No. 708,151. Patented Sept. 2, 1902.

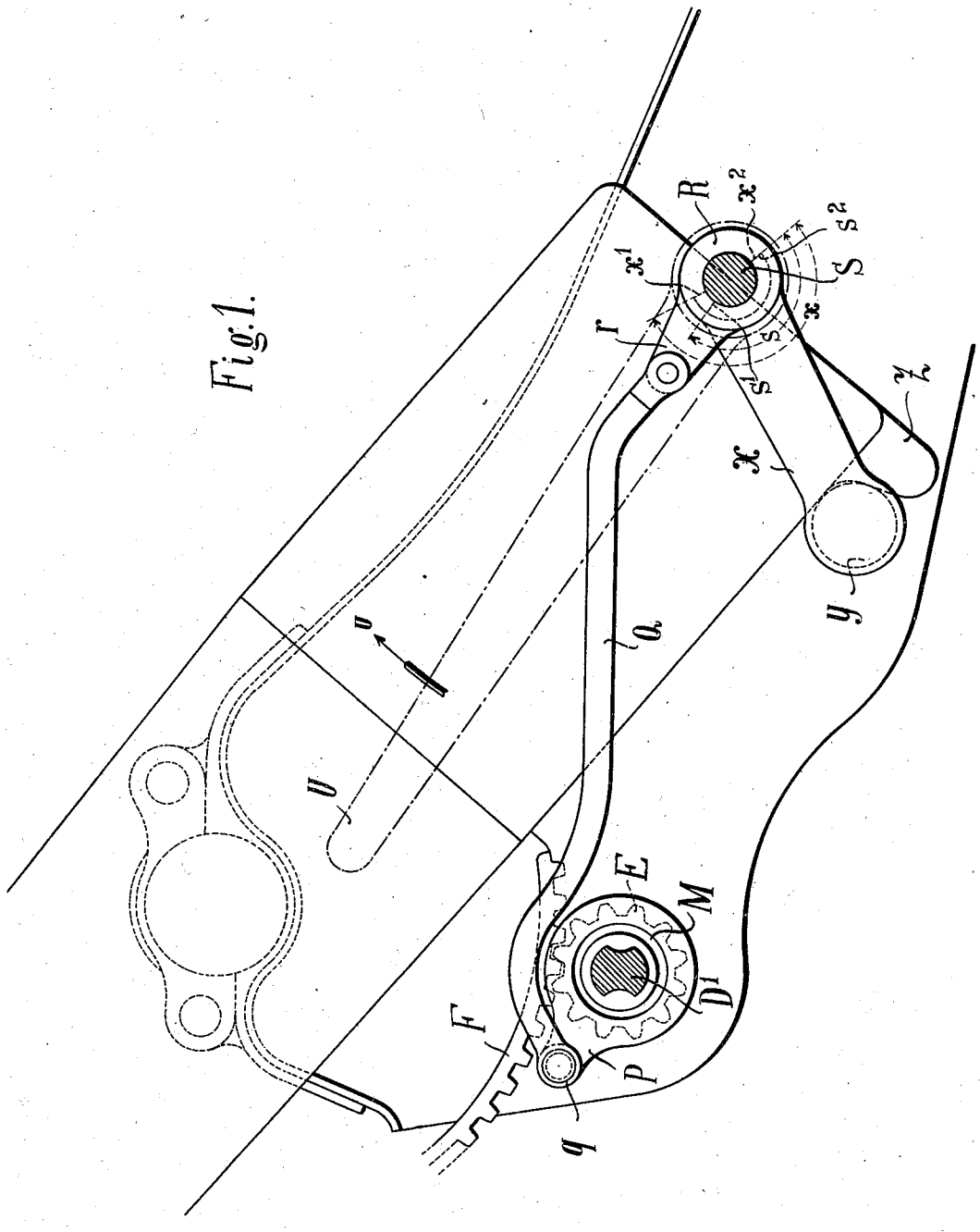
J. KURIG.

ORDNANCE.

(Application filed Jan. 9, 1902.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



Witnesses:
H. E. Manning
Harry A. Knight

Inventor:
Josef Kurig
By Hovey & Knight
attys.

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J. KURIG.

ORDNANCE.

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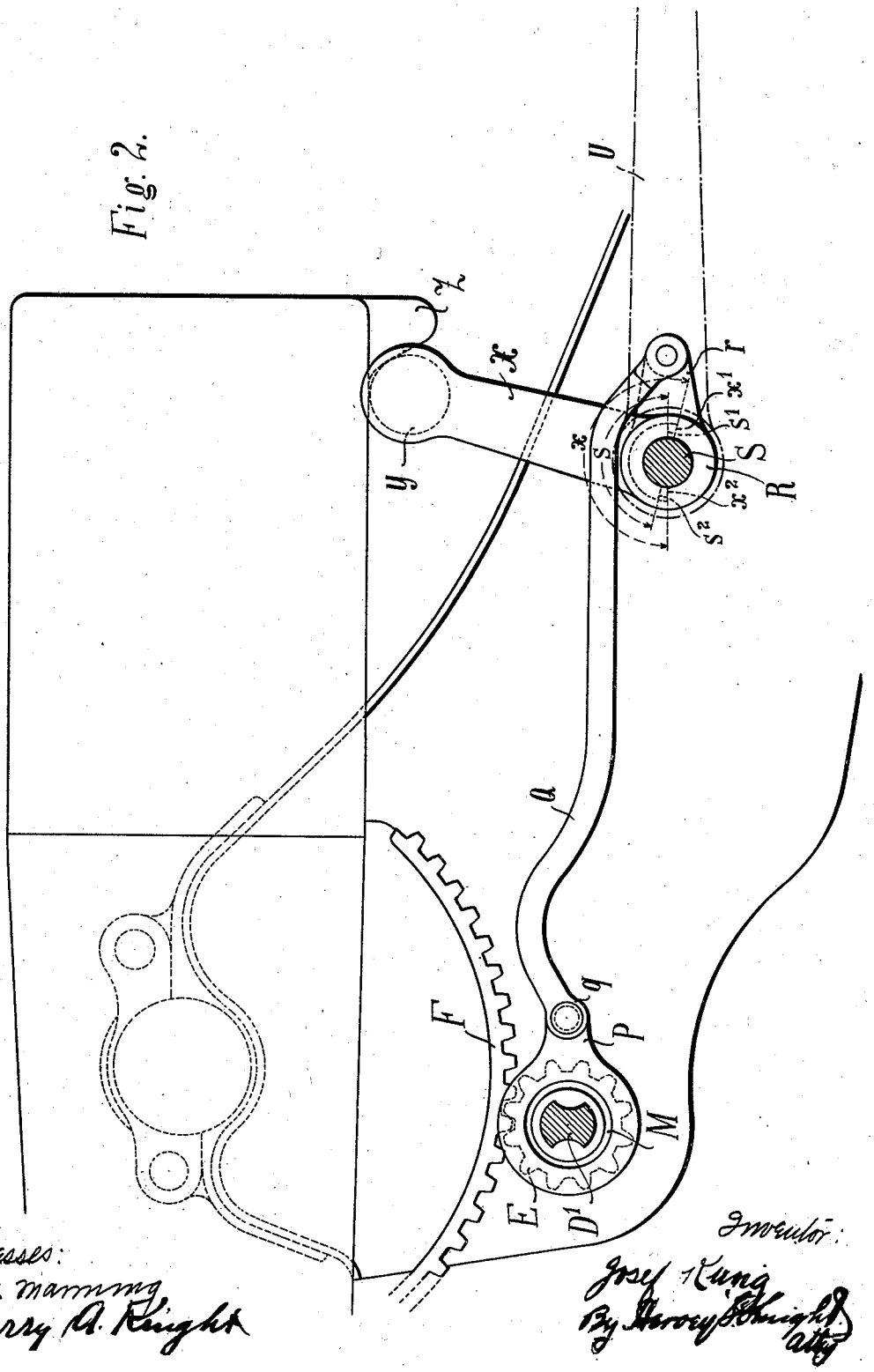
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



Witnesses:
C. E. Manning
Harry A. Knight

Inventor:
Josef Kurig
By Harvey B. Knight & Co.
Attys

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J. KURIG.

ORDNANCE.

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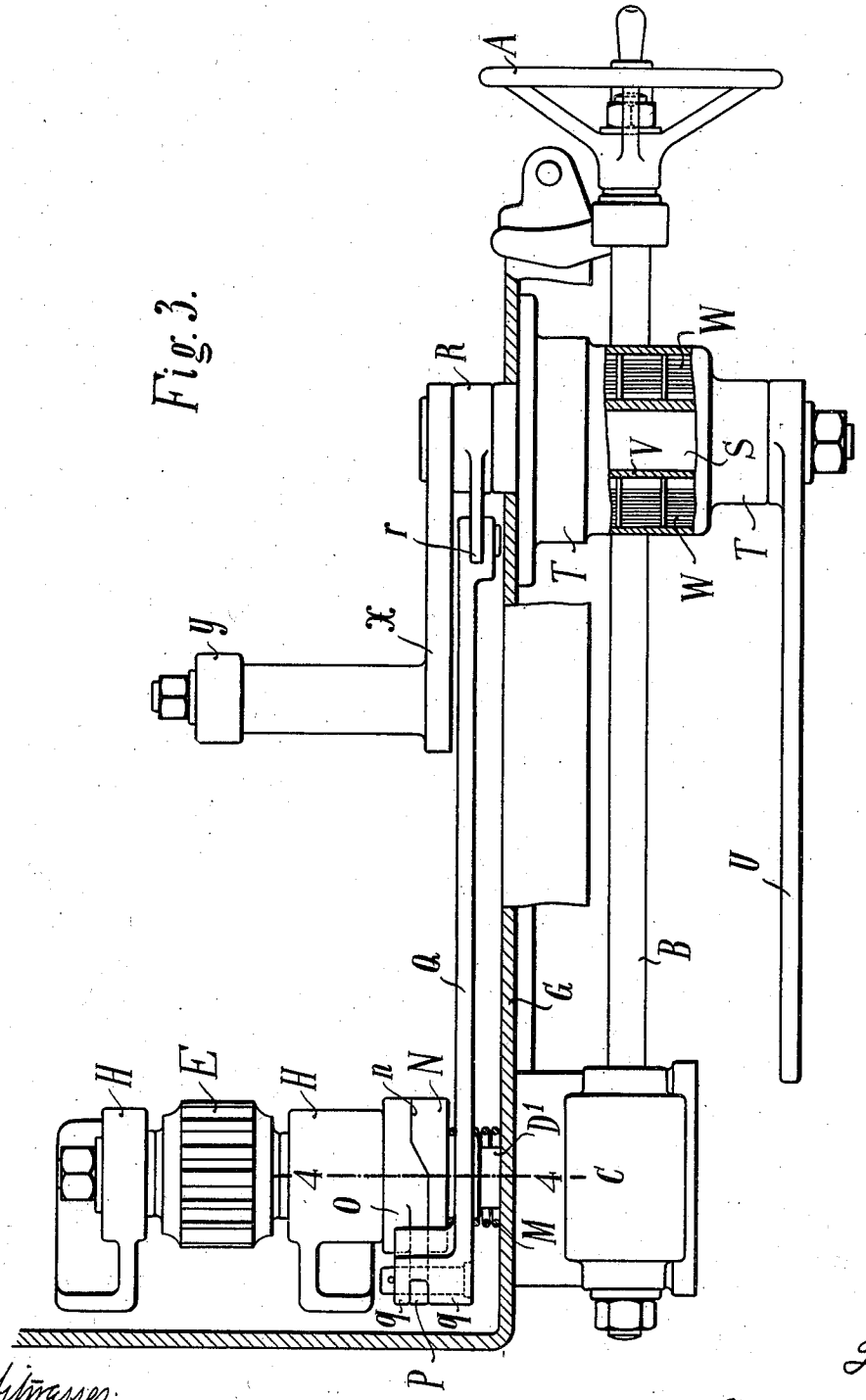
(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



Witnesses:
H. E. Manning
Harry A. Knight

Inventor:
Josef Kurig
By Harry A. Knight
Atty.

No. 708,151.

Patented Sept. 2, 1902.

J. KURIG.

ORDNANCE.

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(No Model.)

4 Sheets—Sheet 4.

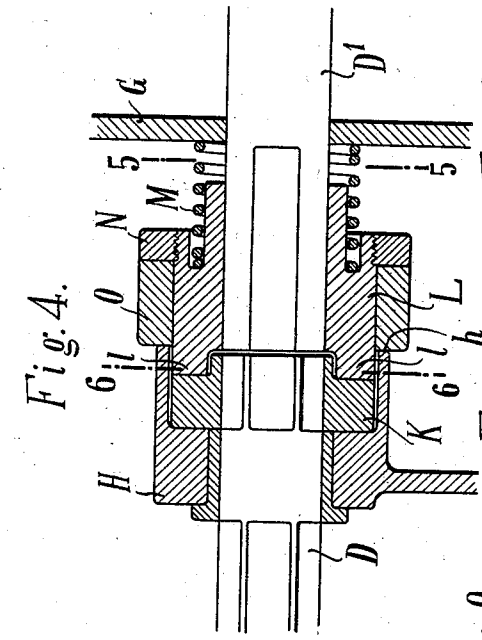

Fig. 4.

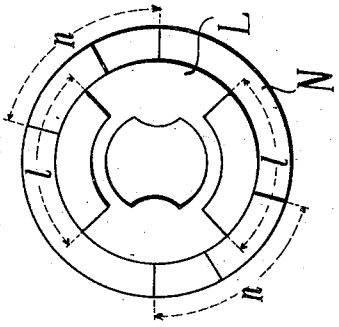

Fig. 8.

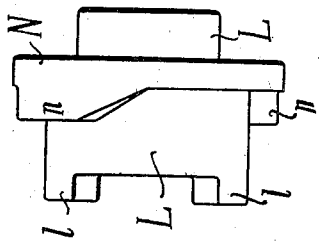

Fig. 7.

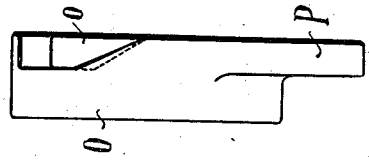

Fig. 9.

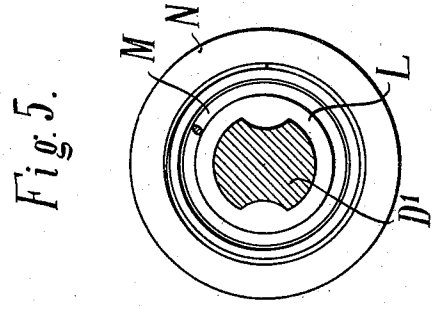

Fig. 5.

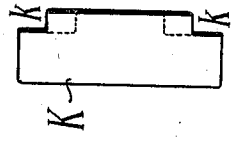

Fig. 10.

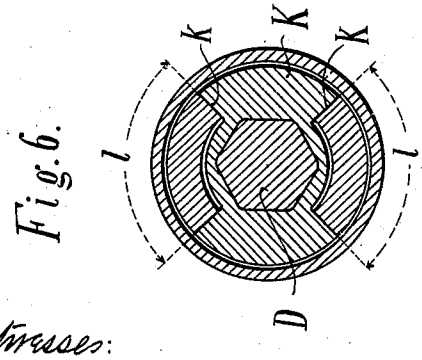

Fig. 6.

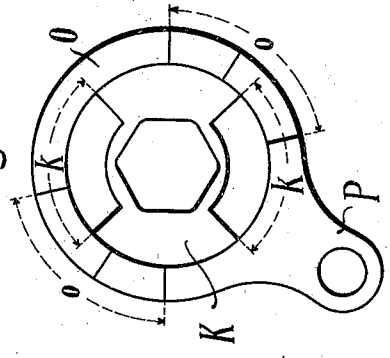

Fig. 11.

Witnesses:
H. Eg. Manning.
Harry A. Knight

Inventor.
Josef Kurig
By Hervey & Knight
Attys.

UNITED STATES PATENT OFFICE.

JOSEF KURIG, OF ESSEN, GERMANY, ASSIGNOR TO FRIED. KRUPP, OF ESSEN, GERMANY.

ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 708,151, dated September 2, 1902.

Application filed January 9, 1902. Serial No. 88,995. (No model.)

To all whom it may concern:

Be it known that I, JOSEF KURIG, residing at Essen-on-the-Ruhr, Germany, have invented certain new and useful Improvements in Ordnance, of which the following is a specification.

The foregoing invention relates to that class of ordnance which is fired at great elevations and in which loading in such positions is accompanied by great difficulty or is altogether precluded, so that the gun must be returned after each discharge to a particular position—the loading position—and then returned to firing position. This has heretofore been accomplished through the medium of the elevation mechanism at the expenditure of considerable time.

The present invention has for its object to provide ordnance of this kind with an attachment which permits the rapid transposition of the gun from firing to loading position, and vice versa. This object is accomplished according to this invention by introducing a clutch into the elevating mechanism, after the disengagement of which the breech of the gun may be elevated or depressed independently of the operation of the elevating mechanism.

In the accompanying drawings the invention is illustrated, by way of example, in use upon a howitzer with a toothed elevating-segment.

Figure 1 is a side elevation of the parts of the howitzer which come under consideration, the gun being shown in one of its firing positions of greatest elevation and the forward wall of the carriage being broken away. Fig. 2 is a view similar to Fig. 1 with the gun occupying its loading position. Fig. 3 is a plan view of the elevating mechanism in combination with the device forming the subject of the present invention, several of the parts being shown in section. Fig. 4 is a vertical longitudinal section on the line 4 4, Fig. 3. Figs. 5 and 6 show vertical cross-sections on the lines 5 5 and 6 6, respectively, of Fig. 4. Figs. 7 to 11 are detail views.

The elevating mechanism forms no part of the present invention and may therefore be briefly described. It consists at one end of a hand-wheel A, a shaft B, carrying a worm inclosed in a housing C, a worm-wheel mounted on shaft D D′ in engagement with said worm, and a toothed wheel E, also mounted on said shaft D D′, which meshes with a toothed arc F, rigidly connected with the gun. The driving portions of the elevating mechanism (the hand-wheel A, the shaft B, and the worm-gear) are located on the outer side of the carriage-wall G, while the remaining parts of the elevating mechanism are located between the walls of the carriage adjacent to the bearing H of the shaft D D′. The shaft which carries the worm-gear of the driving parts of the elevating mechanism and the toothed wheel E consists of two parts D and D′, Fig. 4. That part D of this shaft which, with the exception of its bearing portion, is hexagonal and carries the toothed wheel E has rigidly connected with it one half K of a clutch. This clutch member is inclosed by the bearing H and is provided, as shown in Figs. 10 and 11, with two diametrically opposite recesses *k*. These recesses are entered with a limited play by two corresponding lugs *l* of the other clutch member L (see Figs. 7 and 8) when the clutch is in engagement. The clutch member L is permitted to have a sliding movement on the portion D′ of the shaft which carries the driving worm-gear of the elevating mechanism, but is prevented from relative rotation thereon. The two clutch members are held normally in engagement by a spring M, which presses at one end against the carriage-wall G and at its other end against the clutch member L and is guided by a boss on the latter. The mechanism for throwing out the clutch is likewise located between the walls of the carriage and consists in part of a ring N, Figs. 7 and 8, screwed fast to the clutch member L, and therefore non-rotatable on the part D′ of the shaft, and provided with two segments *n*, located at one hundred and eighty degrees apart, which are slightly higher than the lugs *l* of the clutch-half L and commencing at a bottom face extending perpendicularly to the axis of the ring N, then with a certain pitch for an angular distance of thirty degrees, then run parallel to the bottom face of the ring, and finally drop perpendicularly at their other ends to said bottom face. The disengaging device

further comprises a sleeve O, Figs. 9 and 11, rotatable upon the clutch member L and sustained by the end *h* of the bearing H. This sleeve O is provided with two recesses *o*, the form and opposed positions of which correspond to those of the segments *n* on the ring N. The segments *n* during the engagement of the clutch enter the recesses *o* of the sleeve O; but when the sleeve O is rotated in the direction of the hands of a clock, looking from the worm-gear of the elevating mechanism, the segments *n* are displaced from their engagement with the recesses *o*, the ring N being secured against turning on the part D′ of the shaft and the latter being held fast in consequence of the self-locking nature of the worm-gear. As the sleeve O cannot now slide because of its abutment against bearing H, a turning of the sleeve O in the aforesaid direction must be followed in consequence of the cooperation of the angular or pitched faces of the segments *n* and recesses *o* by a sliding of the ring N a distance corresponding to the height of the segments *n*, said ring N taking with it the clutch member L, which is slidable upon the shaft portion D′. The clutch K L will thus be disengaged and increased tension put upon the spring M. For thus disengaging the clutch a rotation of the sleeve through an angle of thirty degrees is necessary, owing to the described form of the segments *n* and recesses *o*. The sleeve O carries an arm P, to which a rod Q is jointed through the medium of its bifurcated end *q*. The other similarly-formed end of the rod Q is in jointed connection with an arm *r* of a crank R, which is fixedly attached to a shaft S, mounted in a housing T, secured to the outer side of the carriage-wall G. Shaft S carries upon its outer end the hand-lever U, so that by throwing the hand-lever U in the direction of the arrow *u*, Fig. 1, the crank R, and with it the sleeve O, will be turned and the clutch K L will be disengaged. The portion of the shaft S within the housing T is angular and carries a collar V, to which are connected the inner ends of several spiral springs W, which are separated by annular washers, while the outer ends of said springs W are fastened to the housing T. These springs are so wound that they seek to turn the shaft S, and with it the hand-lever U, in the direction of the arrow *u*, Fig. 1. The tension of the spring W and that of the spring M, which holds the clutch K L in engagement, are so proportioned that the springs W cannot of themselves rotate the shaft S and through its connections disengage the coupling. Upon that portion of the shaft S within the carriage-wall G and next to the crank R a lever X is mounted in such a manner that it has a limited lost motion. To secure this lost motion, a projection *s* is located at the bearing-point of this lever upon the shaft S, the abutting faces *s′* and s^2 of which projection extend radially to the axis of the shaft S and engage with a groove *x* concentric with the shaft S in the nave of the lever X. The abutting faces *x′* and x^2 of this projection extend likewise radially to the axis of the shaft S, and the angle which the abutting faces *x′* and x^2 make with each other is about thirty degrees greater than the angle which the abutting faces *s′* and s^2 of the projection *s* make with each other. The lever X carries a lateral arm which engages beneath the under side of the gun-breech and rests, through the medium of the roller Y, against said under side or against a horn Z.

In the following explanation of the manipulation and operation of the invention it is assumed that the several parts are to move from their positions shown in Figs. 1 and 3, which they occupy in one of the firing positions of the gun. In this position the clutch K L is in engagement and is held in engagement by the spring M. The shaft part D′ will prevent the elevating mechanism from turning by reason of the self-locking character of the worm and worm-wheel driving-gear, so that the shaft part D, the toothed wheel E, and the gun-body cannot change their positions by themselves. The roller Y of the lever X lies against the horn Z of the gun-breech, and the abutting face s^2 of projection *s* bears against the bearing-face x^2 of the groove *x*, while the bearing-face *x′* is distant about thirty degrees from the abutting face *s′*. If it is now desired to shift the gun to loading position, the lever U is thrown in the direction of the arrow *u*, Fig. 1. In the first part of this motion the sleeve O will be turned in the same direction as the lever U through the medium of the crank R and the rod Q, so that the clutch K L will be disengaged, putting tension on the spring M. The breech of the gun can now be raised independently of any movement of the elevating mechanism, since the toothed wheel E, carried by the shaft part D, is no longer coupled with the shaft part D′. Since before the clutch will become disengaged it is necessary that the lever U rotate through an angle of thirty degrees, it follows that, owing to the described formation of the groove, upon the completion of such disengagement of the clutch the abutting face *s′* of the projection *s* comes to rest against the abutting face *x′* of the groove *x*. In consequence of this if one throws the lever U still farther in the aforesaid direction the lever X will be carried with it, and the gun will be raised by the lateral arm of the lever X. In this operation the springs W uncoil, and consequently assist in raising the breech of the gun. Since the breech of the gun imposes a load upon these parts, it will return the gun of its own weight as soon as the lever X is moved past the perpendicular by throwing the lever U. This movement is accompanied by the gun simultaneously with the turning of the lever X or as soon as the roller Y of the lever X bears against the horn Z of the bottom piece of the gun. The several parts now take, upon the disengagement of the clutch, the position

illustrated in Fig. 2, in which the hand-lever U comes to rest upon a stop (not shown in the drawings) on the carriage. The gun being now loaded and it being desired to return it to the firing position it previously occupied, the hand-lever U is thrown toward the muzzle of the gun, putting tension on the spring W. The lever X partakes of this movement as soon as the abutting face s^2 of the projection s reaches the position of abutment against the bearing-face x^2 of the groove x. The lever X then raises the gun until the lever reaches its vertical position, after which the gun descends under the effect of its increased weight, due to the load introduced into its breech, and turns the lever X until the abutting face x' of its groove x abuts against the face s' of the projection s. Further movement of the lever U under the influence of the weight of the breech of the gun now takes place in opposition to the spring W. At the commencement of the engagement of the clutch the gun has reassumed the firing position from which it had been moved, (in the present case the position shown in Fig. 1;) but the hand-lever continues its movement downward for about thirty degrees farther in order to insure the complete engagement of the clutch. Hence the engaging face s^2 of its projection s again arrives in engagement with face x^2 of the groove x.

From the foregoing explanation it is obvious that the transfer of the gun from the firing to the loading position, and vice versa, can be accomplished in a greatly-reduced time as compared with the shifting of the gun through the medium of the elevating mechanism, so that the rapidity of firing is essentially increased. The amount of power necessary for the elevation of the gun is comparatively insignificant, since the tension stored up in the springs W by the descent of the gun assists in raising it.

Having thus described the invention, the following is what is claimed as new therein:

1. The combination of an elevating device for guns locking the gun in an adjusted firing position, and mechanism disengaging the gun from the elevating device and moving the gun independently of the elevating device from an adjusted firing position to loading position and thence to the same firing position.

2. The combination of an elevating device for guns, a clutch in connection with said elevating device, and means operating the clutch and moving the gun independently of the elevating device, from an adjusted firing position to loading position and thence to the same firing position.

3. The combination of an elevating device for guns, a clutch introduced between the driving and driven parts of said elevating device, mechanism through which the breech of the gun is manipulated up and down independently of the elevating mechanism, and a connection between the breech-shifting means and the clutch, throwing the clutch out as the breech is shifted to loading position, and in when the gun reaches its original firing position.

4. In combination with a gun, an elevating mechanism, a clutch interposed between the driving and driven parts of the elevating mechanism and means for throwing the clutch in and out, consisting of the ring N, and the sleeve O having engaging faces formed at an inclination, one of said parts being connected with the movable member of the clutch and the other having a fixed abutment, and means for imparting relative rotation between said parts.

5. In a gun-mount, elevating mechanism embodying in its structure a two-part shaft, with a clutch interposed between and having its members respectively fixed and sliding on the parts of said shaft, a worm-gear rotating said shaft, a spring on said shaft bearing against the sliding clutch member, and the ring and sleeve having angularly-disposed engaging faces, and arranged the one in connection with the movable clutch member, and the other in abutment with a fixed part, and means for rotating said sleeve.

6. In a gun-mount, an elevating mechanism holding the gun in adjusted firing position and embodying a clutch between its driving and driven parts; a shaft having a crank-arm providing a movable support for the breech of the gun, independent of the elevating mechanism, and connections between the shaft and the clutch.

7. In a gun-mount, an elevating mechanism holding the gun in adjusted firing position embodying a clutch between its driving and driven parts; and a shaft having a crank-arm providing a movable support for the breech of the gun, independent of the elevating mechanism, and a counterbalance-spring on said shaft tending to rotate the crank in a direction to raise the gun-breech.

8. In a gun-mount, an elevating mechanism embodying a clutch between its driving and driven parts, and a shaft having a crank-arm providing a movable support for the breech of the gun, and a crank-and-rod connection between the shaft and clutch moving the latter into and out of engagement as the supporting-crank moves.

9. In a gun-mount, the combination of the toothed arc, connected with the gun, the toothed gear engaging said arc, the two-part shaft, one part of which carries said toothed gear, the clutch interposed between the two parts of said shaft, the ring and sleeve having inclined engaging faces, and connected the one to the movable member of the clutch and the other to a fixed part, and disengaging the clutch when they are relatively rotated, the shaft near the breech of the gun carrying a lever which raises and lowers said breech and with a hand-lever for manipulating it, and the lever-and-rod connection between the last-named shaft and the clutch-operating sleeve; a lost motion being provided between

the manipulating hand-lever and the breech-supporting crank, whereby upon movement of the hand-lever in one direction the clutch is first disengaged and the gun-breech moved, and upon movement of the hand-lever in the opposite direction the gun-breech is moved and the hand-lever is reëngaged.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOSEF KURIG.

Witnesses:
WILLIAM ESSENWEIN,
PETER LIEBER.