(No Model.)

2 Sheets—Sheet 1.

T. NORDENFELT.

CARRIAGE FOR MACHINE GUNS.

No. 364,366. Patented June 7, 1887.

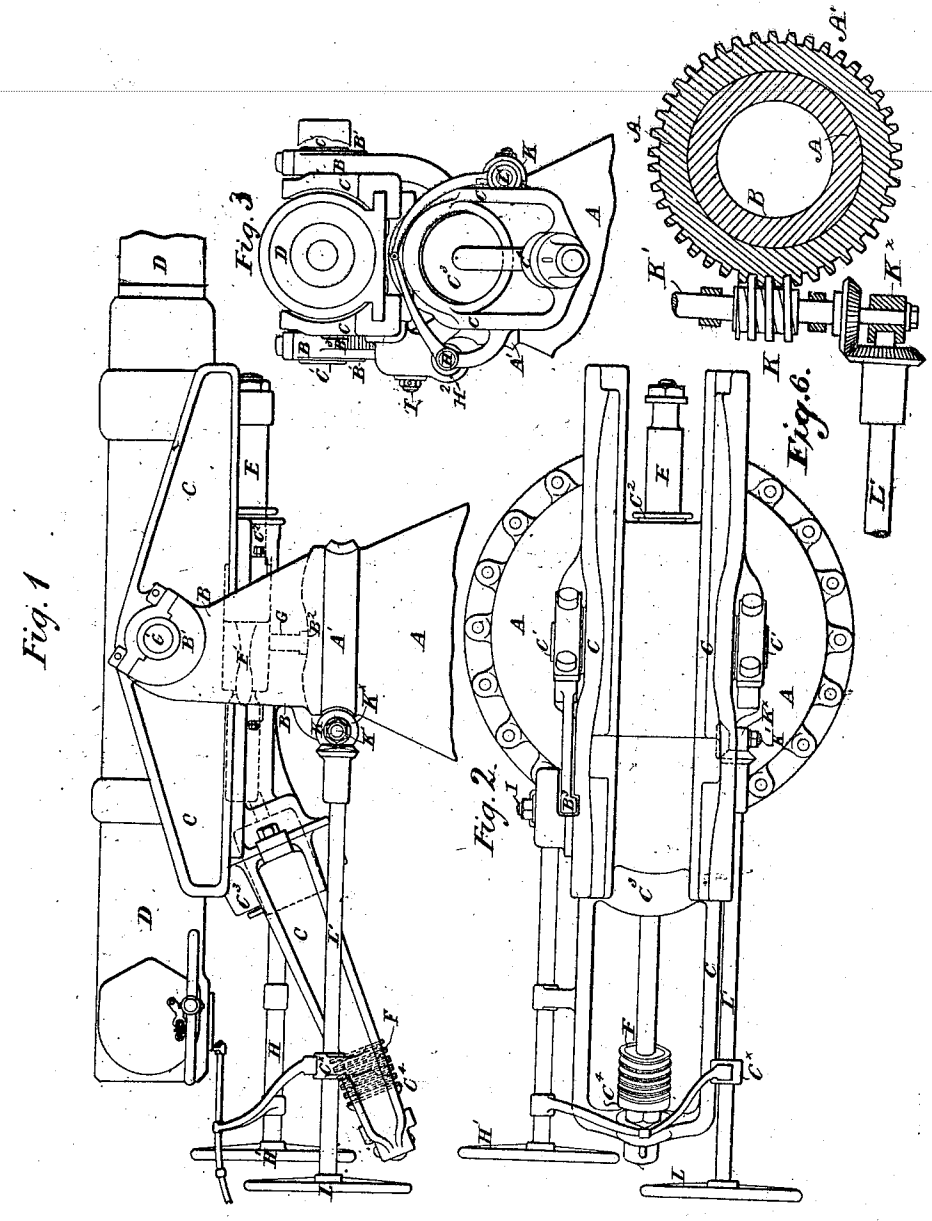


Fig. 1

Fig. 2

Fig. 3

Fig. 6

Witnesses
Baltus D. Long
Nellie L. Holmes

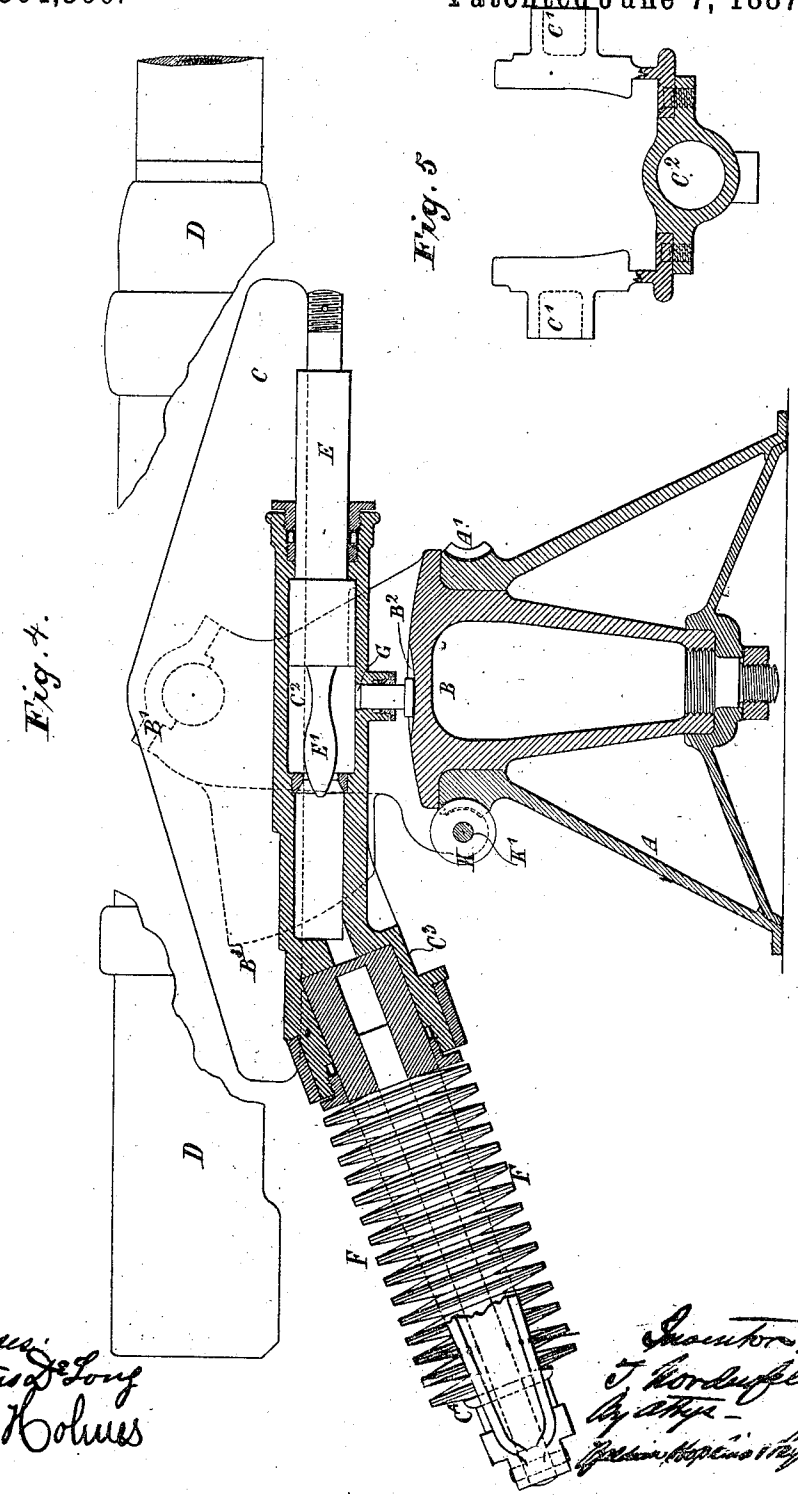
Inventor
T. Nordenfelt
By attys
Baldwin, Hopkins & Peyton.

(No Model.) 2 Sheets—Sheet 2.

T. NORDENFELT.

CARRIAGE FOR MACHINE GUNS.

No. 364,366. Patented June 7, 1887.



Witnesses:
Baltus de Long
H. L. Holmes

Inventor:
T. Nordenfelt
by attys—
Dodger, Hopkins & Taylor

UNITED STATES PATENT OFFICE.

THORSTEN NORDENFELT, OF WESTMINSTER, ENGLAND, ASSIGNOR TO THE NORDENFELT GUNS AND AMMUNITION COMPANY, (LIMITED,) OF SAME PLACE.

CARRIAGE FOR MACHINE-GUNS.

SPECIFICATION forming part of Letters Patent No. 364,366, dated June 7, 1887.

Application filed September 14, 1886. Serial No. 213,513. (No model.)

To all whom it may concern:

Be it known that I, THORSTEN NORDENFELT, a subject of the King of Sweden, residing at 53 Parliament Street, in the city of Westminster, England, civil engineer, have invented certain new and useful Improvements in Gun-Carriages Applicable Especially to Machine-Guns, of which the following is a specification.

This invention has for its object improvements in gun-carriages applicable especially to machine-guns.

The gun is carried in a cradle, in which, on recoil, it is able to slide. The cradle is provided with trunnions, and these are received into bearings on a forked support. The stem of this support pivots vertically in a socket formed at the top of a conical pedestal. The gun has a ram fixed to it, and this enters a cylinder formed upon the cradle. When the ram is driven in by the recoil, it expels water or liquid from the cylinder, and this passes into a second cylinder. The second cylinder contains a ram of larger diameter than the first, and disk-springs are applied to control the movement of this ram. The springs are compressed when, in consequence of the recoil, the ram moves outward from the cylinder. The play of the springs is less than the distance through which the gun recoils, in consequence of the difference in area of the two rams. The space occupied by the springs consequently is short. The flow of the water or liquid from one cylinder to the other is controlled by throttling it in a narrow passage, and during the recoil the passage may be gradually contracted until the gun is brought to rest. A convenient way in which to vary the dimensions of the passage connecting the two cylinders is to provide a suitably-shaped tail on the first ram to enter and partially fill this passage. I apply also a third hydraulic cylinder, and the ram of this cylinder is armed with a brake-block, which bears against a surface around one of the bearings and concentric with the trunnions.

When there is little or no hydraulic pressure in the system, the brake does not interfere with the trunnions moving in their bearings, and the gun can then be moved for the purpose of aiming, either by means of a shoulder-crutch attached to the cradle or otherwise; but on the commencement of the recoil the hydraulic pressure within the system becomes great, the brake-block is then strongly pressed against the surface opposed to it, and the gun is thus securely locked in position until the disturbance to which the recoil gives rise has ceased. Elevating-gear may be applied, consisting of an axis with hand-wheel carried upon the cradle and a worm on this axis. The worm engages with a worm-wheel, and thus by a frictional connection turns a spur-wheel engaging with an arc of teeth concentric with the trunnion-bearings and formed or fixed upon the same support.

For the purpose of training the gun, a ring of worm-teeth is formed around the pedestal, a worm on a transverse horizontal axis gears with the ring in rear, and the bearings in which this axis is carried are on the support which carries the trunnions. On the same axis with the worm there is also a beveled wheel. Another similar wheel gears with the first beveled wheel. Its axis, which is provided with a hand-wheel, is supported at one end by a pin on a sleeve embracing the axis of the worm and at the other by a bearing connected by a universal joint to the cradle, and in this bearing the axis of the hand-wheel is able to move longitudinally, as well as to turn.

In order that my said invention may be most fully understood and readily carried into effect, I will proceed to describe the drawings hereunto annexed.

In the accompanying drawings, Figure 1 is a side elevation with the gun in place; Fig. 2, a plan with the gun omitted; Fig. 3, a rear elevation with the gun in place; Fig. 4, a vertical longitudinal section with the gun in place, and Fig. 5 a transverse section of a gun-carriage adapted to receive a machine-gun. Fig. 6 is a detail view, partly in horizontal section and partly in plan, showing portions of the training mechanism.

A is a conical pedestal carrying the forked standard or support B, which is able to rotate

about a vertical axis. B′ are bearings on this support, which receive the trunnions C′ C′ of the cradle C.

D is the gun. It is able to slide longitudinally in the cradle.

E is a ram fixed to the gun, and it enters a cylinder, C^2, formed in the cradle beneath the gun. The ram E may, but less conveniently, be replaced by a piston-rod and piston, and when speaking of a "ram" I intend to include this form.

C^3 is another cylinder of larger diameter communicating with the cylinder C^2. It also contains a ram, and this abuts upon a steel spring, F. The spring represented in the drawings is composed, in a well-known manner, of a series of dished disks of steel; but a coiled spring may be substituted. The spring abuts in rear upon a support, C^4, carried by arms projecting from the cradle.

G is a third hydraulic cylinder. It is mounted upon the cradle and in constant communication with the other cylinders, C^2 and C^3. The ram of the cylinder G abuts upon an arc, B^2, on the standard or support B. The gun-carriage shown in these figures is also provided with elevating and training gear; but this may be omitted and the gun directed by means of a shoulder-piece, stock, or crutch. The elevating-gear consists of an axis, H, on which is a hand-wheel, H′, and a worm, H^2.

I is an axis, also carried upon the cradle, and on it is a worm-wheel driven by the worm, and a spur-wheel engaging with an arc of spur-teeth B^3, formed in connection with the forked standard B. The spur-wheel is not rigidly fixed upon the axis H, but is connected therewith by frictional holding-gear, so that the teeth may not be exposed to excessive strain by the recoil of the gun. On firing, the ram E is driven into the cylinder C^2, and liquid is forced out of this cylinder into the larger cylinder C^3. The plunger of this cylinder is thereby caused to move outward, but through a distance less than that over which the gun recoils. It compresses the spring F, which is made proportionally stiff, in consequence of the small amount of play required. A short spring can be used, and this is a great advantage derived from the employment of two cylinders of different areas in the manner described. When the recoil is complete, the reaction of the spring brings the gun forward again to the firing position.

The speed of movement both in recoil and return to the firing position is regulated by suitably adjusting the dimensions of the passage between the cylinders C^2 and C^3. This may be done by providing the ram E with a tail, E′, entering the passage from one cylinder to another. The tail is so shaped as to close the passage in which it moves to the extent required. While the gun is in movement, during recoil and return to the firing position, the ram in the cylinder G is exposed to pressure, and the brake-block which it carries bears forcibly against the arc B^2 on the standard B. Thereby the gun is locked, so that the elevation cannot be changed, and the gun has not to be separately aimed for each discharge, as it would be if the concussion on discharge were able to change the elevation. Nevertheless, after the gun has come to rest, the recoil having expended itself, the elevation may be changed by turning the elevating-wheel H′; or if no mechanical elevating-gear be provided, then the gun may be directed by a stock or shoulder-crutch, against which the shoulder is pressed.

Mechanical training-gear may also be provided, as the drawings show, in which case worm-teeth are provided at A′, around the pedestal A, and a worm, K, engages with these teeth. This worm is carried on a transverse horizontal axis, K′, and the bearings for this axis are upon the forked standard B. The axis K′ is turned to train the gun by means of a hand-wheel, L, on an axis, L′. The axis is able to slide through the swiveling-bearing $C^\times$ upon the cradle, and its inner end is connected (but so as to be able to turn) with a sleeve, $K^\times$, on the axis K′. The axes K′ and L′ are geared together by beveled pinions.

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

1. A gun-carriage comprising a cradle mounted on trunnions, in which cradle the gun is able to move longitudinally, and two hydraulic cylinders upon the cradle, communicating with each other and of different diameters, the cylinder of smaller diameter receiving a ram connected with the gun and that of larger diameter being furnished with a ram operating against a spring to check the recoil, and moved by the reaction of the spring to return the gun to the firing position.

2. A gun-carriage comprising a cradle mounted on trunnions, and a hydraulic cylinder mounted on the cradle controlling the recoil of the gun, and another hydraulic cylinder communicating with the first and having a ram exerting a pressure against the support on which the cradle is carried, and thereby preventing the movement of the cradle during the recoil, but leaving it free to be moved to alter the elevation of the gun when the force of the recoil is expended.

3. A gun-carriage comprising a cradle mounted on trunnions, in which cradle the gun is able to move longitudinally, and a hydraulic cylinder on the cradle receiving a ram connected with the gun, such ram having a tail or prolongation of varying cross-section entering a passage through which liquid is driven by the movement of the gun.

4. The combination of the pedestal, the turning support mounted in the pedestal, the worm-teeth around the pedestal, the worm

engaging the worm-teeth, the transverse horizontal axis of the worm carried by the turning support, the hand-wheel L, the sliding hand-wheel axis gearing with the worm-axis, the sleeve on the worm-axis for supporting the hand-wheel axis, the bearing $C^{\times}$ for the hand-wheel axis, and the gun-cradle carried by the turning support and with which said bearing has jointed connection, substantially as and for the purpose set forth.

THORSTEN NORDENFELT.

Witnesses:

PHILIP THAINE,

F. J. NORRIS.