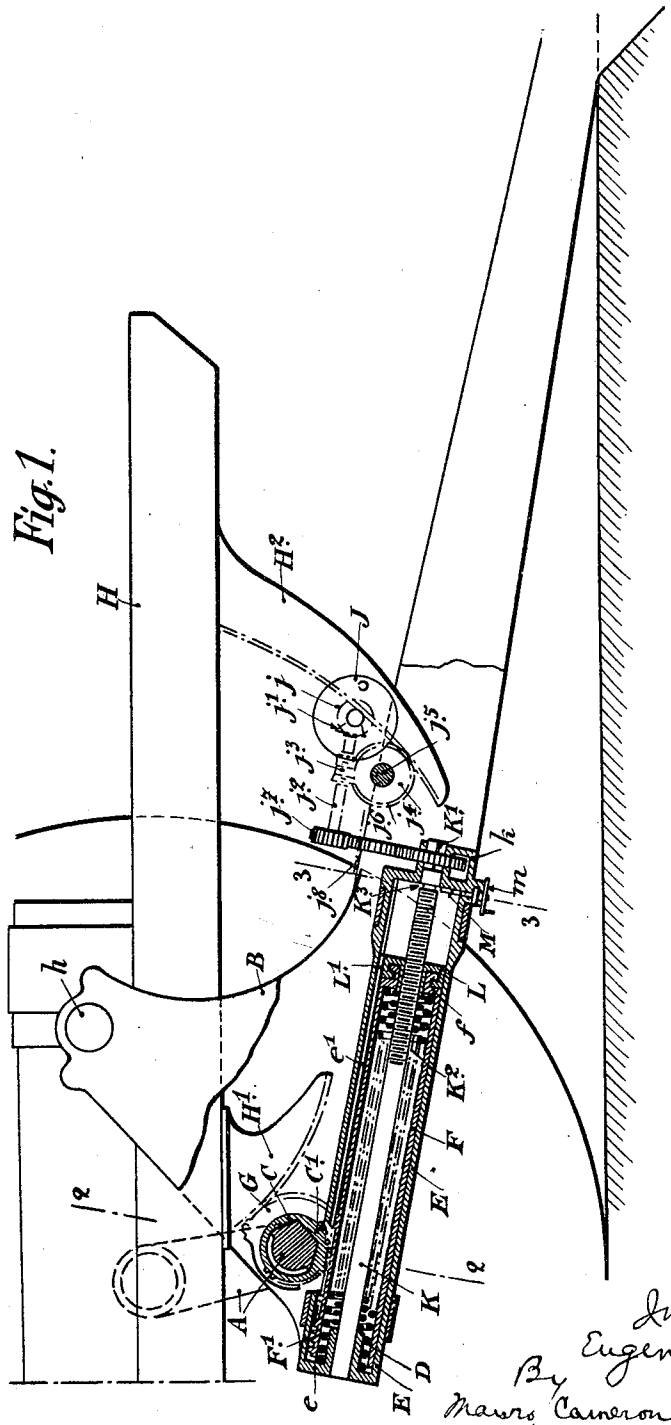
Dec. 11, 1923. 1,476,849

E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

Filed April 30, 1923 9 Sheets-Sheet 1

Fig. 1.



Inventor
Eugene Schneider
By Mason, Cameron Lewis & Kirkham
Attorneys

Dec. 11, 1923. 1,476,849

E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

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Fig. 2.

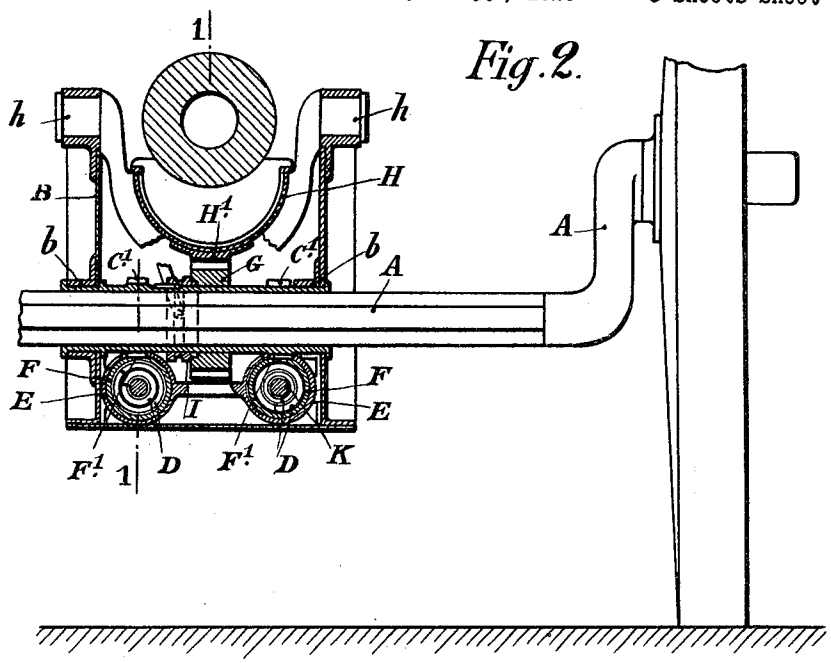


Fig. 3.

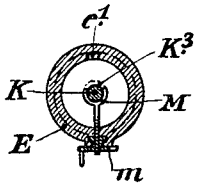
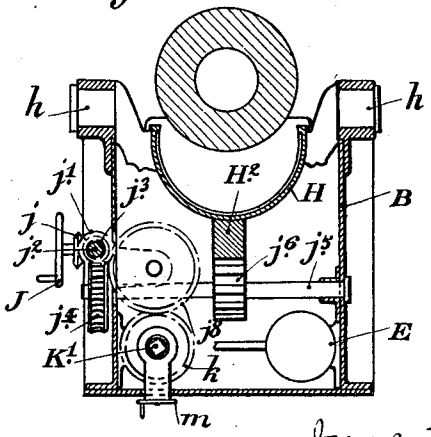


Fig. 4.



Inventor
Eugene Schneider
By Mauro, Cameron, Lewis & Kerkam
attorneys

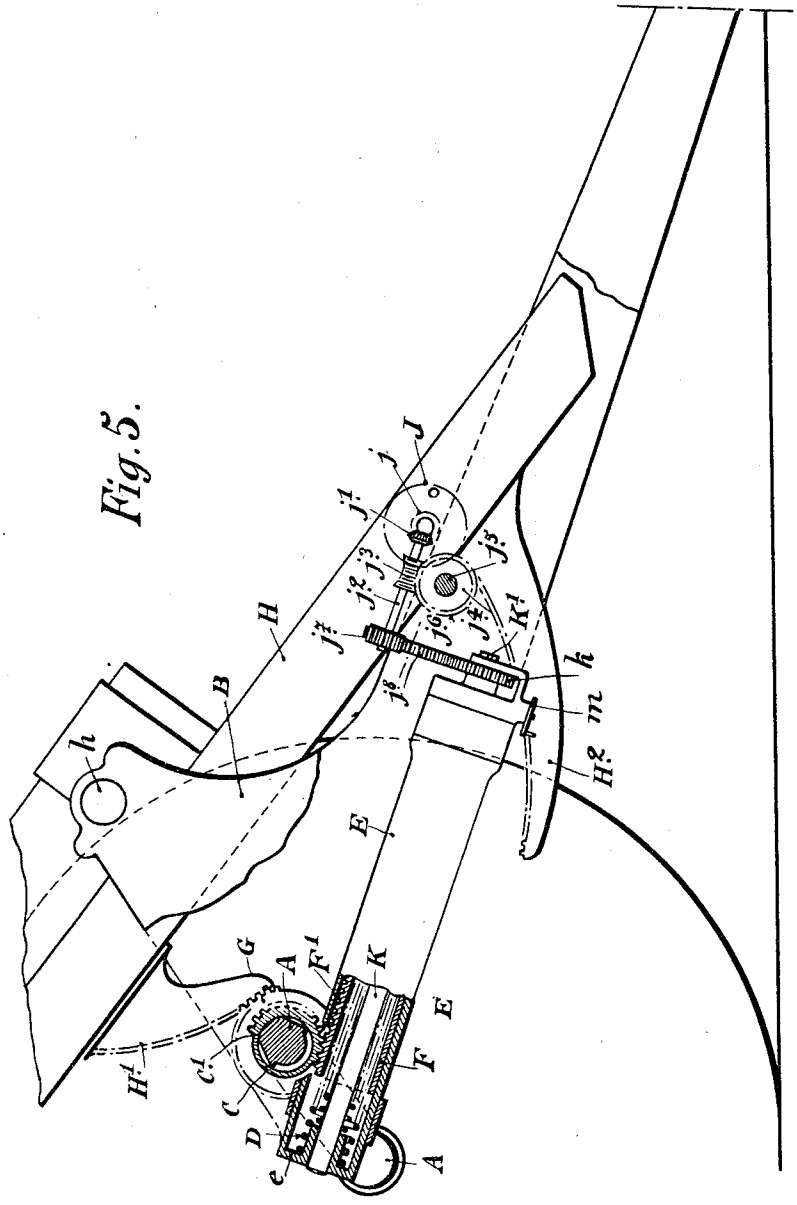
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E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

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Fig. 5.



Inventor
Eugene Schneider
By
Mauro, Cameron, Lewis & Kirkham
Attorneys

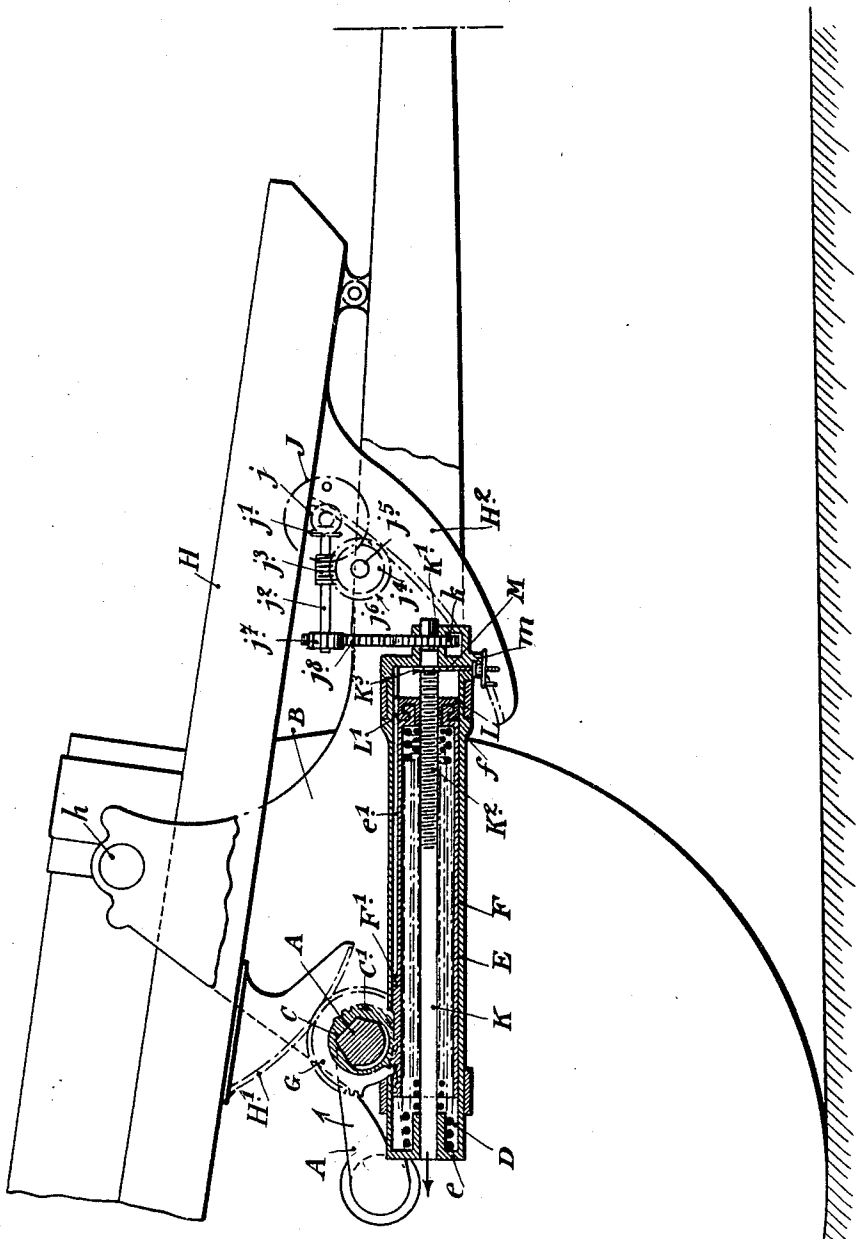
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E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

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Fig. 6.



Inventor
Eugene Schneider
By
Mauro, Cameron, Lewis & Kirkam
Attorneys

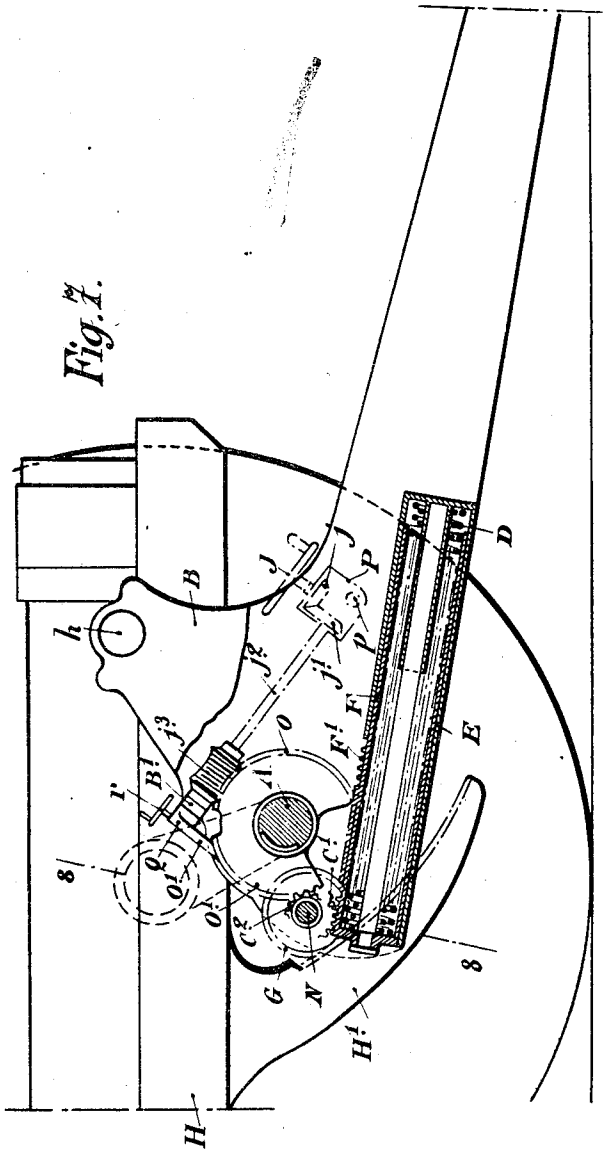
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E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

Filed April 30, 1923 9 Sheets-Sheet 5

Fig. 1.



Inventor
Eugene Schneider
By
Mauro, Cameron, Lewis & Parker
attorneys

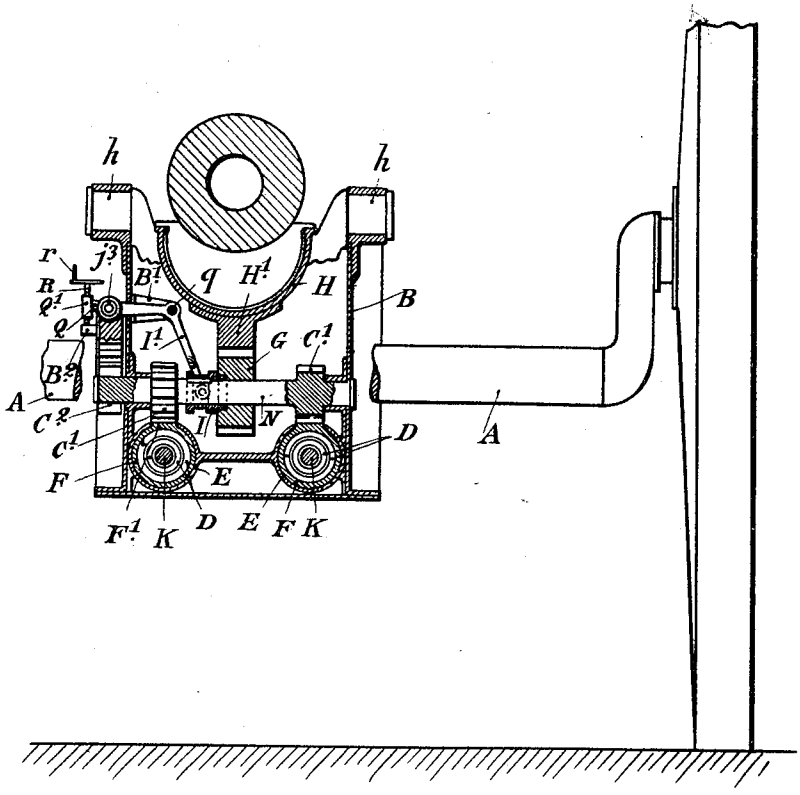
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E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

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Fig. 8.



Inventor
Eugene Schneider
By
Mauro, Cameron, Levis & Kerkam
Attorneys

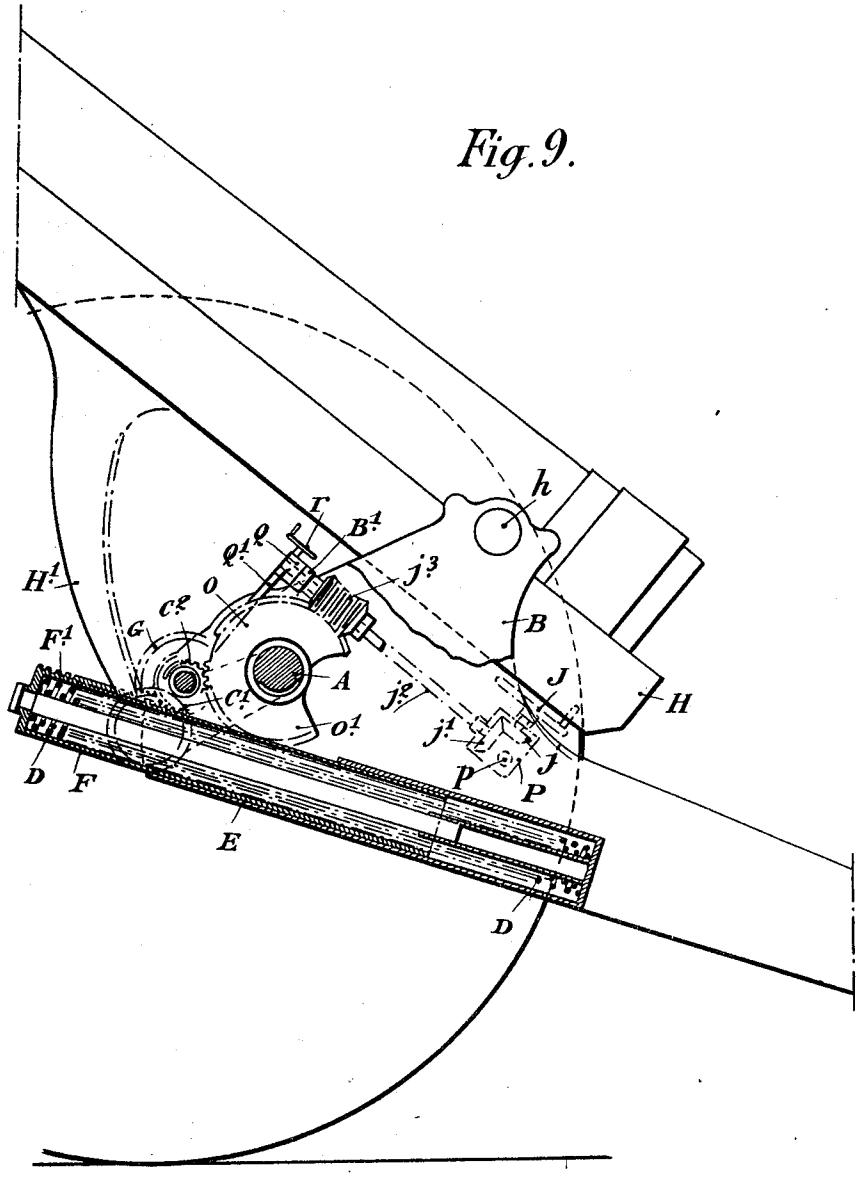
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E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

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Fig. 9.



Inventor
Eugene Schneider
By
Mauro, Cameron, Lewis & Herkam
Attorneys

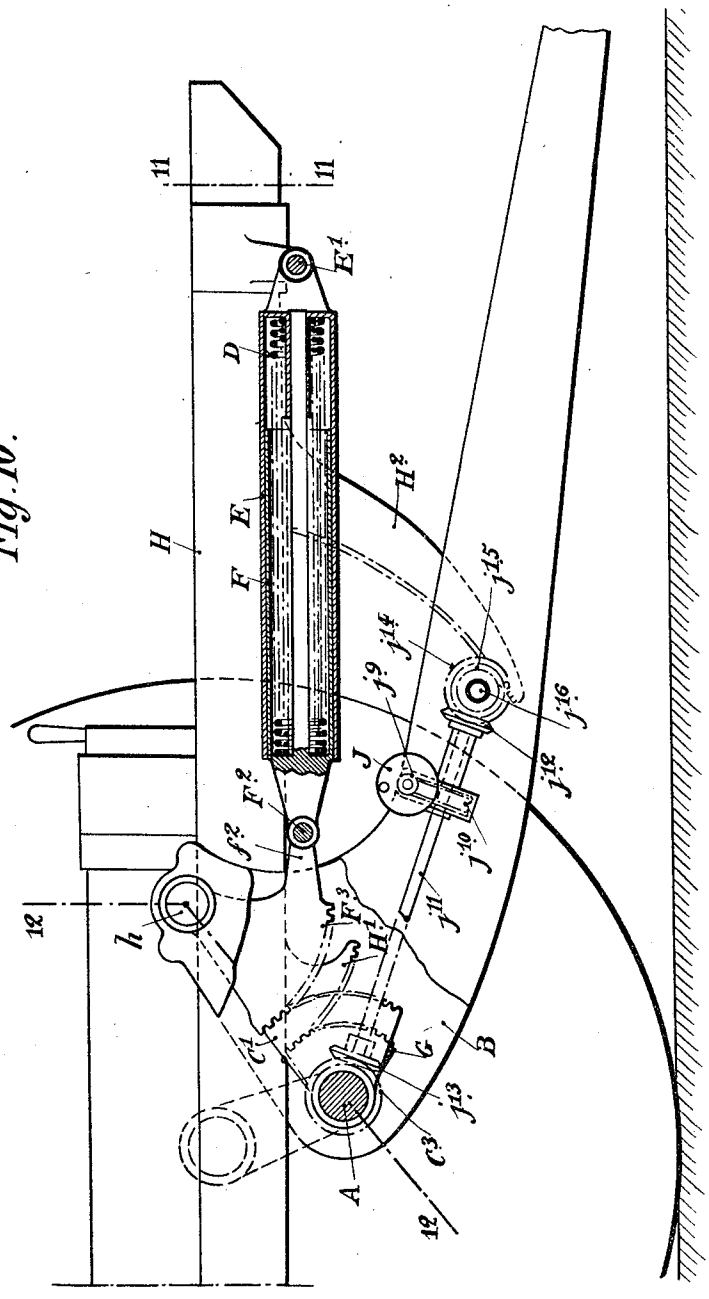
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E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

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Fig. 10.



Inventor
Eugene Schneider
By Mauro, Cameron, Lewis & Kerkam
attorneys

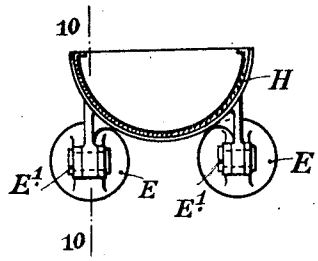
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E. SCHNEIDER

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE

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Fig. 11



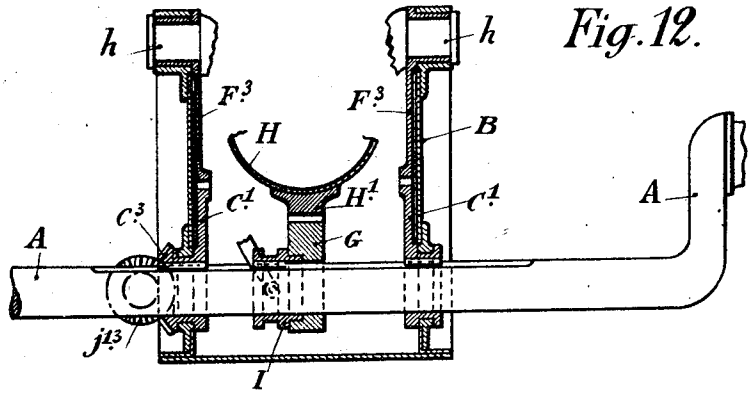


Fig. 12.

Inventor
Eugene Schneider
By
Mauro, Cameron, Lewis & Peckham
attorneys

Patented Dec. 11, 1923. 1,476,849

UNITED STATES PATENT OFFICE.

EUGÈNE SCHNEIDER, OF PARIS, FRANCE, ASSIGNOR TO SCHNEIDER & CIE., OF PARIS, FRANCE, A LIMITED JOINT STOCK COMPANY OF FRANCE.

GUN CARRIAGE HAVING A CRANKED CARRIAGE AXLE.

Application filed April 30, 1923. Serial No. 635,723.

To all whom it may concern:

Be it known that I, EUGÈNE SCHNEIDER, a citizen of the Republic of France, residing at Paris, France, have invented new and useful Improvements in and Relating to Gun Carriages Having Cranked Carriage Axles, which invention is fully set forth in the following specification.

As is well known the provision of a cranked carriage axle in wheeled gun carriages is chiefly designed to allow of raising at will the line of fire, i. e. to the axis of the cradle trunnions, to a variable height above the ground from the lowest position occupied by the trail body when firing in a horizontal line or at low angles of elevation, whereas the trail body is raised into its highest position for firing at very high angles of elevation.

In the ordinary gun carriages of this type, a hand labour manœuvre is required for effecting the desired changes in the position of the carriage axle, after which the usual gun elevating mechanism is operated.

With the object of saving time, it has already been proposed to perform these two manœuvres simultaneously by means of one and the same hand-actuated mechanism. That proposed procedure is however very faulty, because it entails in addition to the effort required to be exerted for the purpose of elevating the gun, also the still very great effort which is required for effecting the rotation of the carriage axle and raising the weight of the gun and carriage resting upon the said carriage axle.

The present invention has now for its object to provide an improved wheeled gun carriage (running on the usual road wheels, or carried by an endless track) having a cranked carriage axle, in which the operations of raising the height of the line of fire and elevating the gun are effected simultaneously but by means of separate and independent mechanisms, instead of one common mechanism as hitherto.

According to this invention the raising of the line of fire is effected by means of a motor, such as a metal spring motor or the like, having as hereinafter described a threefold function; namely it serves as a motor for raising the height of the line of fire, whilst serving at the same time as a counterbalancer for diminishing the effort required for actuating the elevating mechanism; and it serves as an elastic suspension for the gun carriage during transport.

This spring motor is so designed that it can be brought into action by the operation of the elevating mechanism. In other words the operation of the elevating mechanism effects a release of the spring motor which can then come automatically into action to raise the height of the line of fire, whilst the operation of the elevating mechanism is effected without effort owing to the approximate counterbalance of the weight which has to be overcome by the elevating mechanism. The spring motor is, further, so designed that when the engagement normally produced by means of the elevating mechanism is undone, the spring will then act as an elastic suspension between the gun carriage and the wheeled axle or the endless track truck.

The lowering of the line of fire from a raised position of the latter, is effected likewise without effort by means of the improved apparatus, since the effort transmitted to the elevating mechanism by the weight of the gun carriage, is approximately counterbalanced, because the motor springs are gradually compressed as the carriage axle is lowered.

Various practical embodiments of this invention are illustrated by way of example in the accompanying drawings in which:—

Figures 1 to 6 illustrate a first embodiment of the invention.

Figure 1 is a longitudinal elevation partly in section taken along the line 1—1 of Figure 2.

Figure 2 is a vertical cross section taken along the line 2—2 of Figure 1.

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

Figure 4 is a partial rear end elevation showing the elevating mechanism and its engagement with the motor for raising the line of fire. In these four figures the carriage axle is shown with its cranked portion A in the lowest position.

Figure 5 is a longitudinal elevation partly in section, showing the cranked portion in its highest position, and the gun barrel in its position of greatest elevation; and

Figure 6 is a similar longitudinal elevation partly in section, showing the gun in condition for transport after disengagement has been effected between the elevating

mechanism and the motor for raising the height of the line of fire.

Fig. 7 is a side elevation, partly in section, illustrating another embodiment of the inventive idea, the carriage axle being shown in its lowest position;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7;

Fig. 9 is a view similar to Fig. 7 showing the carriage axle in its highest position;

Fig. 10 is a side elevation, partly in section, of a third embodiment of the inventive idea;

Fig. 11 is a sectional view taken on the line 11—11 of Fig. 10; and

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 10.

Referring to the drawings, wherein like reference characters refer to like parts throughout the several views, and particularly to Figs. 1 to 6 inclusive, A is the cranked carriage axle of the improved gun carriage. As shown the gun carriage is constructed to allow the carriage head to slide along the axle for training the gun. For this purpose the carriage head B carries a sleeve C arranged to slide along the carriage axle A which is suitably shaped in cross section for this purpose as shown in Figure 1. The sleeve C whilst being capable of sliding along the carriage axle, is also capable of rotating with the latter in the carriage head B. With this object the outside contour of the said sleeve is circular in cross-section, and the sleeve is engaged in two bearings *b* formed in the side frame plates of the carriage. The mechanism for sliding the carriage head along the carriage axle is of a well known ordinary type and is not shown.

For the purpose of rotating the sleeve C and the carriage axle A, the improved gun carriage comprises according to this invention, a motor consisting of a pair of springs D. These springs bear at one end against one of the closed ends *e* of the cylindrical casings E fixed to the gun carriage, and at their other ends, they bear against the end *f* of a tube F which is capable of longitudinal movement in the cylinder E. The tube F is provided externally with a rack F^1 which meshes with a toothed sector C^1 formed on the sleeve C.

It is obvious that if the springs D have been given a suitable initial tension it will be sufficient to allow them to expand freely in order that this expansion shall produce longitudinal motion of the racks F^1, and consequently, rotation of the toothed sectors C^1 of the sleeve C, and as a result, rotation of the carriage axle A.

On the sleeve C there is mounted loose a toothed sector G meshing with a sector H^1 which is formed on the underside of the gun carriage cradle H and is centered on the axis of the trunnions of the said cradle. A clutch I allows of establishing a driving connection between the sector G and the sleeve C, or of making it loose in relation to the latter, at will. If the sector G and sleeve C are connected with each other, then any rotational motion given to the sleeve C by the springs D, will cause likewise rotational motion of the sector H^1, and consequently a raising of the forward part of the cradle when the carriage axle is raised.

The engagement of the motor springs D by the elevating mechanism is effected as follows:—The elevating mechanism comprises, for instance, a handwheel J whose motion is transmitted by pinions j, j^1 to a shaft j^2 journalled on one of the side frame plates of the gun carriage, and carrying a worm j^3 meshing with a worm wheel j^4 fixed on a cross shaft j^5 journalled likewise in the side frame plates of the gun carriage.

The shaft j^5 carries a pinion j^6 meshing with an elevating sector H^2 formed on the underside of the cradle H. On the shaft j^2 is fixed a toothed wheel j^7 connected through the medium of a pinion j^8 to a toothed wheel *k* mounted on a square part K^1 of a rod K extending along the axis of one of the tubes F and the corresponding cylinder E. This rod is capable of a limited longitudinal movement by sliding with the said square part K^1 in the pinion *k*, whilst at the same time it is guided at its other end in the cylinder E. The pinion *k* is prevented from having any longitudinal motion by being held between supports that serve as guides for the end K^1 of the rod. This rod has a screwthreaded portion K^2 which works in a nut L having a flange engaging with a certain amount of play in a peripheral groove *f* at the end of the tube F.

For firing, irrespectively of the position occupied by the carriage axle and the gun barrel, the rod K is prevented from having any longitudinal motion by means of a fork M (Figs. 1 and 3) engaging aroung a necked portion K^3 of the rod K. This fork may be moved out of the way in order to allow the rod K to have a free longitudinal movement whereby the tube F is carried along by the rod K, thus allowing the springs to expand and act as an elastic suspension as hereinafter described. The moving of the fork M out of the way is effected by means of an internally screwthreaded handwheel *m* journalled with its hub in a suitable recess in the cylinder E.

When the parts are, for instance, in the position shown in Figures 1 to 4, which represents the position of the gun for a horizontal line of fire, and therefore, the lowest position of the carriage axle A, it will be perceived that the motor springs D are in a state of compression owing to the fact that the elevating mechanism is locked

in position. These springs can expand only when the elevating mechanism is operated. If, for the purpose of elevating the gun, the elevating mechanism is operated by means of the handwheel J, the springs D are, by this very fact, allowed to expand and produce a rotational movement of the sleeve C by a longitudinal movement of the racks F^1. This rotational movement, if the pinion G has been previously brought into mesh by means of the clutch I, causes a rotational movement of the toothed sector G, and, consequently, a rising movement of the sector H^1 formed on the underside of the cradle, whilst at the same time the rotational movement of the sleeve C produces a rotational movement of the carriage axle A. From this, it will be perceived that the actuation of the elevating mechanism by hand is followed by an automatic actuation of the sector H^1, that is to say, by a counterbalancing of the oscillatory mass and an automatic raising of the line of fire.

In order in any position of elevation, to prevent the sector H^1 from having a tendency to carry the tubes F along by the action of the vertical component of the force exerted by the recoil brake, provision is made for holding these tubes F by means of the gearing j^7, j^8, k, the fork M and the nut L. This nut L is guided by a rib L^1 in a groove e^1 formed in the cylinder E. Consequently the tubes F can move only as a result of the rotation of the rod K, and this latter rotation can in its turn take place only when the elevating mechanism is being operated. In other words, any elevation of the gun barrel is followed instantly by an automatic expansion of the springs D, which expansion can take place only as a result of the movement of the nuts L. Inversely, the springs are prevented from expanding when, by reason of the stoppage of the operation of the elevating mechanism the nut L has been locked upon the screw-thread K^2 of the rod K.

For road transport, the parts are placed into the position shown in Figure 6 wherein the horizontal portion of the carriage axle is situated practically in the horizontal axle plane of its journals. For this purpose the fork M is moved out of the way by operating the handwheel m in the requisite direction. The corresponding rod K is then able to move freely in the longitudinal direction; in other words the springs D are quite free to expand or contract, care having been taken to move the pinion G out of mesh by sliding the clutch I in the requisite direction.

All shocks experienced by the road wheels or the endless tracks of the gun carriage are transmitted through the carriage axle A and the pinions C^1 fixed to the sleeve C, to the racks F^1, thereby causing compression of the springs D at each rising movement of the carriage axle. Inversely, a following descent of the carriage axle will have the result of causing the racks F^1 to move in the opposite direction, and thus producing a corresponding expansion of the springs D.

It will thus be perceived that the springs D have the three-fold function ascribed to them hereinbefore, namely:—They act as a motor for raising automatically the height of the line of fire at every fresh elevation of the gun barrel; they act at the same time to counterbalance the oscillating mass for the purpose of diminishing the effort required to actuate the elevating mechanism by hand; and finally they act as an elastic suspension for the load during road transport.

In the embodiment illustrated in Figs. 7 to 9 inclusive, the gun carriage cradle H carries only one toothed sector H^1 which is centred on the axis h of the cradle trunnions, and which serves both as an elevating sector and as a transmission member for the automatic actuating apparatus of the mechanism for raising the height of the line of fire.

For this purpose the sector H^1 meshes with a pinion G mounted on an intermediate shaft N parallel to the axis of the carriage axle and journalled in the side frame plates of the gun carriage. On this shaft N are fixed the two pinions C^1 meshing with the racks F^1 formed on the tubes F against the bottoms of which the springs D take their bearing. Except during road transport, the pinion G is locked on the shaft N by means of a clutch I actuated as hereinafter described. The shaft N carries on one end a pinion C^2 which is fixed to it and meshes with the spur teeth O′ of one of the two toothed sectors of a disk of which the other (having helical teeth 0) meshes with the worm j^3 of the elevating mechanism j^3—j^2—j^1—j actuated by means of the handwheel J. The disc O—O^1 is arranged to rotate with the carriage axle A whilst being able to slide along it. The mechanism for actuating the clutch I is so designed as to effect at one and the same time the unlocking of the pinion G from its shaft N, and the unmeshing of the worm j^3 from the helical sector teeth O. The combination J—j—j^1 is carried by a box P which is capable of swivelling around a pin p carried by one of the side frame plates of the gun carriage. The shaft j^2 is journalled at one end in this box P, and at its other end in one end of a lever Q fulcrumed at q on a bracket B^1 attached to one of the side plates of the gun carriage. The free end of the lever Q carries a nut Q^1 working on a screw R which is journalled in a fixed support B^2 and can be actuated by means of a handwheel r. By turning the

handwheel r in the requisite direction, the nut Q^1 is raised, and with it the worm j^3 the shaft j^2 of which swivels around the pin p. At the same time, by means of a forked lever I^1, the clutch sleeve I is moved towards the left, thus releasing on one side the pinion G, and on the other, the sector O, whereby, as in the preceding example, the springs D are allowed to act as an elastic suspension for the gun carriage during road transport.

In the embodiment illustrated in Figs. 10 to 12 inclusive, the cylinders E, in which work the tubes F serving as abutments for one end of the motor springs D, instead of being fixed to the gun carriage, are supported by the gun carriage cradle H by means of pivotal joints E^1. Each of the tubes F is pivotally connected at its outer end at F^2 to an arm f^2 projecting from a toothed sector F^3 mounted loose on the corresponding trunnion h of the cradle. This sector F^3 meshes with a toothed sector C^1 which rotates with the carriage axle A whilst being capable of sliding along it. On the axle A there is also mounted loose a toothed sector G meshing with a toothed sector H^1 formed on the underside of the carriage cradle H, as in the example shown in Figures 1 to 6. The sector G is normally locked with the carriage axle A by means of a clutch I. The hand-actuated elevating mechanism comprises the handwheel J whose motion is transmitted through a worm j^9 to a worm wheel j^{10} fixed on a shaft j^{11} journalled in a side frame plate of the gun carriage, and carrying two bevel pinions j^{12}, j^{13}. The pinion j^{12} meshes with a pinion j^{14} fixed on a shaft j^{16} carrying the gun-elevating pinion j^{15} which meshes with the toothed sector H^2. The pinion j^{13} meshes with a pinion C^3 fixed to the toothed sector C^1.

It will be perceived that if whilst the sector G is in engagement, the handwheel J be actuated in the requisite direction, the transmission terminating in the gun-elevating sector H^2 will thus be operated by hand by means of the pinion j^{12}, and at the same time the motor springs D are rendered free to exert their automatic effort which is transmitted through the sector F^3 to the sector C^1, and through the latter to the carriage axle A and to the sector G which is in mesh with the sector H^1. As in the foregoing examples, there is produced in this manner automatically a raising of the height of the line of fire at the same time as a counterbalancing of the oscillating mass by the hand-actuation of the elevating mechanism. Always as in the foregoing examples the unlocking of the sector G allows the springs D to act as an elastic suspension between the carriage axle and the oscillating mass during road transport.

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:—

1. A gun carriage of the type described comprising, in combination, a cranked axle, resilient means for rotating said axle, elevating mechanism for rendering said means operative, and means for rendering said resilient means ineffective for rotating said axle.

2. A gun carriage of the type described comprising, in combination, a cranked axle, a spring motor for rotating said axle, elevating means for rendering said motor effective, and means for rendering said motor effective as an elastic suspension for said carriage on said axle during road transport.

3. A gun carriage of the type described comprising, in combination, a cranked axle, a spring motor for rotating said axle and for counterbalancing the oscillating mass of said carriage, elevating mechanism for rendering said motor effective to rotate said axle, and means for rendering said motor ineffective to rotate said axle.

4. In a gun carriage of the type described, the combination of a cranked axle, a cradle supported by said axle, a sector secured to said cradle, a rotatable member having engagement with said sector, resilient means for rotating said member, a clutch interposed between said member and said resilient means, and elevating mechanism for rendering said resilient means effective to rotate said member.

5. In a gun carriage of the type described, the combination of a cranked axle, a cradle supported by said axle, a sector secured to said cradle, a gear rotatably mounted on said axle, one or more spring motors for rotating said gear, a clutch interposed between said gear and said motor or motors, and elevating mechanism for rendering said motor or motors effective to rotate said gear.

6. In a gun carriage of the type described, the combination of a cranked axle, a cradle supported by said axle, a sector secured to said cradle, a rotatable member having engagement with said sector, resilient means for simultaneously rotating said axle and member, a clutch interposed between said resilient means and said member, and means for preventing said resilient means from rotating said axle and member.

7. A gun carriage of the type described comprising a cranked axle, a spring motor supported by said axle, a cradle supported by said axle, means operatively connecting said cradle and motor, and means for rendering said motor effective to simultaneously rotate said axle and tilt said cradle.

8. In a gun carriage of the type described, the combination of an axle, a cradle mounted on said carriage, one or more cylinders secured to said carriage, a tube in each of

said cylinders, a resilient member in each of said tubes, a rack formed on each of said tubes, a sleeve journalled in said carriage, a pinion fixed to said sleeve and having engagement with said rack, a sector movably mounted on said sleeve, means for locking said sector to said sleeve, a second sector secured to said cradle and having engagement with said first-named sector, and elevating mechanism for rendering said spring effective to simultaneously rotate said axle and tilt said cradle, and means for rendering said spring effective as a suspension for the carriage on said axle.

9. A gun carriage comprising a cranked axle, means for rotating said axle and for counterbalancing the oscillating mass, and elevating mechanism for rendering said means effective, said means being adapted to serve as an elastic suspension for said gun carriage during road transport.

In testimony whereof I have signed this specification.

EUGÈNE SCHNEIDER.

Witnesses:
ANDRÉ MOSTICKER,
LOUIS GARDET.