No. 631,201. Patented Aug. 15, 1899.

# M. DARMANCIER & A. DALZON.

## RECOIL BRAKE FOR GUN CARRIAGES.

(Application filed Mar. 5, 1898.)

(No Model.)

Fig. 1.

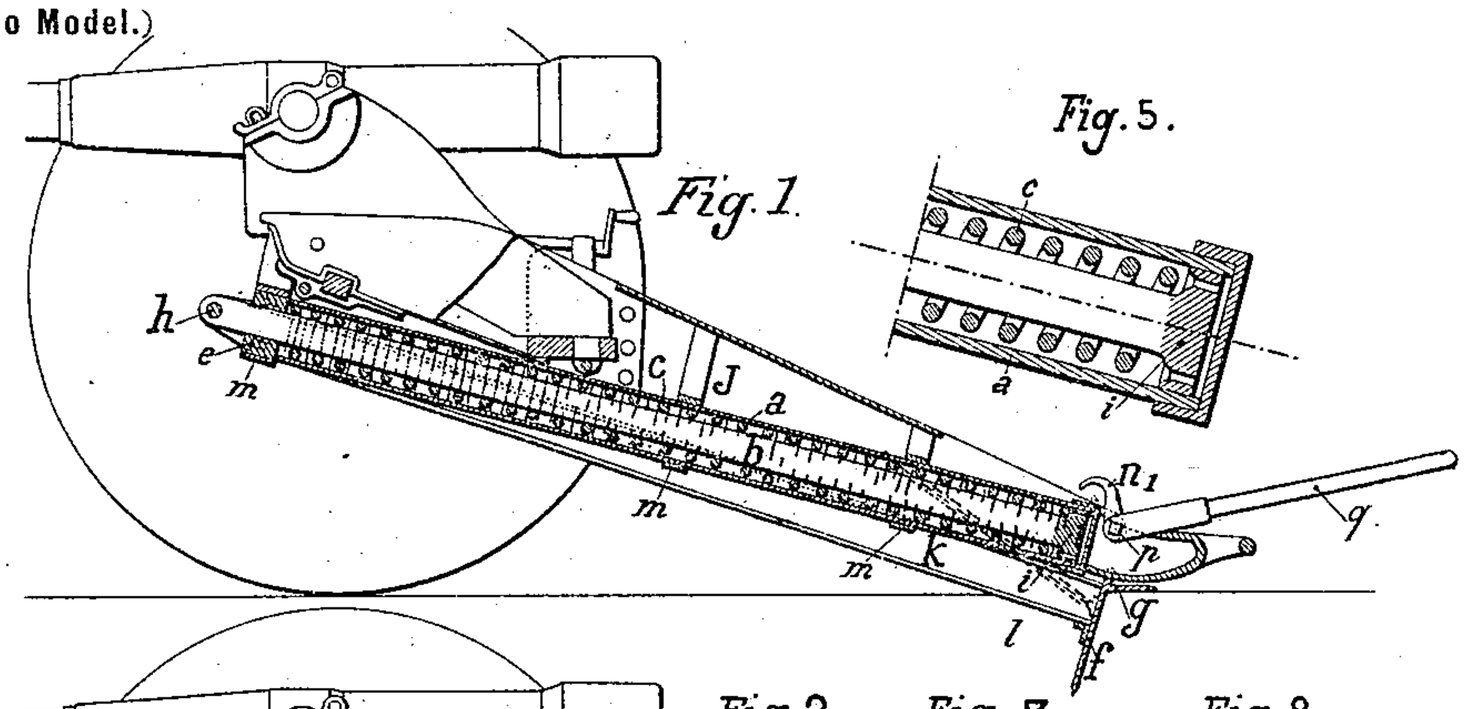



Fig. 5.




Fig. 2.

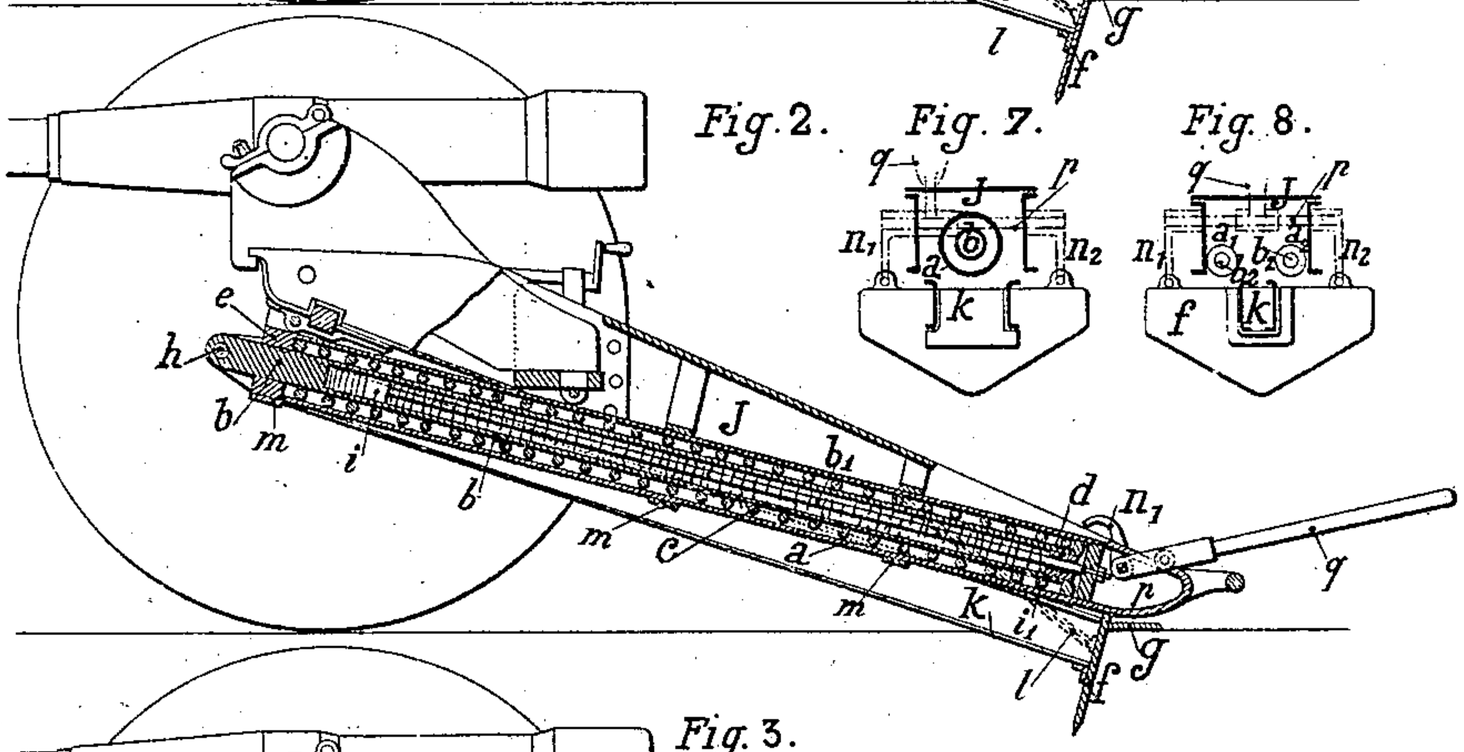



Fig. 7.




Fig. 8.




Fig. 3.

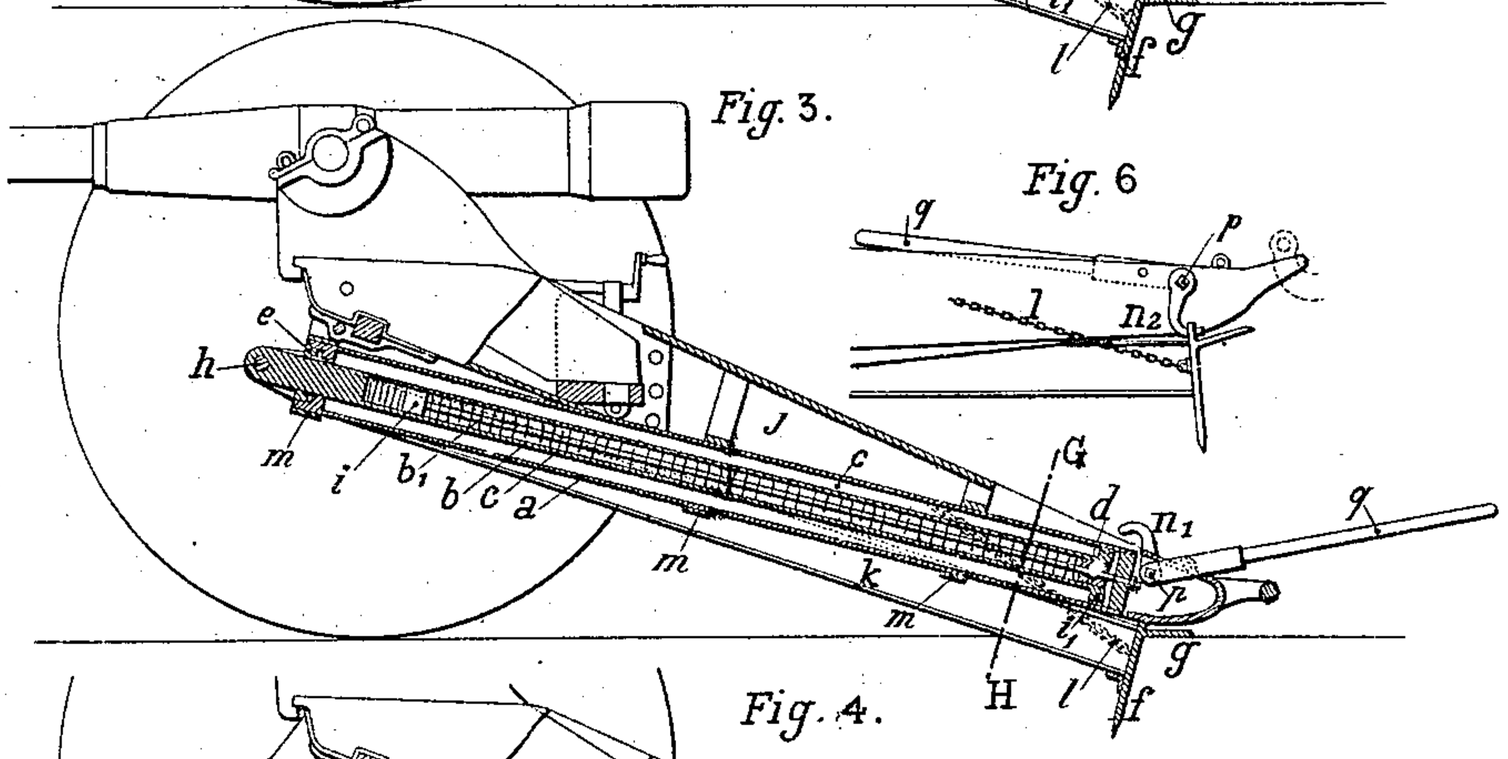
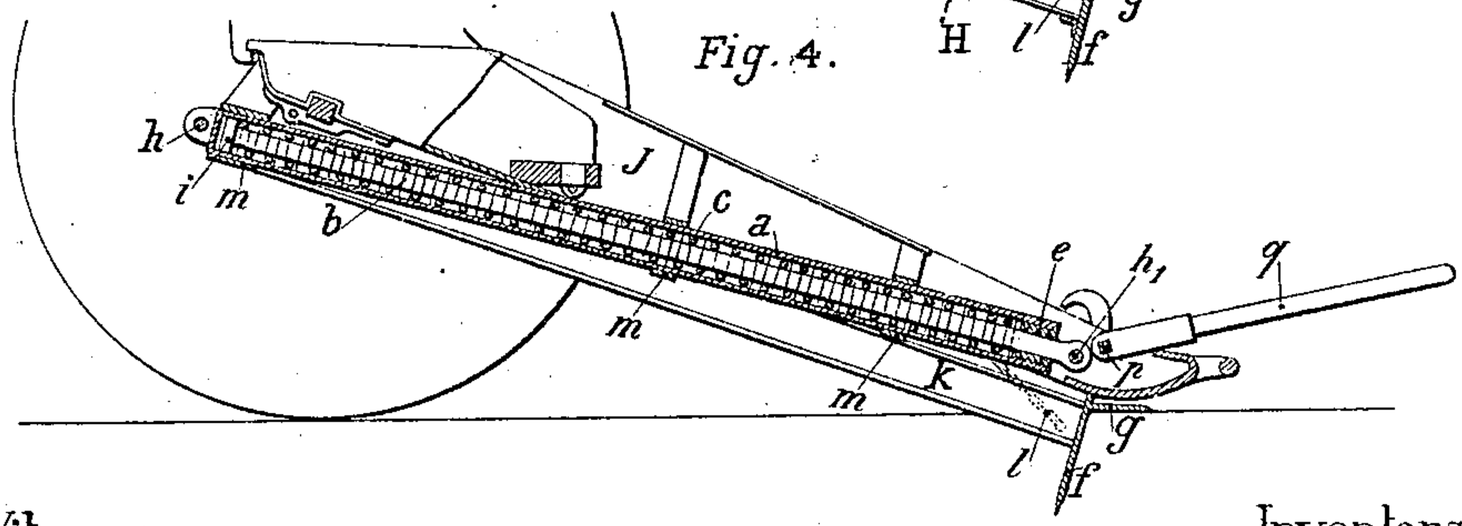



Fig. 6




Fig. 4.

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# UNITED STATES PATENT OFFICE.

MICHEL DARMANCIER AND AIMÉ DALZON, OF ST. CHAMOND, FRANCE.

## RECOIL-BRAKE FOR GUN-CARRIAGES.

SPECIFICATION forming part of Letters Patent No. 631,201, dated August 15, 1899.

Original application filed July 31, 1897, Serial No. 646,694. Divided and this application filed March 5, 1898. Serial No. 673,187. (No model.)

*To all whom it may concern:*

Be it known that we, MICHEL DARMANCIER and AIMÉ DALZON, citizens of the Republic of France, residing at St. Chamond, (Loire,) France, have invented certain new and useful Improvements in Recoil-Brakes for Gun-Carriages Mounted on Wheels, of which the following is a specification.

Our invention relates to a new or improved recoil-brake for gun-carriages mounted on wheels, the said recoil-brake being designed so as to enable the combined gun and carriage to recede or recoil bodily whenever the gun is fired and to automatically resume its initial or firing position prior to firing again.

This improved recoil-brake consists, substantially, of the combination of (*a*) an energy-storing device or recuperator, consisting of an elastic or collapsible body, such as a spring or a mass of compressed air, which being compressed during the recoil stores a certain quantity of energy which it redelivers after the recoil on resuming its initial length or volume and utilizes for restoring the combined gun and carriage to their initial or firing position; (*b*) a recoil and running-out speed controlling or regulating device, consisting of an untight piston working, together with or during the same time as the energy-storing device, into a liquid contained in a cylinder and dividing the said cylinder in two partitions or rooms, which communicate by a passage of sufficiently small area for causing the friction of the liquid forced from one partition or room into the other through the said narrow passage by the movement of the piston to gradually expend a portion of the energy produced by the recoil or redelivered by the energy-storing device or recuperator, so as to regulate or control the speed of the recoil and running-out movements. The aforesaid both devices thus combined constitute an elastic or collapsible apparatus capable of being compressed during the recoil and of resuming its initial length or volume during the running-out movement, a part of which apparatus is secured to the carriage-frame and another part of which is pivotally connected or hinged to the forward or upper end of an inclined rigid prop or recoil-arm resting on the ground through the medium of an anchor or fluke driven into the ground under the percussion of the gun-carriage trail. The lower or rear end of the said rigid prop is connected to the gun-carriage trail by one or two chains or other suitable like connecting device in such a manner that the initial compression of the energy-storing device or recuperator automatically raises the said prop and holds it in contact with the gun-carriage trail when the combined gun and carriage are not in battery—viz., when the gun-carriage trail is lifted above the ground. The recoil-brake thus designed may be single or consist of two identical apparatuses of smaller size parallel to each other and located either beneath or inside or on each side of the carriage-trail.

In order that our said invention may be readily understood by any person skilled in the art, we shall now proceed to describe the same more fully, reference being had to the accompanying drawings, which illustrate by way of example various forms of construction of our apparatus, which are all comprised by the foregoing general description and which we consider as the best and most suitable for carrying out our invention.

In the said drawings, Figures 1, 2, 3, and 4 illustrate in axial longitudinal section four peculiar and equivalent arrangements of our improved recoil-brake fitted to a traveling gun-carriage, the left wheel of which is omitted for exposing more clearly the mechanism. Fig. 5 is an axial section, drawn on a larger scale, of the recoil and running-out controlling-piston and of the bottom of the brake-cylinder illustrated in Fig. 1, showing the narrow outlet-ports provided in the piston for enabling the liquid to pass through from one side to the other of the said piston. Fig. 6 is a longitudinal elevation of a peculiar device for connecting the rigid prop with the gun-carriage frame and fitted with a trail-lever provided with two hooks. Figs. 7 and 8 are transversal sections made upon line G H of Fig. 3 of the same connecting device applied, respectively, to a single, Fig. 7, and

to a double, Fig. 8, recoil-brake of our improved system.

In all figures the same reference-letters indicate similar or correspondingly working parts.

Fig. 1 illustrates a form of construction of our improved recoil-brake in which the energy-storing device or elastic body consists of a helical spring *c*, located in the cylinder or tube *a*, the forward and rear ends of said spring bearing, respectively, against the upper cover-plate *e* of the tube *a* and against the recoil-controlling piston *i*. The latter (shown on a larger scale in Fig. 5) is made untight by any convenient way—say by drilling through it one or several narrow ports (more clearly seen in Fig. 5)—and works in the tube *a*, containing any suitable liquid, such as a mixture of water and glycerin. The said piston is secured to the lower or rear end of a rod *b*, passing through a water-tight stuffing-box or packing provided in the upper cover *e* of the tube *a*, which is securely connected to the carriage-frame *j* by a set of rings *m*. The upper end of the rod *b* is pivotally connected or hinged by a bolt *h* or like connecting device to the upper end of an inclined rigid prop or recoil-arm *k*, made of wood or metal of any suitable shape in transverse section, provided at its rear end with an anchor or fluke. The latter consists of a sharp-edged plate *f* and a shoulder *g*, designed to check the sharp plate or blade *f* as it enters the ground. The shape of the said plate (shown in Figs. 7 and 8) is made to correspond to the direction of the percussion stress which is to drive it into the ground and terminates below in a projecting point or apex situated centrally the length of the fluke and in the central vertical plane of the gun-carriage. The angle, Figs. 7 and 8, at the point of the fluke may vary, but is preferably an obtuse angle, and the incline of the part *f* practically corresponds to the direction in which the percussion stress is transmitted through the carriage-trail. The inclined rigid prop *k* abuts or presses during the recoil and running-out movements of the gun-carriage against the ground through this anchor or fluke *f*, which is prevented from entering the ground too deeply by the shoulder *g*.

In the above-described form of construction of our apparatus, as seen in Fig. 1, the energy-storing helical spring *c* is immersed into the brake liquid. We may in such case, for enabling the liquid to pass from one side of the piston to the other, provide one or more longitudinal grooves or slots, in which case the piston *i* may be provided or not with the narrow ports shown in Figs. 1 and 5.

Instead of immersing the spring *c* in the liquid it may be kept separate therefrom by constructing the apparatus as shown in Fig. 2. The brake liquid is then contained in the central tubular rod *b*, forming a hydraulic cylinder with or without internal outlet grooves or slots, and the recoil-controlling device consists of an untight piston *i*, (without or with outlet-ports,) the said piston *i* being connected by a central rod *b'* to the bottom plate or cover of the tube *a*, so as to move together with the said tube. The central rod *b* passes through a packing or stuffing-box *d*, which incloses the liquid in the tubular rod *b*, and the energy storing or recuperator helical spring *c* bears against the piston *i*, secured to the said tubular rod and serving as a guide for its lower end.

Fig. 3 illustrates an arrangement absolutely the same as the foregoing, with the only difference that the energy-storing spring *c* is dispensed with and replaced by a volume of air initially compressed into the annular space or room *c*, extending between the tube *a* and the outer wall of the tubular rod *b*, the piston *i* at the lower end of said rod being in this case made air-tight by means of any well-known or suitable packing.

In the form of construction illustrated by Fig. 1 the tube *a*, as above explained, is secured by rings *m* to the carriage-frame *j* and moves together with the latter, the rod *b* and the piston *i* being held back by the bolt *h*. We might obviously without departing in any way from the nature of our invention employ the reverse arrangement, which is carried out in the modified construction illustrated by Fig. 4, in which the upper cover of the brake cylinder or tube *a* is provided with a suitable lug or lugs pivotally connected or hinged to the bolt, trunnion, or like *h* and can slide freely in a set of rings *m m*, secured to the carriage-frame *j*. The recoil-controlling device consists, as in the above-described arrangements, of an untight piston *i*, working in liquid and fixed to the upper end of a rod *b*; but the lower extremity of this rod is hinged to a bolt *h*, secured to the carriage-frame *j*, whereby the rod *b* and piston *i* are caused to move together with the gun-carriage, and during the recoil the spring *c*, immersed into the liquid, as in Fig. 1, is compressed between the piston *i* and the bottom *e* of the cylinder or tube *a*, provided with a packing or stuffing-box, through which passes the rod *b*.

In all equivalent arrangements above described the lower end of the rigid prop *k* (or the anchor or fluke itself) is connected to the carriage-trail by two inclined chains, such as *l*, Fig. 6, set parallel to each other and on both sides of the prop *k* and the carriage-trail. This connecting device, which might be replaced by any other like one—say by a bifurcated chain, the middle of which should be secured to the under side of the carriage-trail, or by telescopic rods—has for its object to prevent the trail from receding too far from the anchor or fluke at the end of the recoil movement and to hold said anchor automatically in contact with the under side of

the trail when the latter is raised. For this purpose we impart to the energy-storing device an initial compression intended to stretch the chains *l* (or other like connecting device,) and such compression is so regulated as to produce an upward transverse strain strong enough to raise the prop and anchor and hold the latter in contact with the under side of the trail at the position shown in Fig. 6, the inclined position and the length of the chains permitting, however, the gun-carriage to recede for a predetermined distance without removing the fluke from its cut or indentation in the ground.

In order to impart increased rigidity to the connection between the rear of the prop *k* and the carriage-trail in the "limbered up" or traveling position—that is to say, coupled with the fore-carriage, as shown in Fig. 6—we may clamp on both ends of the axle *p* of the trail-lever *q* two hooks $n'$ $n^2$, which, when the firing is over and the lever *q* is turned down upon the gun-carriage, engage two lugs provided on the anchor *f*, and, together with the chains *l*, hold the said anchor rigidly in contact with the under side of the trail during the whole time the lever *q* remains turned down upon the gun-carriage. When the gun is set to battery for firing and the lever *q* is raised and set in the position shown at Figs. 1 to 4, the hooks $n'$ $n^2$ are disengaged from the anchor *f* and the prop *k* is connected to the trail by the chains *l* only. Figs. 7 and 8 show, respectively, in the dot and pick lines the arrangement of the said hooks $n'$ $n^2$ and lever *q* in the case where the gun-carriage is provided with a single recoil-brake *a b*, Fig. 7, and in the case where the recoil-brake is double—that is to say, consists of two identical apparatuses of smaller size $a'$ $b'$ and $a^2$ $b^2$, Fig. 8.

Whatever may be the preferred arrangement of our recoil-brake, the operation of such apparatus is as follows: When the gun is fired, the percussion stress conveyed by the carriage-trail to the anchor *f* causes the latter to enter the ground. Then the combined gun and carriage bodily recoil, while at the same time the anchor remains in the cut or indentation it has made in the ground. The recoil speed is controlled and regulated by the friction of the liquid passing from one side to the other of the untight (or recoil and running-out movements speed-controlling) piston through the narrow passage or passages provided for this purpose. At the same time the energy-storing device or recuperator is compressed. After the recoil, which is checked by the chains *l* connecting the recoil-brake with the gun-carriage, the recuperator redelivers the energy stored and the counteracting impulse of the energy-storing device (spring or air) causes the gun-carriage to resume its initial or firing position relatively to the anchor *f*, the liquid being during this time forced inversely to its preceding direction through the narrow communication provided between the both sides of the recoil and running-out movements speed-controlling piston, the friction of the said liquid regulating the speed of the running-out movement, as well as the recoil speed, and the combined gun and carriage is again in position ready for firing. When, the firing being over, the trail is raised for coupling the gun to the fore-carriage, the initial compression of the energy-recuperator *c* raises automatically the rear end of the prop *k* against the under side of the trail, as hereinbefore explained, and when the lever *q* has been turned down on the gun-carriage in the position shown in Fig. 6 the hooks $n'$ and $n^2$, engaging the anchor *f*, hold rigidly the prop *k* in its raised position and prevent it from oscillating or swinging around the bolt *h* during the traveling.

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

1. In an improved recoil-brake for gun-carriages mounted on wheels, the combination of an energy-storing device or recuperator, a recoil and running-out speed-controller, a sliding connection between one part and the carriage-frame, and an inclined prop pivotally connected to the other part at its upper end and the lower end of the prop connected with the gun-carriage trail substantially as described.

2. The combination with a cylinder, of a recoil-controlling piston in said cylinder at one end, a cover-plate to the cylinder at the other end, a spring in the cylinder between said piston and plate, a rod passed through the said plate and connected to the piston, a support for said plate, a rigid inclined prop pivotally connected to said rod and an anchor on the rear end of the prop, all substantially as specified.

3. The combination with a cylinder, a rod therein, a piston carried by one end of said rod, an elastic body around said rod in the cylinder, a cover-plate on the upper end of the cylinder through which said rod passes, a rigid prop pivotally connected to the upper end of said rod, and an anchor on the other end of the prop, substantially as described.

4. The combination with a cylinder, and a rod therein, of a piston carried by one end of the rod, an elastic body around the rod in the cylinder, a cover-plate on the upper end of the cylinder through which said rod passes, a rigid prop pivotally connected to the upper end of the rod, an anchor on the other end of prop and an inclined connection between the lower end of the prop and the carriage-trail, as set forth.

5. The combination with a cylinder and a rod therein, of a piston carried by one end of the rod, an elastic body in the cylinder around the rod, a cover-plate through which the rod

passes, a prop pivotally connected to the upper end of the rod, an anchor on the other end of the prop, an inclined connection between the lower end of the prop and the carriage-trail, and means for positively holding the said anchor to the under side of the trail, as set forth.

In witness whereof we have hereunto set our hands in presence of two witnesses.

MICHEL DARMANCIER.
AIMÉ DALZON.

Witnesses:
RAYMOND FONTANILLES,
HASLEYS BUNOUGH.