N. KOCH.

GUN CARRIAGE.

APPLICATION FILED JAN. 24, 1910.

985,179.

Patented Feb. 28, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

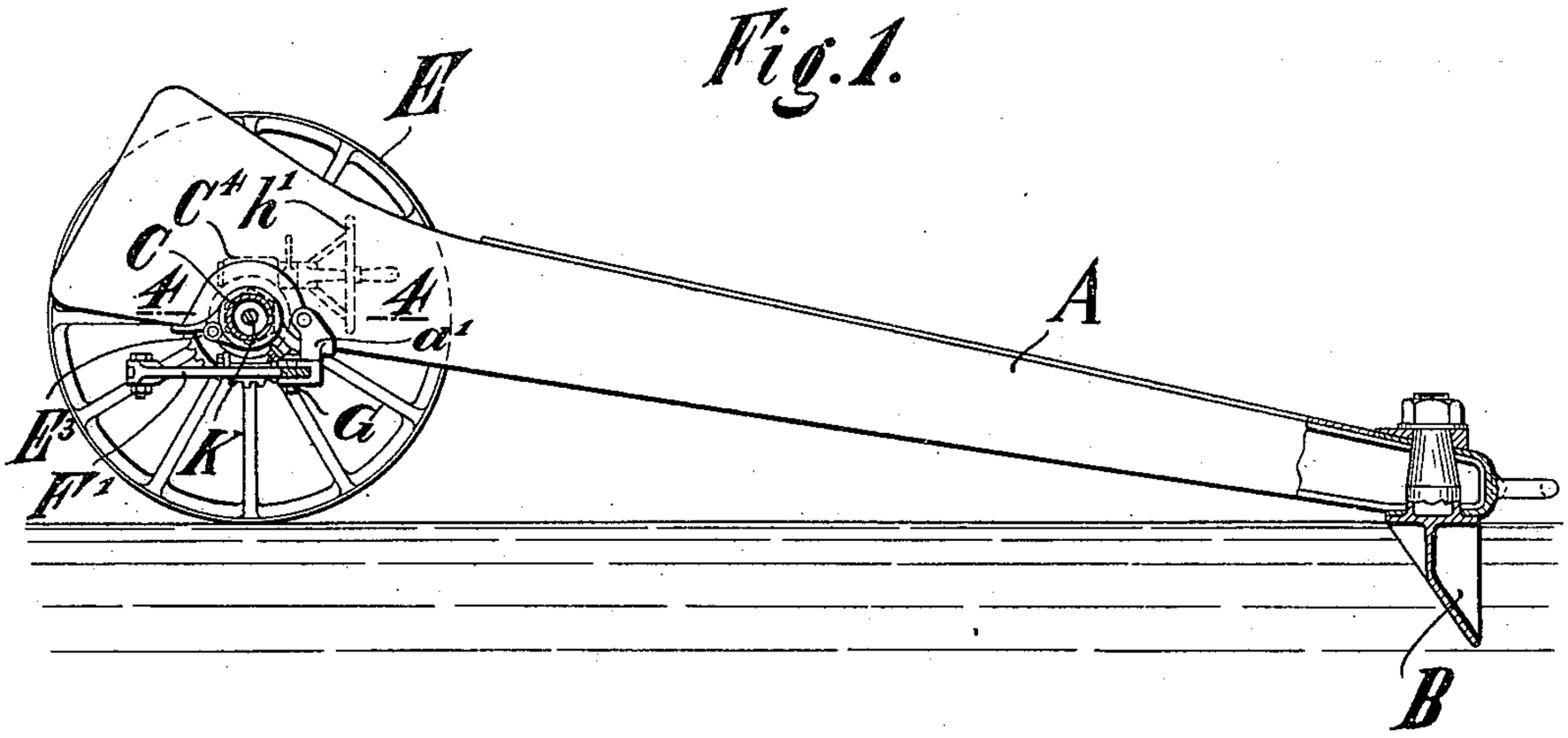
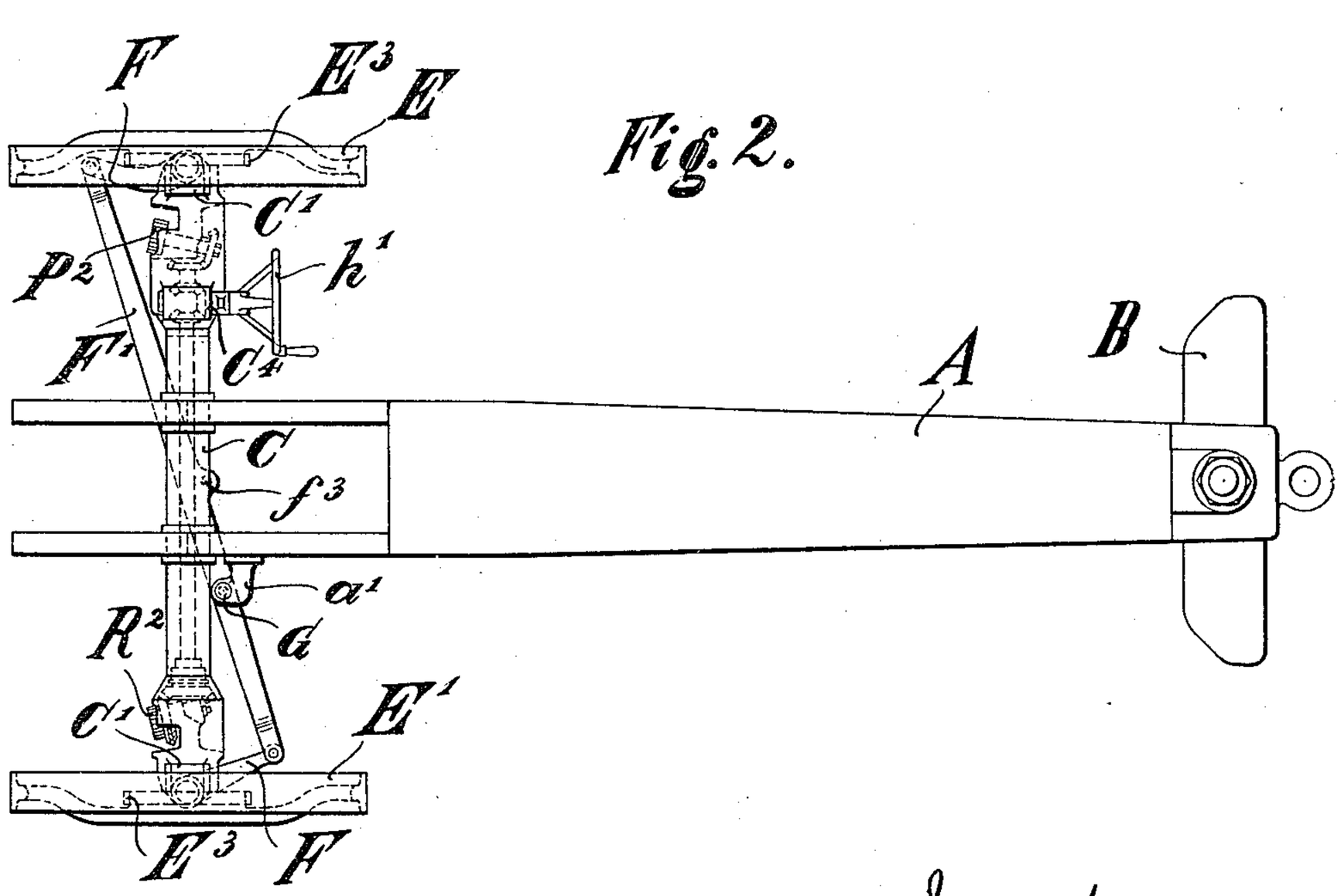


Fig. 2.



Witnesses
J. N. Skyukoop,
C. B. Melton

Inventor
Norbert Koch.
By Knight Bros
Attorneys

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2 SHEETS—SHEET 2.

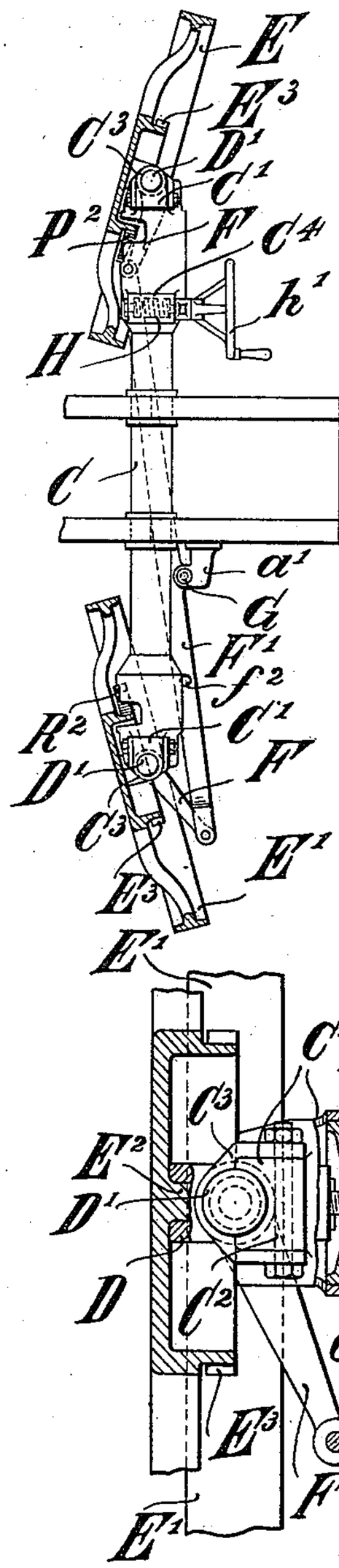


Fig. 3.

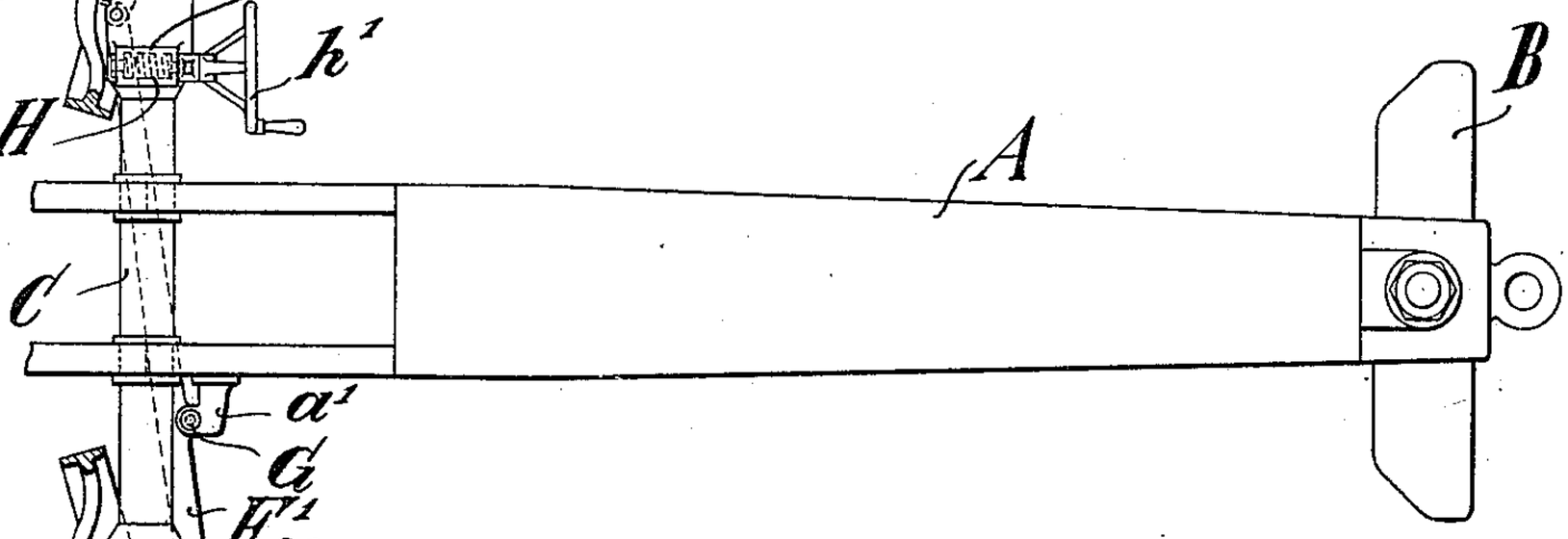


Fig. 4.

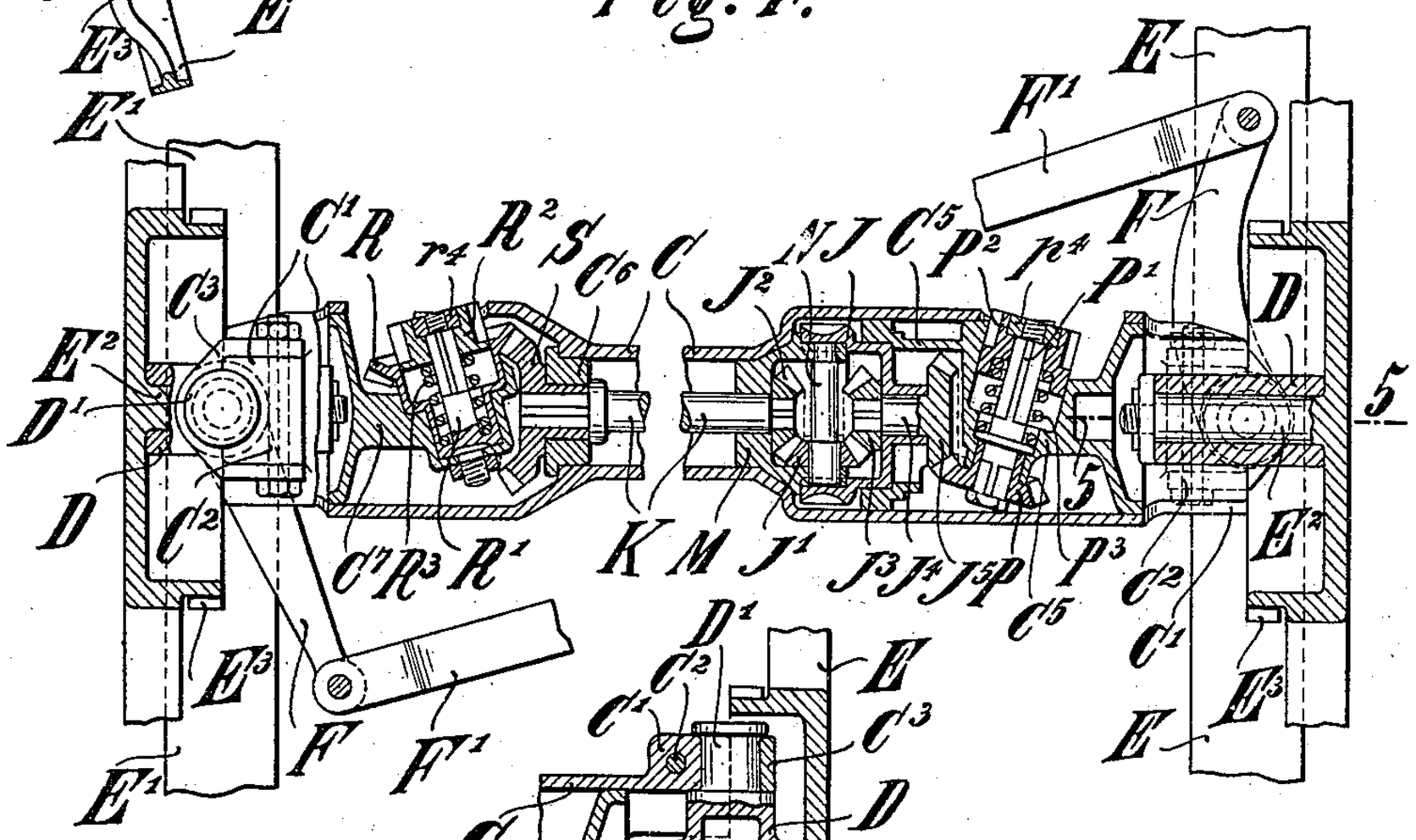
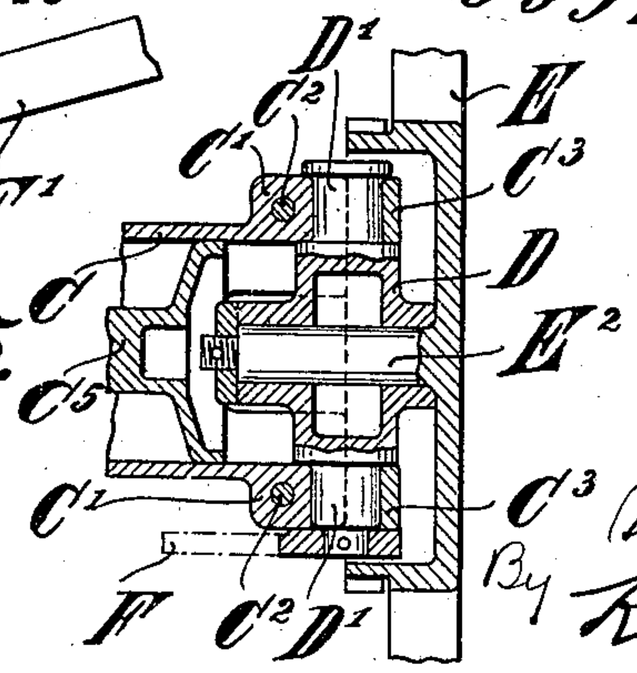


Fig. 5.



Witnesses
J. M. Skynkoop,
L. B. Melton.

Inventor
Norbert Koch.
By Knight Bros
Attorneys

UNITED STATES PATENT OFFICE.

NORBERT KOCH, OF ESSEN-ON-THE-RUHR, GERMANY, ASSIGNOR TO FRIED. KRUPP AKTIENGESELLSCHAFT, OF ESSEN-ON-THE-RUHR, GERMANY.

GUN-CARRIAGE.

985,179. Specification of Letters Patent. **Patented Feb. 28, 1911.**

Application filed January 24, 1910. Serial No. 539,725.

To all whom it may concern:

Be it known that I, NORBERT KOCH, a subject of the Emperor of Germany, and a resident of Essen-on-the-Ruhr, Germany, have invented certain new and useful Improvements in Gun-Carriages, of which the following is a specification.

The present invention relates to gun carriages and is an improvement on the gun carriage forming the subject matter of my U. S. Letters Patent No. 912,135 of February 9, 1909.

The accompanying drawings show an embodiment of the invention, by way of example.

Figure 1 is a side view, partly in section, of a gun carriage, one wheel being broken away, and the other wheel being in the position for travel; Fig. 2 is a top view of Fig. 1; Fig. 3 is a view corresponding to Fig. 2, but partly in section and showing the wheels in the training position; Fig. 4 is a section on line 4—4, Fig. 1, on an enlarged scale and looking from above, and Fig. 5 is a section on line 5—5, Fig. 4, on an enlarged scale.

A indicates the carriage-body which has its trail provided with a spade B, which can rotate about a vertical axis. The hollow wheel-axle C is secured in the other end of the carriage-body A. The ends of the axle terminate in bifurcated pieces C^1 between which the journals D are mounted to swing in a horizontal plane through the medium of trunnions D^1 (see especially Fig. 5). The trunnions D^1 of the journals are retained in position by means of covers C^3 which are inserted over the pieces C^1 and secured in position by means of screws C^2. The carriage-wheels E and E^1 are journaled in the journals D, by means of trunnions E^2. To the lower trunnion D^1 of each journal D is rigidly secured an arm F. The arms F are connected with each other by means of a cross-bar F^1 which is jointed to the arms. The cross-bar F^1 is provided with two bores f^2 and f^3 (Figs. 2 and 3). A guide bracket a^1 for the cross-bar F^1 is provided on that wall of the carriage-body A which is toward the wheel E^1. The bracket a^1 is provided with bores for a key-bolt G, which bores correspond to the bores f^2 f^3. When the bores in the bracket a^1 register with the bore f^2 in the cross-bar F^1, the carriage-wheels E and E^1 are in the traveling position (Figs. 1 and 2) and when the bores in the bracket a^1 register with the bore f^3 the wheels are in the training position (Fig. 3). The wheels can be secured in both of these positions by means of the key-bolt G.

The hollow axle C is enlarged at its ends. On that end of the axle C which is toward the wheel E is mounted a housing C^4 (Figs. 1 to 3) in which is journaled a worm H (Fig. 3). This worm, which can be turned by means of a hand-wheel h^1, engages with a hollow worm-wheel J (Fig. 4) which is journaled in a member C^5 secured in the axle. A sleeve M, which is rotatably mounted in the axle and which can be coupled to the worm-wheel J by means of a bolt N, engages in the hollow space of the worm-wheel J. In the hollow spaces of the worm-wheel J and the sleeve M is arranged a bevel-wheel gear (differential gear) which serves for transmitting rotation of the worm-wheel J and the sleeve M to the two carriage-wheels E and E^1 when the latter are in the training position. The bevel-wheel gear consists of three bevel-wheels J^1 J^2 and J^3. The bevel-wheel J^1 is rotatably mounted on the bolt N and meshes with both of the bevel-wheels J^2 and J^3. A shaft J^4 on which the bevel-wheel J^3 is non-rotatably secured is integral with a bevel-wheel J^5 which meshes with a bevel-wheel P journaled in the member C^5. The bevel-wheel P is non-rotatably mounted on one end of a shaft P^1 which carries on its other end a sprocket wheel P^2 which is slidably but non-rotatably mounted on the shaft P^1. The sprocket-wheel projects through an opening provided in the axle C and is adapted to coöperate with a toothed crown E^3 (Figs. 3 and 4) on the carriage-wheel E when the latter is in the training position. For that purpose, the shaft P^1 of the wheels P and P^2 is inclined relative to the longitudinal axis of the axle C. A helical spring P^3 tends to hold the sprocket-wheel P^2 in the position shown in Fig. 4 (the working position), in which position the sprocket-wheel abuts against a nut p^4 screwed on the threaded end of the shaft P^1. The slidable arrangement of the sprocket-wheel P^2 is for the purpose of permitting the sprocket-wheel to yield in case a tooth on the toothed crown E^3 should hit a tooth on the sprocket-wheel

P^2 when the carriage-wheel E is swung into the training position.

The transmission of movement from the worm-wheel J to the carriage-wheel E^1 is effected by means of the bevel-wheels J^1, J^2 and a shaft K on one end of which the bevel-wheel J^2 is non-rotatably mounted. The other end of the shaft K, which is journaled in a bushing C^6 in the axle, carries a bevel-wheel S, which is non-rotatably connected to the shaft K and which meshes with a hollow bevel-wheel R. The bevel-wheel R, which corresponds to the bevel-wheel P, is journaled in a member C^7 secured in the axle. A sprocket-wheel R^2 is slidably; but non-rotatably connected with a shaft R^1 which is integral with the bevel-wheel R. The sprocket-wheel R^2 which corresponds to the sprocket-wheel P^2 is under the action of a spring R^3 which tends to hold it in the position shown in the drawings, in which the wheel R^2 abuts against a nut r^4 secured on the threaded end of the shaft R^1. The sprocket-wheel R^2 serves for coöperating with a toothed crown E^3 on the carriage-wheel E^1 when the latter is in the training position.

During the travel of the gun, the carriage-wheels E and E^1 assume the position shown in Figs. 1 and 2, and they are held in this position by means of the arms F rigidly connected with the journals D, the cross-bar F^1 and the key-bolt G inserted in the bore f^2 in the cross-bar and in the bores in the guide-bracket a^1.

After the gun has reached firing position and has been unlimbered, the key-bolt G is removed to break the connection between the guide bracket a^1 and the cross-bar F^1. The operator then takes hold of one of the carriage-wheels E and E^1 and swings it about the axis of the trunnion D^1 until it reaches the training position (Fig. 3). The arm F and the cross-bar F^1 cause the other carriage-wheel to partake of this movement. Thereupon the carriage-wheels are secured in position by the insertion of the key-bolt G in the bore f^3 of the cross-bar and the bores of the guide-bracket a^1. In this position (the training position), the axes of rotation of the carriage-wheels intersect the axis of rotation of the spade B (Fig. 3).

If the teeth on the sprocket-wheels P^2 and R^2 do not register with the gaps between the teeth of the toothed crowns E^3 on the carriage-wheels when the wheels E and E^1 are swung into the training position, the sprocket-wheels P^2 and R^2 will be displaced on their shafts P^1 and R^1 against the pressure of the springs P^3, R^3.

The engagement of the sprocket-wheels P^2 and R^2 with the toothed crowns E^3 might be effected by turning the carriage-wheels. However, this would require great expenditure of force. The engagement is, therefore, more suitably effected by moving the gear in the wheel-axle by means of the hand-wheel h^1 and the worm H. The turning of the worm H is partaken of by the worm-wheel J, which carries along the bolt N and the bevel-wheel J^1 located on the bolt N. The bevel-wheel J^1 thereby carries out a movement about the common axis of the shafts K and J^4 and imparts rotation to the bevel-wheels J^2 and J^3 which in turn transmit their movement through the parts K S R R^1 and J^4 J^5 P P^1 of the gear to the sprocket-wheels P^2 and R^2 so that the latter reach an angular position in which the springs P^3 and R^3 cause them to snap into the toothed crowns E^3 of the carriage-wheels. If one of the sprocket-wheels P^2 R^2, for instance P^2, enters into engagement with its toothed crown E^3 before the other sprocket-wheel R^2 enters into engagement with its toothed crown E^3, the gear between the bevel-wheel J^1 and the sprocket-wheel P^2 remains at rest during the further turning of the worm H, but the bevel-wheel J^1 which is rotatable on the bolt N, rolls on the bevel-wheel J^3 and carries the bevel-wheel J^2 along until the sprocket-wheel R^2 has also entered into engagement with its toothed crown E^3. When this engagement has been effected, the required lateral training can be imparted to the carriage by turning the worm H. It need not be explained how the gear acts in that case.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:—

1. A gun-carriage having a spade mounted to rotate about a vertical axis, carriage-wheels mounted to swing about vertical axes to a training position, and driving mechanism adapted to engage both of said wheels when they are in the training position for imparting rotation to the wheels; said mechanism being provided with a differential gear.

2. A gun-carriage having a spade mounted to rotate about a vertical axis, carriage-wheels mounted to swing about vertical axes to a training position, and driving mechanism adapted to engage both of said wheels when they are in the training position for imparting rotation to the wheels; said mechanism being provided with a differential gear; said mechanism having its wheel-engaging parts slidable in such a manner as to permit them to yield when, on the carriage-wheels being swung into the training position, the teeth of the wheel-engaging parts are incapable of entering into engagement with the carriage wheels.

3. A gun-carriage having a spade mounted to rotate about a vertical axis, carriage-wheels mounted to swing about vertical axes to a training position, and driving

mechanism adapted to engage both of said wheels when they are in the training position for imparting rotation to the wheels; said mechanism being provided with a differential gear; said mechanism having its wheel-engaging parts slidable in such a manner as to permit them to yield when, on the carriage-wheels being swung into the training position, the teeth of the wheel-engaging parts are incapable of entering into engagement with the carriage wheels, and springs for subsequently effecting the engagement between the wheel-engaging parts and the carriage wheels.

4. A gun-carriage having a spade mounted to rotate about a vertical axis, carriage-wheels having journals and adapted to be swung about vertical axes from a traveling position to a training position, arms on the journals of said wheels, and a rod connecting said arms.

5. A gun-carriage having a spade mounted to rotate about a vertical axis, carriage-wheels having journals and adapted to be swung about vertical axes from a traveling position to a training position, arms on the journals of said wheels, and a rod connecting said arms, and means on the carriage for securing said rod in the traveling position and in the training position of the wheels.

The foregoing specification signed at Barmen, Germany, this 4th day of January, 1910.

NORBERT KOCH. [L. S.]

In presence of—
OTTO KÖNIG,
WILLY KLEIN.