the sides of the trail to prevent the bending of the axle during recoil.

In this class of guns it is desirable to lock the wheels, so as to aid in maintaining the carriage in its position during the operation of the gun, and I have shown ratchet-wheels A^2 , attached to the hubs of the wheels, and a

pawl a^2 , arranged to slide in a chamber c^5 , attached to or formed with the trunnion-plate, and this pawl can be operated in the usual manner to lock the wheels. From this construction so far described it will be seen that I provide a carriage which is relatively exceedingly light, and still has the requisite rigidity to prevent distortion under recoil, and by locking the wheels and using the end piece of the shape before set forth, in connection with the spade, as well as having the axle low relative to the ground, I have been able to provide a carriage which will remain practically stationary during recoil.

Heretofore in mounting guns on such carriages various means have been suggested to take up the recoil, such as springs and other well-known devices, but so far all have had some disadvantages and failed to satisfactorily meet the requirements, and it is one of the features of my present invention to provide a recoil apparatus which can be used in connection with the carriage, by means of which the recoil will be successfully overcome without disturbing the position of the carriage, and, what is perhaps of more importance, preventing the jumping of the gun before the projectile leaves the muzzle, and I will now proceed to describe the apparatus shown for accomplishing this result. Mounted on the axle A is a gun-supporting frame D , which in the present instance comprises a slide-plate D' , having flanges or ribs D^2 , forming partial bearings for the frame, and which, in connection with the bearing-pieces D^3 , form a convenient means for adjustably attaching the frame to the axle. The slide-plate is connected with some suitable means for adjusting the altitude of the gun, and I have shown a screw-threaded rod D^4 , pivotally connected to the slide-plate and operating in connection with an internally and externally screw-threaded sleeve D^5 and an internally screw-threaded sleeve D^6 , which is pivotally mounted in the trail, and also mounted in connection with the sleeve D^6 is a bevel-gear D^7 , engaging a bevel-wheel D^8 , operated by a hand-wheel D^9 , whereby the gun-supporting frame may be elevated and depressed in the well-known manner. This mechanism for elevating and depressing the frame is not new, but is simply used as a convenient construction, and any other well-known elevating and depressing mechanism may be substituted therefor, and I do not deem it necessary to describe its construction more in detail. Mounted on the slide-plate D' is what I have termed a "guide-plate" E , and this is provided with a boss e , fitting a depression d in the slide-plate and forming a pivot for the guide-plate, and it is also provided with a bolt E' . The slide-plate is also provided with a dovetailed grooved recess d' , in which fits and moves the dovetail e' on the guide-plate, and the slide-plate is also provided with an extension or offset d^2 , over which fits a gib e^2 on the guide-plate, so that the guide-plate is held in place

on the slide-plate by the boss, the dovetail, and the gib, and the bolt and gib also aid in preventing the guide-plate rising from the slide plate under the effects of recoil. The guide-plate can be adjusted laterally on the slide-plate by any suitable means to train the gun for azimuth, and I have shown a worm-wheel E^2 engaging a rack E^3 on the guide-plate and operated by a hand-wheel E^4 or other suitable means. The gun G is mounted in a sleeve F , which is secured thereto in any suitable way and moves with the gun on recoil, and this sleeve is provided with a suitable recoil apparatus, about to be described. In the present instance I have shown two cylinders F' connected to or formed with the sleeve F , although in some instances a single cylinder may be used, and these cylinders operate in connection with the pistons H , which in the present instance are connected by piston-rods H' to lugs or projections E^5 , formed on the guide-plate E .

It is well known that, especially in the use of guns of relatively large caliber, in a carriage of this class there is a tendency for the muzzle of the gun to rise when it is being fired, thus interfering with the training of the gun, and thereby inducing a failure to make a good target, and one of the features of my invention is to overcome this tendency, and this I accomplish in connection with my improved recoil apparatus. Thus the cylinder or cylinders F' are arranged to move over the piston H , and the cylinders, as is usual, are filled with some liquid, as glycerine and water, and the recoil is taken up by causing the liquid to pass from one side to the other of the piston in the cylinder. I so arrange the piston in connection with the bore of the cylinder that upon the discharge of the gun there will be a practically uniform resistance offered to the movement of the cylinder for a certain time, (until the projectile has passed beyond the muzzle of the gun,) and then the resistance will gradually increase until the recoil is fully taken up. In order to accomplish this, I bore or otherwise form the cylinders F' for a certain distance from their rear ends—say to the line f in front of the pressure face of the pistons—of a uniform diameter and relatively considerably larger than the diameter of the piston H , as best indicated in Fig. 4. From the point f to the point f' , for instance, the cylinder tapers gradually to about the diameter of the piston H , and from there on to its end it may be practically the same diameter as the piston. From this it will be seen that from the moment of firing until the gun has recoiled a certain distance and until the projectile has reached the muzzle there will be a uniform resistance, and this will not be excessive, and I have found that this prevents the tendency of the gun jumping or disturbing the carriage until the projectile has passed beyond the muzzle of the gun, and then as the resistance gradually increases the disturbance to the gun and carriage is reduced to a minimum, and what-

ever disturbance there is will not interfere with accurate target practice. This feature of my invention may be accomplished in different ways, and the size of the bore can be accurately adjusted to suit any recoil. The cylinders F' in the present instance are provided with plugs F^2 , screwed in their rear ends, and these plugs are preferably hollowed at their inner ends, as indicated at f^2 , so as to form a cushion for the piston when the gun is returned to firing position. The piston-rods in this instance are made hollow throughout a portion of their length, as at H^2 , and a stem or guide-rod I is mounted in the plug F^2 and moves in the piston-stem to properly guide the piston in the cylinder. In order to return the gun to firing position, I mount in the cylinder springs J , which are shown as surrounding the piston-rod H' , and which are compressed during recoil, and are of sufficient strength to gradually return the gun to firing position in a manner well understood. These features, as thus described, and as shown in the drawings, have proven to be most satisfactory in connection with a gun of relatively-high caliber—say, for instance, a twelve-pounder—and I have found that not only is the recoil satisfactorily taken up by my arrangement without danger of jumping or disturbing the carriage until the projectile has actually passed the muzzle of the gun, but that even after that there is comparatively little disturbance to the carriage itself, so that the gun having been once adjusted, both for altitude and azimuth, a series of projectiles can be rapidly fired, if desired, without readjustment of the gun or carriage. Furthermore, by the construction of the trail and the axle-supports in the manner set forth I find that the tendency to bend or distort the axle or other parts of the carriage is overcome, and the carriage has stood the test of rapid and heavy firing without injury to any of the parts, and it will be observed that all the parts are relatively light, so that the carriage as a whole is lighter and stronger than others of this class that have heretofore been made.

Having thus described in detail (sufficiently to enable others to make and use my invention) the various features of construction and arrangement, and set forth their mode of operation, without limiting myself to the precise construction and arrangement set forth, what I claim is—

1. In a gun-carriage, the combination with the axle and trail, of two supports or brackets each comprising a sleeve surrounding the axle, an end plate secured to the trail and having ribs, and braces connected to the trail, substantially as described.

2. In a gun-carriage, the combination with the axle and trail, of supports or brackets comprising a sleeve fitting the axle, an end plate secured to the trail, and a bracket-plate connected to the sleeve and end plate and forming a support for the ammunition-box, substantially as described.

3. In a gun-carriage, the combination with the axle and trail, of supports or brackets mounted on the axle and secured to the trail and comprising a sleeve having an extension
5 projecting through an opening in the side of the trail, an end plate secured to the trail, and a horizontal bracket-plate, substantially as described.

4. In a gun-carriage, the combination with
10 the axle and trail, the latter comprising steel plates embracing the axle, of a support or bracket at each side of the trail also embracing the axle, each of said supports comprising a sleeve, an end plate, and a bracket-plate
15 formed in one piece and secured to the trail-plates, substantially as described.

5. In a gun-carriage, the combination with

the gun-supporting frame, of a sleeve supporting the gun, and hydraulic cylinders and pistons interposed between the sleeve and
20 frame, the cylinders having a uniform bore for a certain distance in front of the pressure face of the pistons and then a tapering bore, whereby a uniform resistance is offered to
25 the recoil at first, and then gradually increased, substantially as described.

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

MORRIS F. SMITH.

Witnesses:

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A. N. DOBSON.