K. VÖLLER.

RECOIL MECHANISM FOR GUNS.

APPLICATION FILED OCT. 18, 1911.

1,034,171. Patented July 30, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

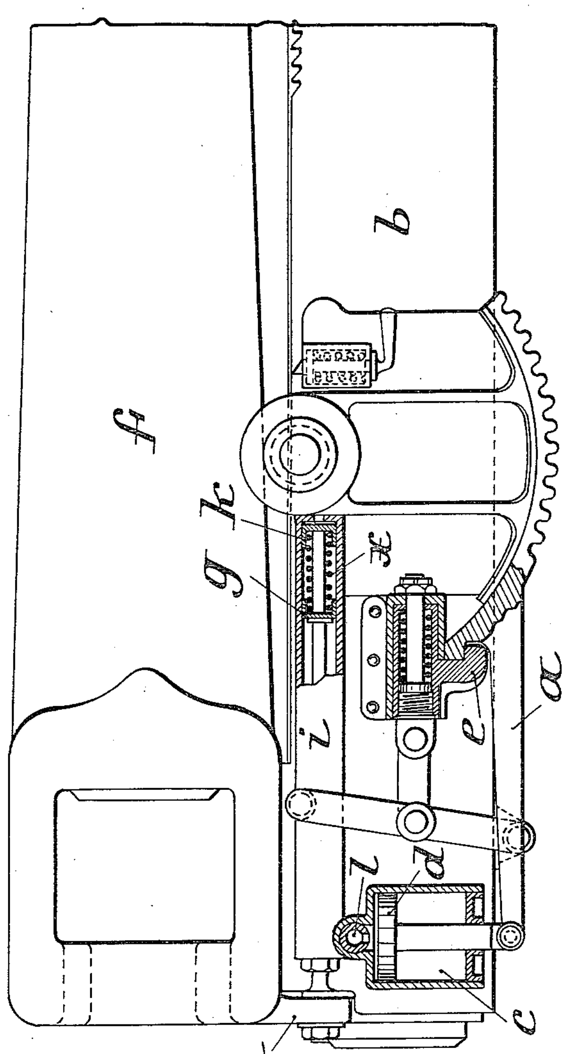
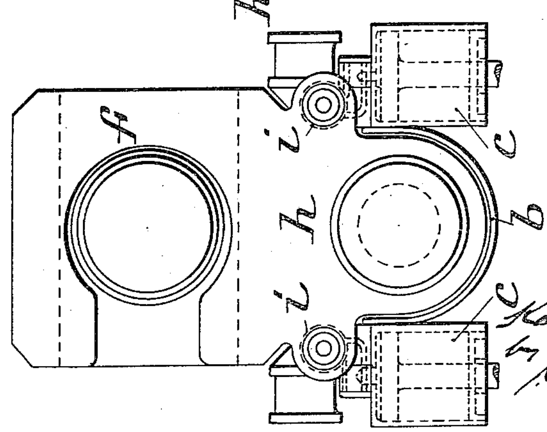


Fig. 2.



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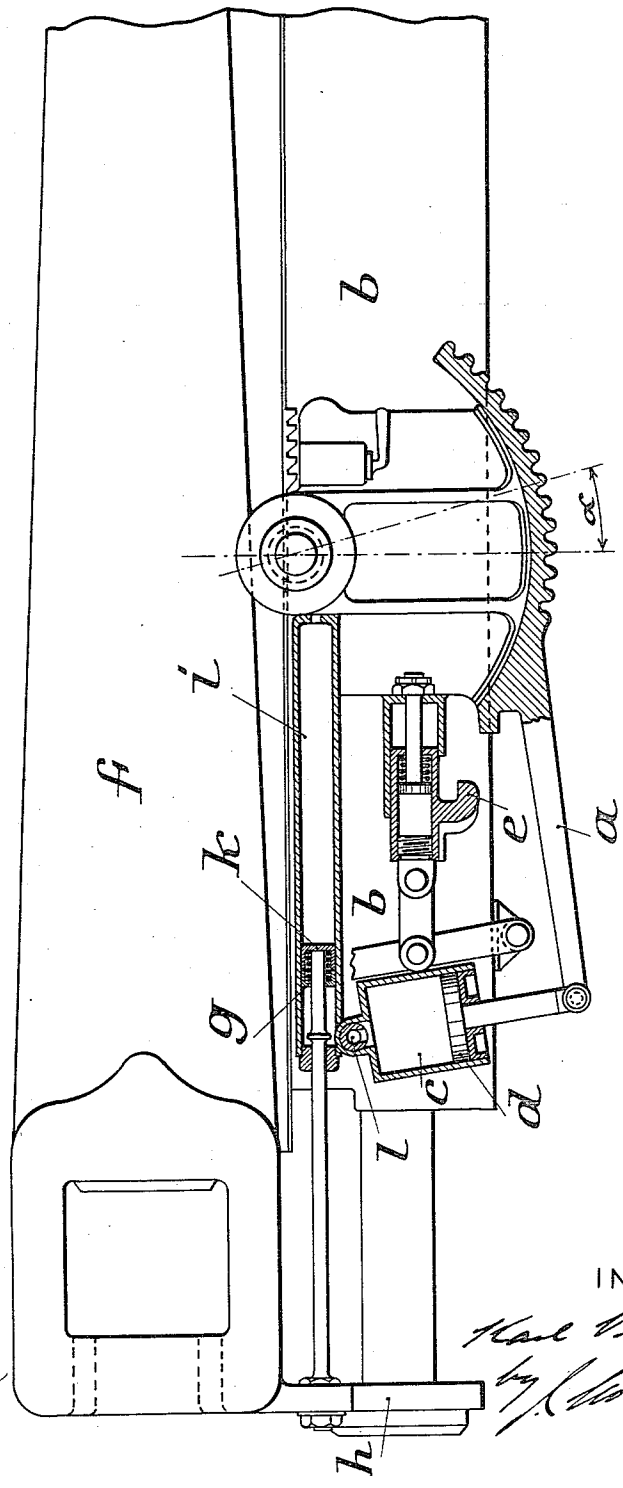
4 SHEETS—SHEET 2.

Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

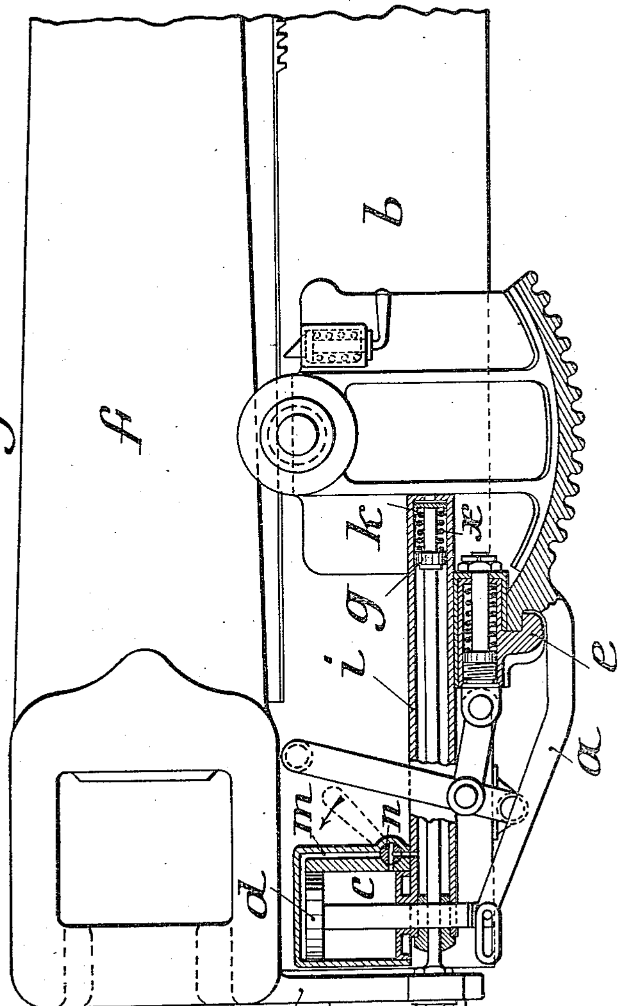
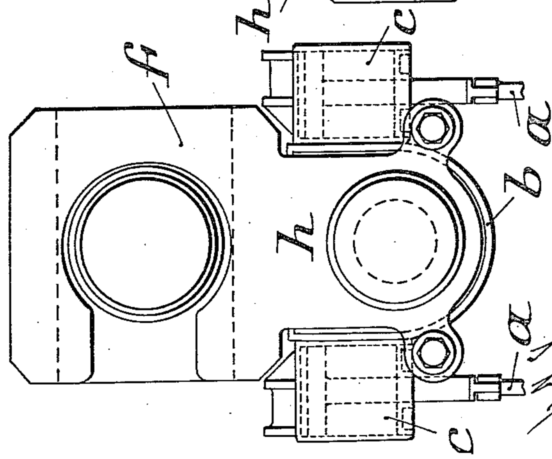


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

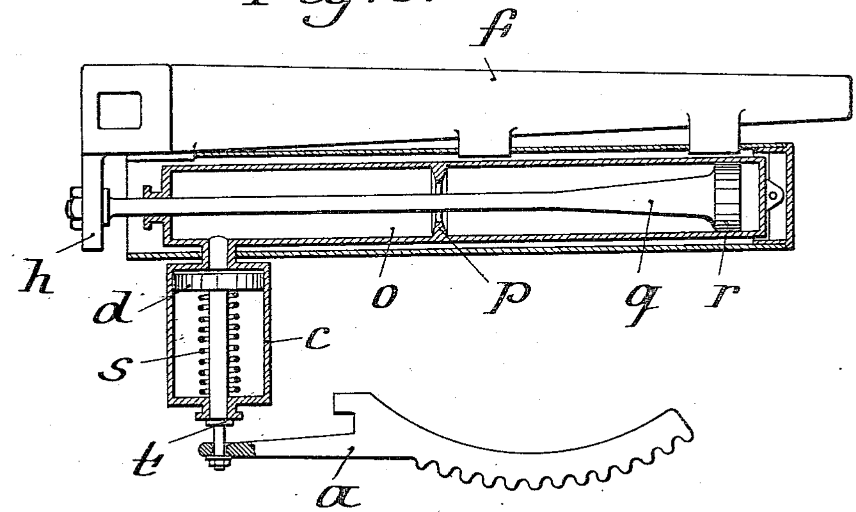
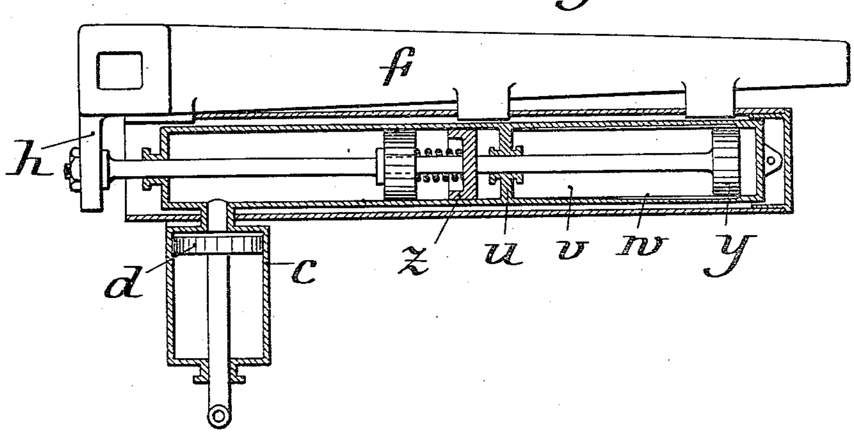


Fig. 7.



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UNITED STATES PATENT OFFICE.

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RECOIL MECHANISM FOR GUNS.

1,034,171. Specification of Letters Patent. Patented July 30, 1912.

Application filed October 18, 1911. Serial No. 655,259.

To all whom it may concern:

Be it known that I, KARL VÖLLER, a subject of the German Emperor, residing at 12 Scharnhorststrasse, Dusseldorf, Germany, have invented certain new and useful Improvements in Recoil Mechanism for Guns; 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.

The present invention relates to guns in which the elevation is changed during the recoil for the purpose of charging and differs from previously known arrangements in that the pin, which by engaging in a curved guide alters the inclination of the barrel during the recoil, is done away with. In this way the barrel is swung more smoothly and the jar on the cradle is lessened. According to the invention, cylinders with movable pistons are arranged between the elevating gear and the cradle slide, and the relative motion of the pistons and cylinders during the recoil causes the rear end of the slide to be raised. In this way the pin attached to the barrel and the curved guiding groove are replaced by very simple means subject to very little wear and tear.

The accompanying drawings show several constructions for carrying out the invention.

Figure 1 is a side view partly in section, Fig. 2 a rear view, Fig. 3 a view similar to Fig. 1 with the parts in position at the end of the recoil, of one construction. Figs. 4 and 5 are respectively a side view partly in section and a rear view of a modified construction. Figs. 6 and 7 are longitudinal sections of other modifications.

In the construction shown in Figs. 1 to 3, between the toothed segment *a* of the elevating gear and the slide *b*, two lifting cylinders *c* with movable pistons *d* are arranged and are linked to the slide and also to the elevating gear. These cylinders are raised during the recoil of the barrel, as soon as the coupling *e* between the slide and the elevating gear is released during the recoil of the barrel *f*. The lifting of the cylinders is effected by means of pistons *g* working in cylinders *i*, whose piston rods are fastened to projections *h* of the barrel, and which during the recoil of the gun force fluid through the hollow pivot pins *l* into the cylinders *c*. Since the toothed segments of the elevating gear are locked, the cylinders *c* and with them the rear end of the cradle slide and the gun barrel are raised by the fluid forced into the cylinders *c* through the angle α. In order that this change of elevation can only take place if the coupling *e* between the elevating gear and the slide is fully released, the pistons *g* in the compression cylinders *i* are displaceable on their piston rods and in the normal position shown in Fig. 1 are so disposed relatively to disks *k* fixed to the end of the piston rod, that the piston rods at first move during the recoil without taking the pistons *g* with them. When the movement has been sufficient to completely release the coupling *e*, the disks *k* take with them the pistons *g* (Fig. 3) and the fluid is then forced into the cylinders *c*. In order that the normal position can be again assumed when the pistons *g* return (Fig. 1), springs *w* are inserted between them and the disks *k*.

The operation of the modified construction shown in Figs. 4 and 5 is the same as that described in connection with Figs. 1—3. An additional device is however provided, by which any change in the elevation of the gun barrel can be prevented during the recoil. For this purpose both sides of the piston *d* are connected together by a channel *m*, in which a three-way stop cock *n* is inserted. A connection leads from the three-way cock to the compression cylinder *i*. If the three-way cock is in the position shown in Fig. 4, the inclination of the barrel and slide will not be altered during the recoil, since the fluid will be forced out of the cylinder *i* into the lower side of the piston *d* and there will be no relative movement of the piston and the cylinder. If the three-way cock *n* is turned through 90° in the clockwise direction, the fluid is forced from the cylinder *i* through the channel *m* to the upper side of the piston *d* and causes a

change in the elevation of the gun barrel during the recoil. The three way cock *n* can also be connected with the elevating gear, so that at a given elevation of the barrel it is automatically placed in the position, in which it allows the fluid access to the upper side of the piston *d*. If it is desired that the barrel shall remain stationary at the end of the recoil, at the elevation it has assumed in the rear position, the stop cock can be so arranged that by means of a member provided at the recoiling parts, preferably in the form of a pin or projection, the fluid can not return into the compression cylinder. In this way the lifting cylinder can act at the same time as a locking member for the parts turning about the trunnions. For safety a special brake is also provided comprising a toothed rack on the cradle slide and a spring locking bolt.

In the construction shown in Fig. 6, the compression cylinder also acts as a brake cylinder. The cylinder *o*, which is connected to the cylinder *c*, is divided by a constriction *p* into two parts and the piston rod *q* is cone shaped at the after end to which the piston *r* is attached. The piston *d* is pushed toward the upper part of cylinder *c* by a spring *s* and is so connected with the segment *a* that under the influence of the fluid forced from the cylinder *o* into the cylinder *c*, it can be moved a certain distance, before it is firmly attached to the segment *a* by the connection *t* and the change of elevation of the barrel is then brought about by the lifting of the cylinder *c*. During this free part of the stroke of the piston the coupling between the slide and the elevating gear is released. On the recoil the braking is effected by the gradual restriction of the opening in the constriction *p* by the cone shaped piston rod *q*. If the spring *s* is made sufficiently strong, no special return spring need be fitted, since this spring can serve to return the gun barrel.

In the construction shown in Fig. 7 the brake cylinder and the compression cylinder are placed together but completely separated by a dividing wall *u*. The part *v* of the cylinder acts as a brake and is provided for this purpose with channels *w*, through which the fluid passes to the other side of the piston *y*. The part *z* of the cylinder is constructed in the same way as the compression cylinder *i* in Figs. 1—3. The action of the compression fluid in the cylinders *c* is also the same as in the first construction.

I claim as my invention:

1. In a recoiling gun the combination with a sliding barrel, and a pivoted cradle therefor, of means for automatically raising the rear end of the barrel during the recoil comprising a cylinder and piston, and means for forcing a fluid into said cylinder to effect a relative movement between the piston and its cylinder.

2. In a recoiling gun, the combination with a sliding barrel, and a pivoted cradle therefor, of means for automatically raising the rear end of the barrel during the recoil comprising a cylinder and piston, and means for forcing a fluid into said cylinder to effect a relative movement between the piston and its cylinder, such last mentioned means being operated by the recoil of the barrel.

3. In a recoiling gun, the combination with a sliding barrel, a pivoted cradle therefor, elevating mechanism for turning the cradle on its pivot, and means for coupling the cradle to said elevating mechanism, of a cylinder secured to said cradle, a piston in said cylinder having a relatively fixed support, a second cylinder communicating with the first cylinder, a piston in said second cylinder connected to said barrel, and means for preventing the last mentioned piston from becoming effective during the recoil of the barrel until the cradle is uncoupled from the elevating mechanism.

4. In a recoiling gun, the combination with a sliding barrel, a pivoted cradle therefor, elevating mechanism for turning the cradle on its pivot, and means for coupling the cradle to said elevating mechanism, of a cylinder secured to said cradle, a piston in said cylinder having a relatively fixed support, a second cylinder communicating with the first cylinder, a piston in said second cylinder, a rod upon which said piston is loosely mounted, said rod being connected to said barrel, a head on said rod, and a spring interposed between said head and piston.

5. In a recoiling gun, the combination with a sliding barrel, a pivoted cradle therefor and elevating mechanism for turning the cradle on its pivot, of a cylinder affixed to the cradle, a piston within said cylinder having its rod connected to a relatively fixed part, a coupling between the cradle and the elevating mechanism, a second cylinder in communication with the first mentioned cylinder, a piston in said second cylinder having its rod connected to the barrel, and means for controlling the communication between said cylinders, to cause or prevent a relative movement between the first mentioned cylinder and its piston during the recoil.

6. In a recoiling gun, the combination with a sliding barrel, a pivoted cradle therefor and elevating mechanism for turning the cradle on its pivot, of a cylinder affixed to the cradle, a piston within said cylinder having its rod connected to a relatively fixed part, a coupling between the cradle and the elevating mechanism, a second cylinder in communication with the first mentioned cyl-

inder, a piston in said second cylinder having its rod connected to the barrel, said first mentioned cylinder having passageways leading to opposite ends from the second cylinder, and a three-way valve controlling such passageways.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

KARL VÖLLER.

Witnesses:
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W. TACK.