K. VÖLLER.

GUN HAVING A RECOILING BARREL.

APPLICATION FILED DEC. 11, 1908.

1,082,718.

Patented Dec. 30, 1913.

4 SHEETS—SHEET 1.

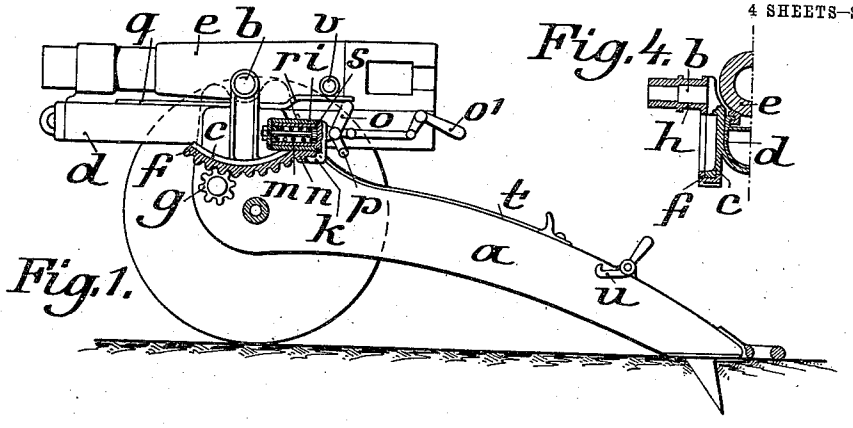

Fig. 1.

Fig. 4.

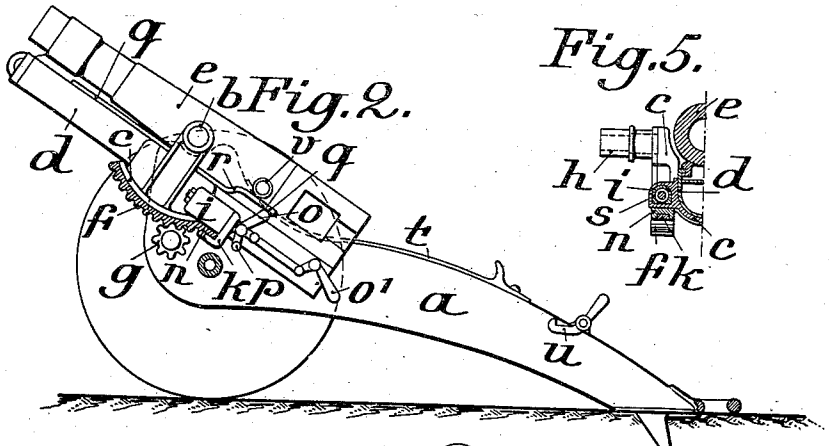

Fig. 2.

Fig. 5.

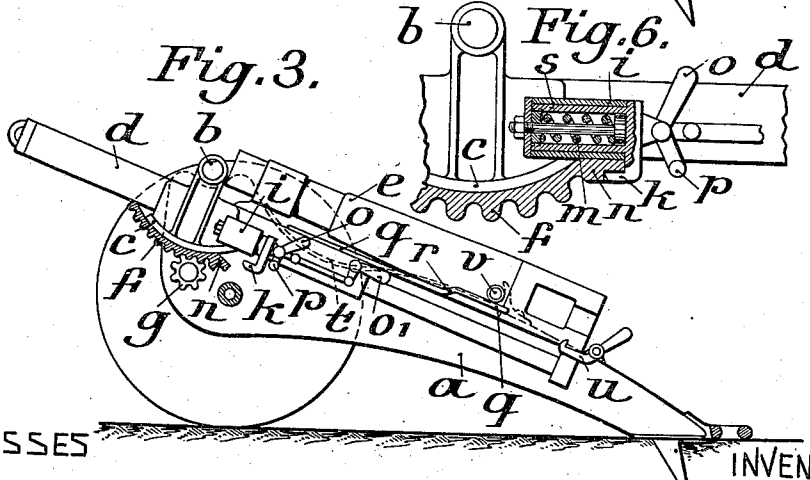

Fig. 3.

Fig. 6.

WITNESSES

E. O. Hildebrand

M. B. Taylor.

INVENTOR

Karl Völler

by Georgii Massiyd

ATTORNEYS

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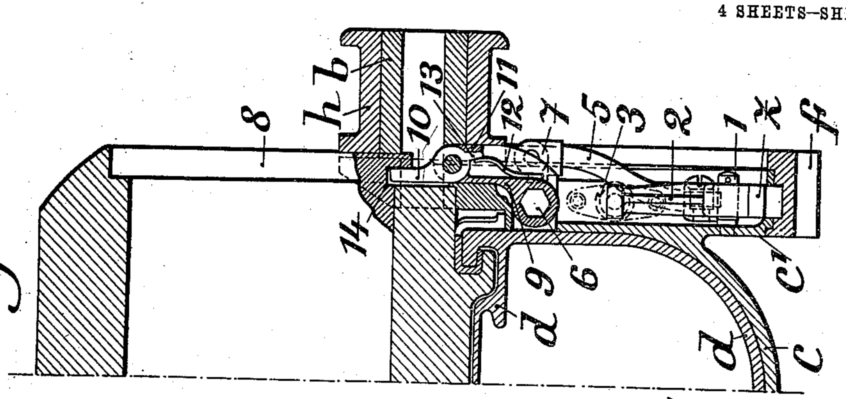

Fig. 8.

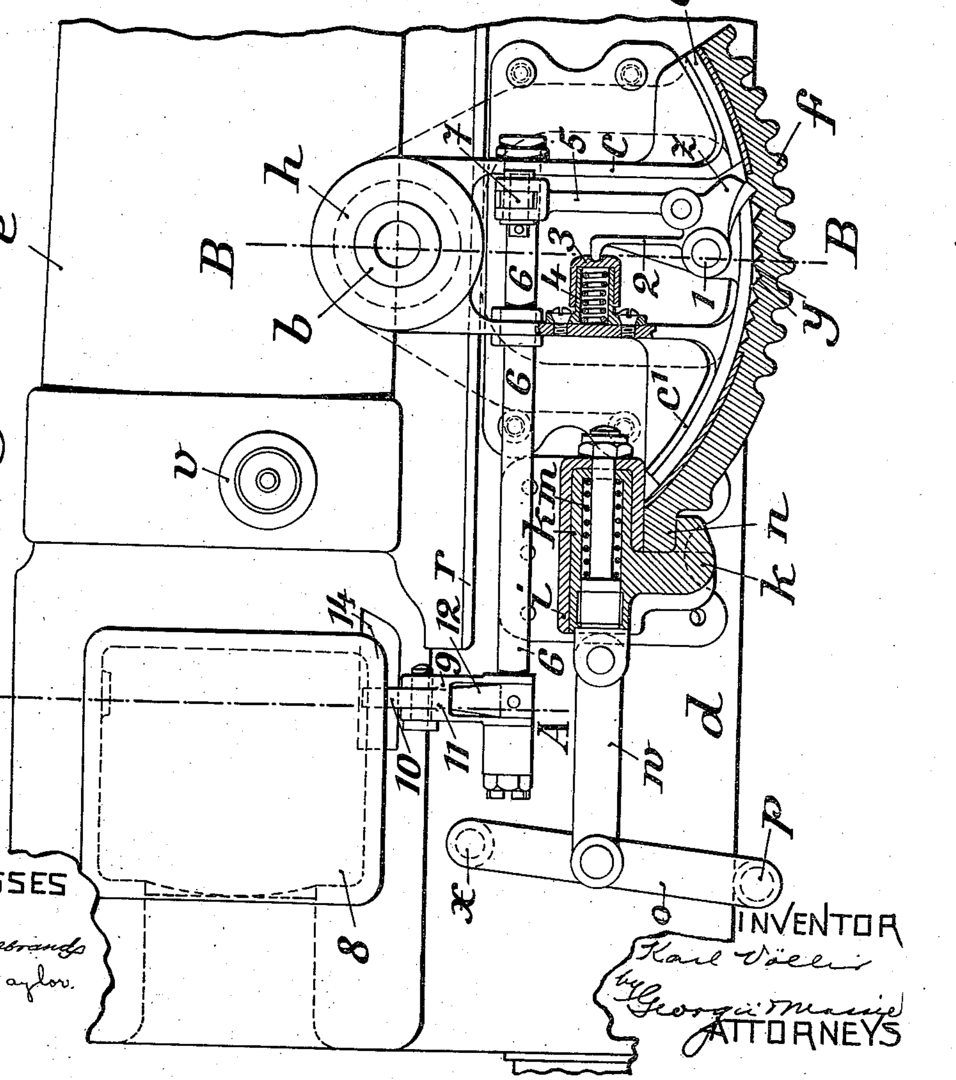

Fig. 7.

WITNESSES

E. O. Hildebrandt

M. B. Taylor.

INVENTOR

Karl Völler

by George Massie

ATTORNEYS

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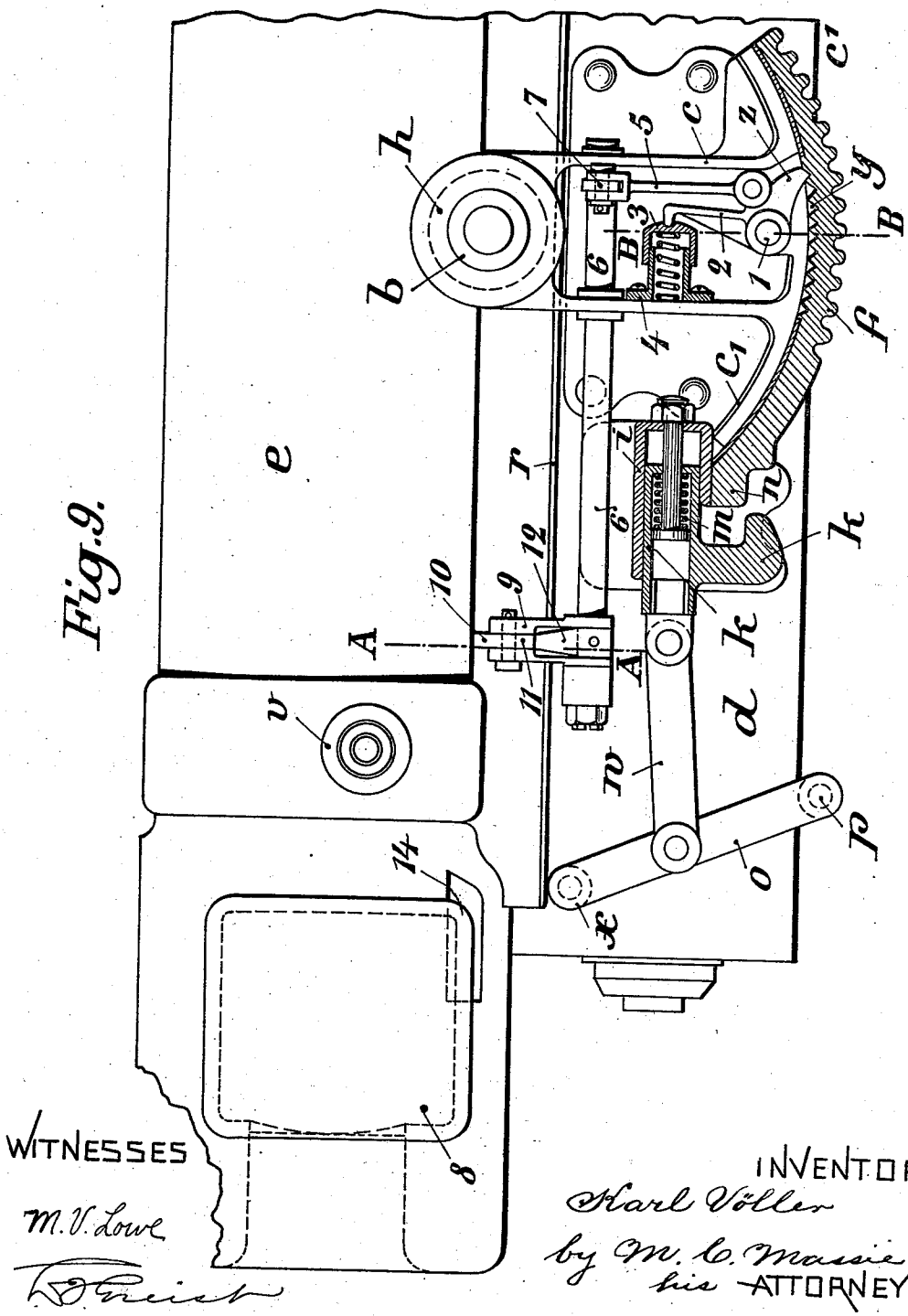
4 SHEETS—SHEET 3.

Fig. 9.



WITNESSES

M. V. Lowe

INVENTOR

Karl Völler

by M. C. Massie

his ATTORNEY

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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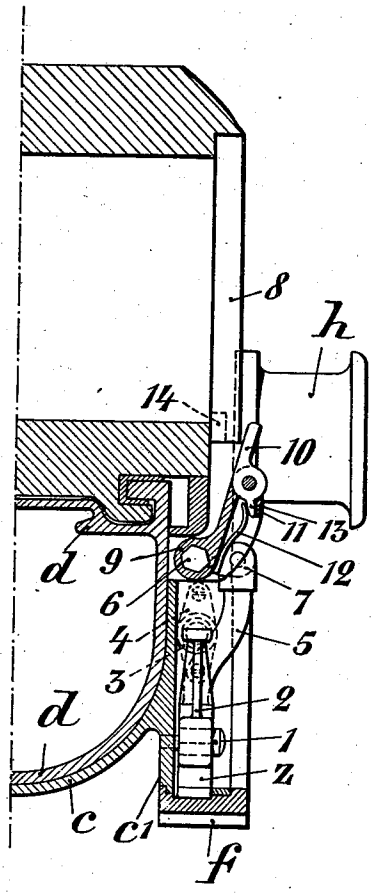
4 SHEETS—SHEET 4.

Fig. 10.



WITNESSES

M. V. Lowe

T. D. Reist

INVENTOR

Karl Völler

by M. L. Massie

his ATTORNEY

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

KARL VÖLLER, OF DUSSELDORF, GERMANY, ASSIGNOR TO RHEINISCHE METALL-WAAREN- UND MASCHINENFABRIK, OF DUSSELDORF-DERENDORF, GERMANY.

GUN HAVING A RECOILING BARREL.

1,082,718. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed December 11, 1908. Serial No. 466,980.

To all whom it may concern:

Be it known that I, KARL VÖLLER, engineer, a subject of the German Emperor, residing at 17 Jülicherstrasse, Dusseldorf, Germany, have invented certain new and useful Improvements in Guns Having a Recoiling Barrel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in ordnance, and in particular to a carriage recoil gun of that type in which, at certain elevations, the gun during the first part of the recoil moves in the direction of the axis of the gun and during the latter part of the recoil is diverted from this direction, in order that the barrel may not strike the earth or any part of the carriage, and, also, in order that the barrel may be in a certain position for loading at the end of the recoil. In such guns it is advisable that at the moment when owing to this deviation of the path such recoiling system turns about its axis, it should be disconnected from the elevating mechanism. Besides this, there are other requirements which must be fulfilled in order to make the weapon useful in war without any complications. Such guns with diverted recoil can be so constructed that the device for diverting the recoil may be used whatever the elevation, even with the lowest elevation. The gun can, however, be so constructed that the recoil is not diverted until a certain elevation has been attained, that is to say, up to a certain elevation the gun-barrel, as in ordinary guns, recoils without being diverted, and at elevations just below that at which the recoiling parts would strike the ground or some other obstruction, and at higher elevations, the recoil is diverted.

If the gun is not to be loaded at the end of the recoil but, as is the case of guns which are fired at a great elevation, when the gun barrel is in its foremost position and also horizontal, it must be possible to bring the barrel at the end of the return movement out of the firing position into the loading position with ease, without affecting the sighting mechanism and when the gun is returned from the loading position it must assume its original elevation. This possibility must exist both when the gun is worked without the diverted recoil and when it is worked with the diverted recoil. Furthermore, when the recoil is diverted the oscillating system and the elevating mechanism must be automatically disengaged and must be reëngaged when the barrel returns to the firing position. The present invention fulfils these various requirements.

An embodiment of the invention is shown in the accompanying drawings.

Figure 1 is a side elevation of a gun constructed according to the invention, in the firing position when firing horizontally, Fig. 2 is a like view of the gun when firing at a high elevation, Fig. 3 is a like view at the end of the recoil at the same elevation, Fig. 4 is a cross section through the barrel, cradle and cradle carrier, Fig. 5 is a similar section in the rear of that shown in Fig. 4, and Fig. 6 is a detail view drawn to an enlarged scale of the coupling device between the oscillating system and the elevating mechanism. Fig. 7 is a part longitudinal sectional elevation of a modification drawn to an enlarged scale. Fig. 8 is a section on lines A—A and B—B of Fig. 7. Figs. 9 and 10 are views corresponding to Figs. 7 and 8 with the parts in different positions during operation.

The cradle carrier *c* is suspended in the carriage *a* from the trunnions *b* on which it is free to turn and carries the cradle *d* along which the barrel *e* slides when it recoils. The trunnions *b* extend through the hollow axles *h* of the toothed sectors *f* which axles are free to turn in the trunnion bearings. The sector is thus guided by segmental guides on the cradle carrier *c*. The toothed sector *f* gears with the pinion *g* and constitutes a part of the elvating mechanism, the rest of which is not shown. One of the axles *h* carries a sighting device of any suitable construction, which is also not shown in the drawings.

In a housing *i* on the cradle carrier *c* slides the hollow stem *s* of a catch *k* held in its normal position by a spring *m*. The housing *i* abuts against a part *n* of the toothed sector *f* which part is engaged by the catch *k* so that the cradle carrier *c* and the sector *f* are rigidly connected. Thus when the sector *f* is moved the sighting device, the cradle and the barrel move with it.

A lever *o* pivoted at *p* to the cradle *d* is coupled with the catch *k*. A rail *q* is fixed

longitudinally to the barrel and has at *r* a bend. This bend constitutes a tappet which as the barrel recoils strikes against the upper end of the lever *o* and turns the latter to the right. Thus the catch *k* is moved to the right against the tension of spring *m* and the cradle becomes disconnected from the elevating mechanism. The cradle and the barrel can now oscillate in response to the recoil of the barrel. The part of the rail *q* to the left of the bend *r* keeps the lever *o* in its depressed position during the recoil of the barrel as indicated in Fig. 3 which shows the barrel at the end of the recoil; in this position the barrel is at a lower elevation than in the firing position owing to the engagement of the pin *v* with the curved guide *t*.

In the arrangement shown a deviation of the oscillating system in one direction only, namely from the higher elevation to the lower elevation, is possible, because a deviation in the other direction is prevented by the housing *i*. That is to say, the housing *i* acts as a stop on the cradle which engages a corresponding stop *n* on the toothed sector of the elevating mechanism. This engagement is maintained until the pin *v* of the barrel comes into contact with the curved guide *t* on the gun carriage *a*.

The barrel can be held in the extreme position of its recoil by the catch *u* and may be loaded in this position. But it is not necessary to use this catch device. The barrel is then returned at the end of the recoil by the return mechanism, and owing to the excess of weight at the rear the pin *v* remains on the curve *t* and when the bend *r* of the rail *q* has passed the lever *o* this is returned into its original position by the spring *m*. At the moment therefore when the pin *v* leaves the guide *t* the barrel has returned to its previous elevation and the housing *i* again abuts on the part *n* of the sector *f*. If the gun is now to be loaded the conditions are the same as those obtained when firing recoil guns at a high elevation.

The barrel can be brought into the loading position by releasing the catch *k* by raising the hand lever *o'* and simultaneously swinging the gun into the horizontal or loading position. After loading, the rear end of the barrel is again lowered, until the housing *i* is in contact with part *n* and the catch is again inserted.

While in the construction described, when the barrel is at a high elevation after the recoil it must be brought to a lower elevation for loading and then returned to the firing position, the arrangement can be so constructed that the barrel at the end of the recoil or any other part thereof, generally at that point where there is the greatest deviation from the direction of firing and only a slight or even no inclination to the horizontal, is coupled by a locking device with the elevating mechanism of the gun carriage, so that it cannot swing back again into the firing position but into the elevation determined by fixing the cradle. In its most forward position it is then at the inclination suitable for loading. The parts are preferably unlocked by the act of closing the breech. The loaded barrel can easily be given so much excess of weight at the rear that on releasing the catch the barrel swings of its own accord into the firing position; otherwise a slight pressure of the hand on the rear end would suffice. Such an arrangement has the further advantage that the barrel returns with the same or nearly the same elevation. The springs and the brake during the forward motion are always uniformly strained and a separate return regulator is not required. Such a construction is shown in Figs. 7 and 8.

The cradle *d* on which the barrel *e* recoils after firing, rests in the cradle carrier *c* and can turn about the trunnion *b* supported by the gun carriage. The cradle carrier *c* has at each side a flange *c'* curved to an arc struck from the trunnion as center. On this flange the toothed sector *f* slides; the sector is connected with the elevating mechanism and adapted to be moved thereby. In order to obtain a greater stability the toothed sector *f* is connected by radial arms with the sleeve *h* surrounding the trunnion *b* and journaled in the gun carriage. The toothed sector *f* has at its rear end a projection *n* which is engaged by a catch *k*. This catch can slide in a housing *i* fixed to the cradle *d* and a spring *m* tends always to bring the catch into engagemnt with the projection *n* so that the toothed sector *f* and the cradle *d* are coupled with the barrel *e* and can be operated together by the elevating mechanism.

Underneath the cradle *d* near the rear end is mounted a shaft *p* carrying lever arms *o*. A link *w* connects lever *o* with catch *k* so that by turning lever *o* toward the left the catch is released from the projection *n*. At its upper end, lever *o* carries a roller *x* against which the rail *r* fixed to the barrel strikes when the latter recoils; the catch *k* is thus disengaged from sector *f* and the elevating mechanism and the cradle *d* are disconnected. When, during the further recoil, the pin *v* on the barrel comes in contact with a curved guide arranged on the gun carriage as in Figs. 1 to 6, the barrel together with the cradle turns about the trunnion in a direction which reduces the elevation. So far the construction is the same as that described with reference to Figs. 1 to 6.

In order to prevent the rear end of the barrel from sinking again as it runs forward the toothed sectors *f* are provided with

teeth on their inner peripheries. Within the cradle carrier c are pawls z turning on pivots 1 and extending through slots in the flanges c', so as to engage the teeth y. The pawl z has an upward extension 2 which engages a piston 3; the latter is subject to a spring 4 which tends to keep the pawl z engaged with the teeth y.

A link 5 connects the pawl z with an arm 7 fixed to a rock shaft 6, journaled in the cradle carrier c longitudinally thereof. Underneath the breech block 8 a second arm 9 is keyed to the shaft 6. To this second arm is pivoted a pawl 10, the movement of which in the direction of the barrel is limited by a stop 11 on the arm 9. A spring 12 maintains the tail 13 of the pawl 10 against this stop.

When the breech is closed and pawl 10 is engaged in the notch 14 in the edge of the breech block (Fig. 8) the pawl z is disengaged from the teeth y. But as soon as the barrel recoils the pawl 10 leaves the notch 14 and can turn free of the barrel. Thereupon the spring 4 urges pawl z into engagement with teeth y, so that the rear end of the barrel and the cradle can rise but cannot descend.

Since the barrel and the cradle during the recoil, as already mentioned, turn about the trunnion so that the inclination to the horizontal becomes less and cannot turn in the opposite direction owing to the locking device just described, the barrel has at the end of its return movement a lower elevation than in the firing position. By suitable choice of the curve of the guide this end position may be such that the gun can be loaded without trouble. When, after loading, the breech block is closed the edge thereof engages the pawl 10 and turns it toward the middle of the barrel, the shaft 6 being thus rotated and the pawl z released. The barrel and the cradle will then automatically, owing to the excess of weight at the rear end, or aided by slight pressure, drop into the firing position, and the elevating mechanism and cradle are again connected with the barrel, so that the gun is ready for firing.

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. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel from the firing elevation during recoil, means to automatically uncouple the barrel from the elevating mechanism before the beginning of such deviation and to permit the recoupling of the parts after return to firing position only.

2. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from the firing elevation to a different elevation at the end of recoil, coupling mechanism arranged to automatically uncouple the barrel from the elevating mechanism before the beginning of such deviation, means to retain the barrel at the changed elevation during counter recoil, and means to permit its return to firing elevation after counter recoil, the coupling mechanism arranged to again become effective at firing elevation.

3. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from the firing elevation to a different elevation at the end of recoil, coupling mechanism arranged to automatically uncouple the barrel from the elevating mechanism before the beginning of such deviation, such coupling mechanism comprising a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage the said part, and means actuated by the longitudinal movement of the barrel to release said catch from said part.

4. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from the firing elevation to a different elevation at the end of recoil, coupling mechanism arranged to automatically uncouple the barrel from the elevating mechanism before the beginning of such deviation, such coupling mechanism comprising a stop swinging with the barrel about its trunnions and arranged to bear against a part moving with the elevating mechanism, a catch connected to the stop and arranged to overlie the said part on the opposite side and means actuated by the longitudinal movement of the barrel to retract said catch to release said part.

5. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from the firing elevation to a different elevation at the end of recoil, coupling mechanism arranged to automatically uncouple the barrel from the elevating mechanism before the beginning of such deviation, such coupling mechanism comprising a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage the said part, and means actuated by the longitudinal movement of the barrel to release said catch from said part, means to retain the barrel at the changed elevation during loading and to permit its return to firing elevation after loading, the coupling mechanism arranged to again become effective at firing elevation.

6. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from the firing elevation to a different elevation at the end of recoil, coupling mechanism arranged to automatically uncouple the barrel from the ele-

vating mechanism before the beginning of such deviation, such coupling mechanism comprising a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage the said part, and means actuated by the longitudinal movement of the barrel to release said catch from said part, means to retain the barrel at the changed elevation during counter recoil, and means to permit its return to firing elevation after counter recoil, the coupling mechanism arranged to again become effective at firing elevation.

7. In a gun, elevating mechanism, means to couple and uncouple the elevating mechanism and barrel to permit the barrel to be swung independently of the elevating mechanism from firing position to loading position and back to firing elevation, such coupling mechanism comprising a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage said part, and means actuated by the movement of the barrel after firing to engage and disengage said catch.

8. In a gun, elevating mechanism, means to couple and uncouple the elevating mechanism and barrel to permit the barrel to be swung independently of the elevating mechanism from firing position to loading position and back to firing elevation, such coupling mechanism comprising a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage said part, and means actuated by the recoil movement of the barrel to release said catch, said catch arranged to again engage the said part when the barrel reaches firing elevation.

9. In a gun, elevating mechanism, means to couple and uncouple the elevating mechanism and barrel to permit the barrel to be swung independently of the elevating mechanism from firing position to loading position and back to firing elevation, such coupling mechanism comprising a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage said part, a lever connected to said catch, and a guide formed on the barrel and arranged to act on the lever during the recoil movement of the barrel to release said catch, said coupling mechanism arranged to again become effective at firing elevation only.

10. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from firing elevation to a different elevation, a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage said part, and means actuated by the longitudinal movement of the barrel prior to its deviation to release said catch and premit oscillation of the barrel independent of the elevating mechanism.

11. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from firing elevation to a different elevation, a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage said part, and means actuated by the longitudinal movement of the barrel prior to its deviation to release said catch and permit oscillation of the barrel independent of the elevating mechanism, means to retain the barrel at the changed elevation during counter recoil and means to permit its return to firing elevation after counter recoil.

12. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from firing elevation to a different elevation, a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage said part, and means actuated by the longitudinal movement of the barrel prior to its deviation to release said catch and permit oscillation of the barrel independent of the elevating mechanism, means to retain the barrel at the changed elevation during counter recoil and means to permit its return to firing elevation after counter recoil, the coupling mechanism arranged to again become effective at firing elevation only.

13. In a gun having a recoiling barrel, elevating mechanism therefor, means to divert the barrel during recoil from firing elevation to a different elevation, a part fixed to the elevating mechanism, a catch swinging with the barrel about its trunnions and arranged to engage said part, and means actuated by the longitudinal movement of the barrel prior to its deviation to release said catch and permit oscillation of the barrel independent of the elevating mechanism, said means comprising a lever connected to said catch, and a guide formed on the barrel and arranged to turn the lever during the recoil movement.

14. In a gun having a recoiling barrel, an elevating segment, a second segment fixed to the gun cradle, coupling mechanism connecting the two segments, and means actuated by the recoiling barrel to release the coupling mechanism to permit the gun to swing on its trunnions from firing elevation to loading elevation and back to firing elevation independent of the elevating mechanism, the coupling mechanism arranged to become again effective at firing elevation.

15. In a gun having a recoiling barrel, an elevating segment, a second segment fixed to the gun cradle, coupling mechanism, connecting the two segments, means to divert

the gun barrel and cradle during recoil from firing elevation to an elevation suitable for loading; means to automatically uncouple the two segments during recoil and before the deviation of the barrel from firing elevation, the coupling again becoming effective at firing elevation only.

16. In a gun having a recoiling barrel, an elevating segment, a second segment fixed to the gun cradle, coupling mechanism connecting the two segments, means to divert the gun barrel and cradle during recoil from firing elevation to an elevation suitable for loading, means to automatically uncouple the two segments during recoil and before the deviation of the barrel from firing elevation, and means to retain the barrel at its changed elevation during counter recoil, said coupling mechanism arranged to again become effective at firing elevation.

17. In a gun having a recoiling barrel, means to oscillate the barrel during recoil to decrease the elevation, means to control such oscillation of the barrel to permit its oscillation in the one direction but prevent its counter oscillation and means automatically actuated by the completion of the loading operation to release such controlling means to permit the barrel to again swing to its original firing elevation.

18. In a gun having a recoiling barrel, an elevating segment, a second segment having the same center and fixed to the cradle, a cylinder carried by the second segment and serving as a stop for the first segment when the two are in register, a spring pressed plunger rod within the cylinder, a catch carried by the rod and arranged to overlie the first segment, means to divert the barrel during recoil from firing elevation to a different elevation, and means actuated by the recoiling barrel to withdraw the catch and uncouple the two segments before such deviation, said coupling again becoming effective when the barrel returns to firing elevation only.

19. In a gun having a recoiling barrel, an elevating segment, a second segment having the same center and fixed to the cradle, a cylinder carried by the second segment and serving as a stop for the first segment when the two are in register, a spring pressed plunger rod within the cylinder, a catch carried by the rod and arranged to overlie the first segment, means to divert the barrel during recoil from firing elevation to a different elevation, and means actuated by the recoiling barrel to withdraw the catch and uncouple the two segments before such deviation, and means to retain the barrel at the changed elevation during counter recoil.

20. In a gun having a recoiling barrel, an elevating segment, a second segment having the same center and fixed to the cradle, a cylinder carried by the second segment and serving as a stop for the first segment when the two are in register, a spring pressed plunger rod within the cylinder, a catch carried by the rod and arranged to overlie the first segment, means to divert the barrel during recoil from firing elevation to a different elevation, a lever connected to the catch, a guide formed on the barrel and arranged to act on the lever during recoil to release the catch before such deviation, and means to retain the barrel at the changed elevation during counter recoil.

21. In a gun having a recoiling barrel, an elevating segment, a second segment fixed to the gun cradle, coupling mechanism connecting the two segments, means to divert the gun barrel and cradle during recoil from firing elevation to an elevation suitable for loading, means to automatically uncouple the two segments during recoil and before the deviation of the barrel from firing elevation, a rack formed on the inner face of one of the segments, a pawl carried by the other segment in engagement with the rack, the rack and pawl mechanism arranged to permit one of the segments to move with the oscillation of the barrel in one direction and to prevent a counter movement, and a connection between the pawl and the gun breech to retract the pawl as the breech is closed after loading.

22. In a gun having a recoiling barrel, an elevating segment, a second segment fixed to the gun cradle, coupling mechanism connecting the two segments, means to divert the gun barrel and cradle during recoil from firing elevation to an elevation suitable for loading, means to automatically uncouple the two segments during recoil and before the deviation of the barrel from firing elevation, a rack formed on the inner face of one of the segments, a pawl carried by the other segment in engagement with the rack, the rack and pawl mechanism arranged to permit one of the segments to move with the oscillation of the barrel in one direction and to prevent a counter movement, a rock shaft mounted on the cradle, arms carried by said shaft, a link connecting one of the arms to the pawl, and the other arm arranged to be operated by the closing of the breech to retract the pawl.

23. In a gun having a recoiling barrel, an elevating segment, a second segment fixed to the gun cradle, coupling mechanism connecting the two segments, means to divert the gun barrel and cradle during recoil from firing elevation to an elevation suitable for loading, means to automatically uncouple the two segments during recoil and before the deviation of the barrel from firing elevation, a rack formed on the inner face of the elevating segment, a pawl carried by the second segment in engagement with the rack,

the rack and pawl arrangement being such as to permit the second segment to move with the oscillation of the barrel to a lower elevation and to prevent a counter movement, a spring pressing the pawl into engagement with the rack, a rock shaft mounted on the cradle, arms projecting from said shaft, a link connecting one arm with the pawl, the other arm arranged to rest in a notch formed in the breech block when in battery position, to be released therefrom as the barrel recoils and to be again engaged as the breech block is closed after loading, whereby to permit oscillation of the barrel to firing position.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

KARL VÖLLER.

Witnesses:
ROBERT W. HEINGARTNER,
AUGUST FUGGER.