K. HAUSSNER.

RETARDING APPARATUS FOR GUNS HAVING DIFFERENTIAL RECOIL.

APPLICATION FILED FEB. 16, 1910.

955,796. **Patented Apr. 19, 1910.**

2 SHEETS—SHEET 1.

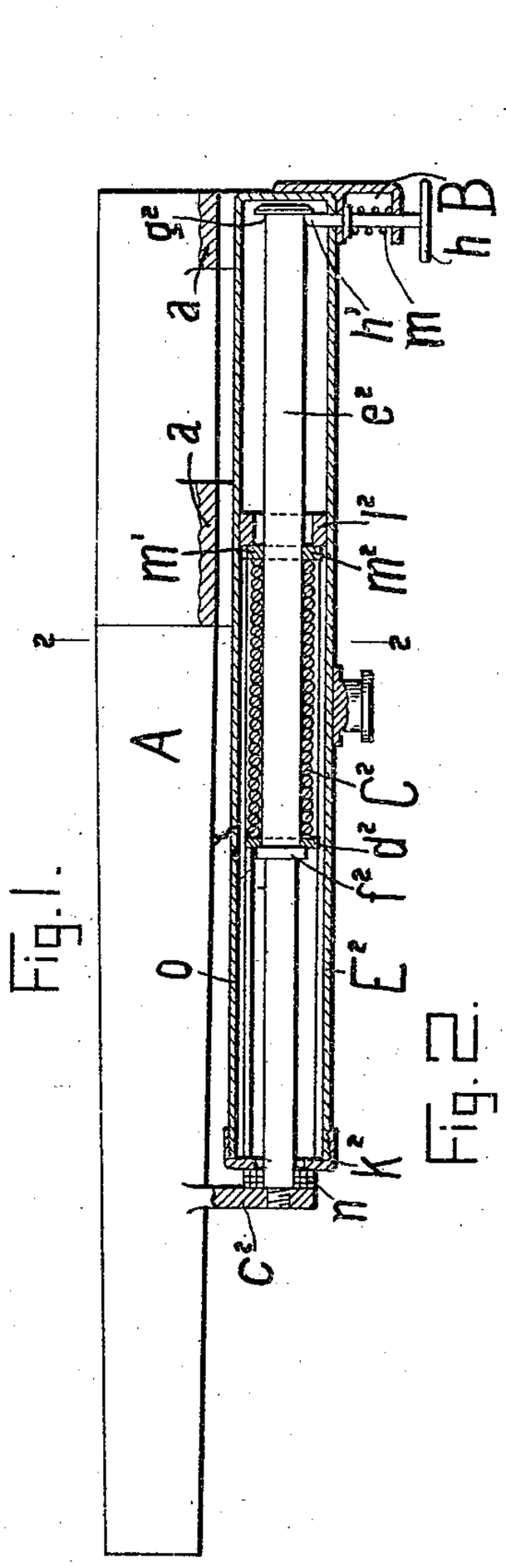

Fig. 1.

Fig. 2.

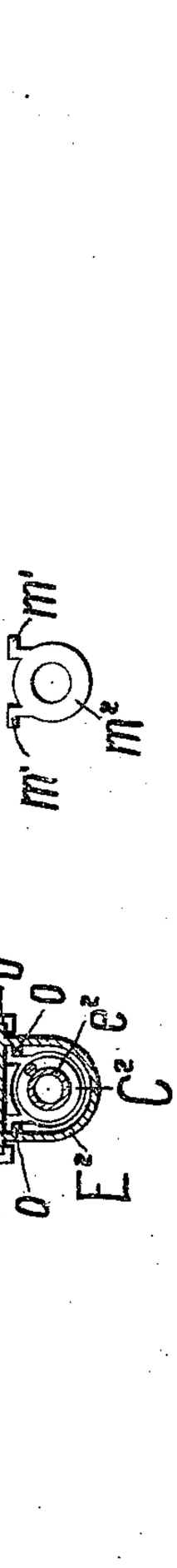

Fig. 3.

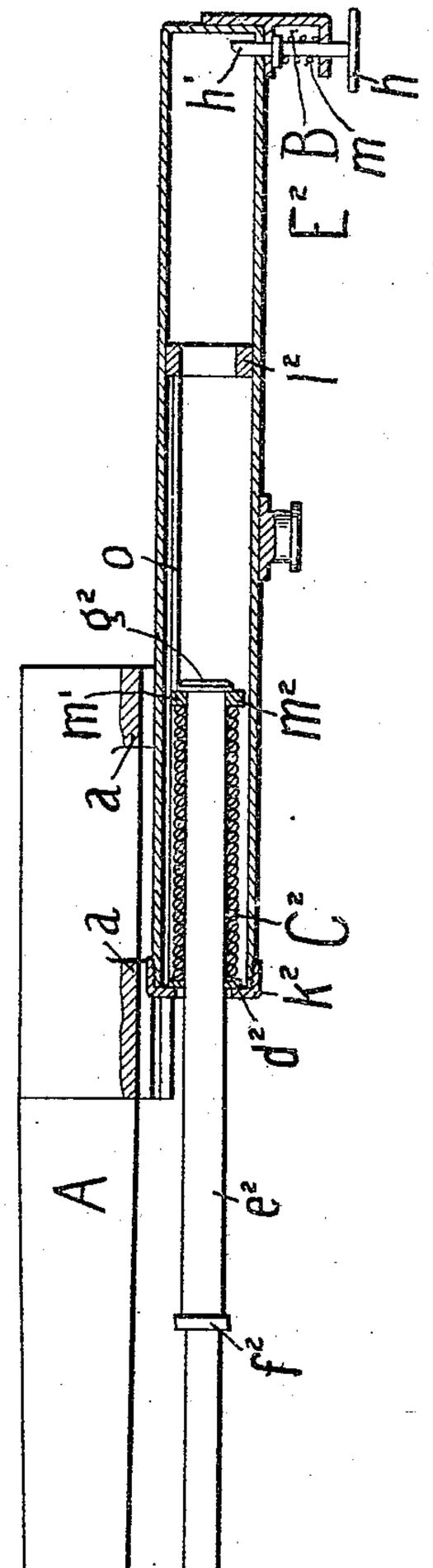

Fig. 4.

Witnesses

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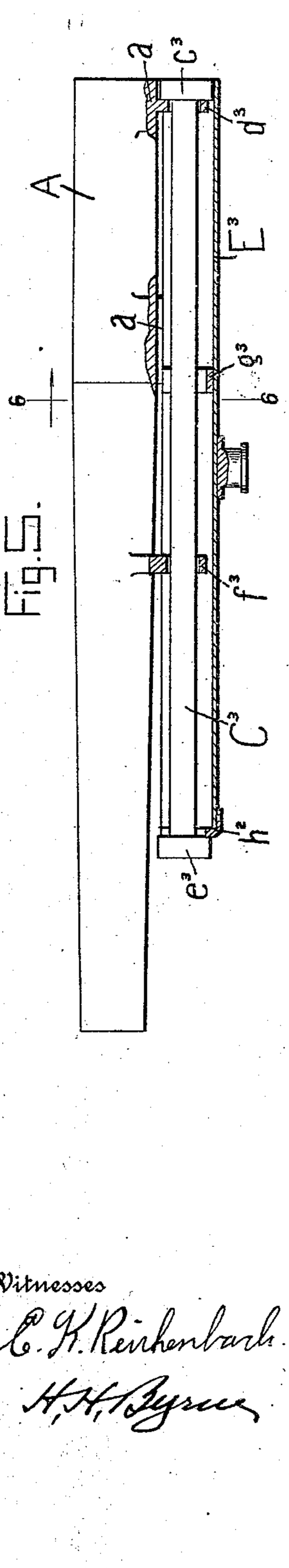

Fig. 5.

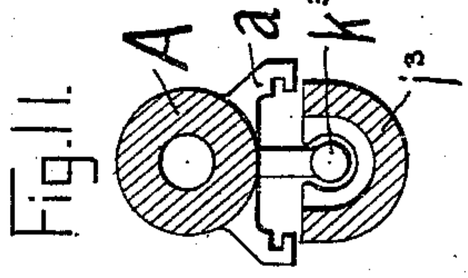

Fig. 11.

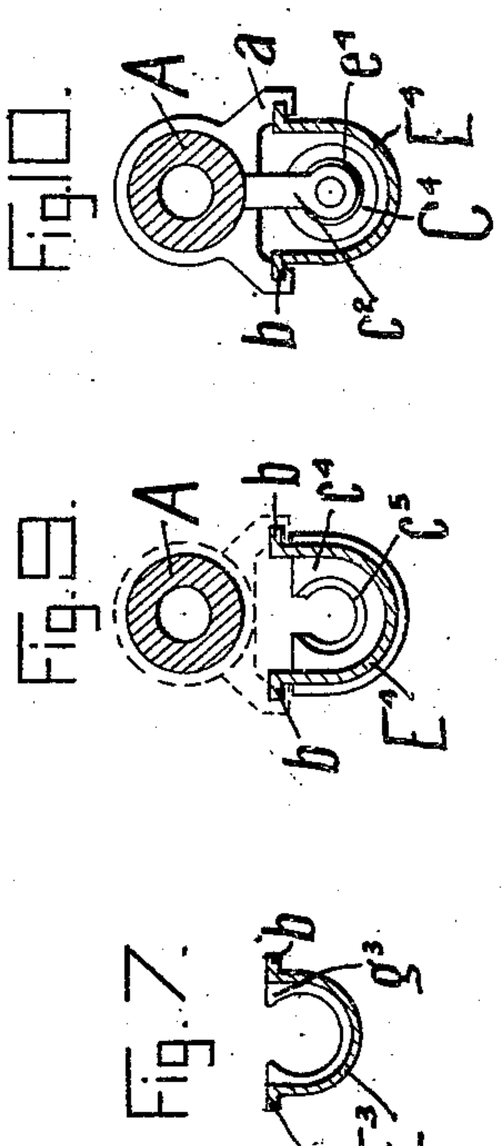

Fig. 10.

Fig. 9.

Fig. 7.

Fig. 6.

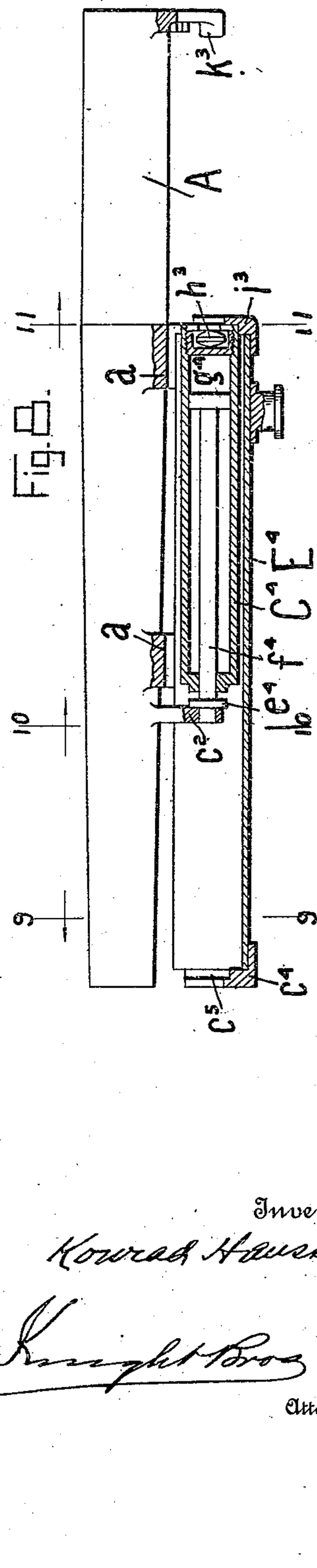

Fig. 8.

Witnesses

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UNITED STATES PATENT OFFICE.

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RETARDING APPARATUS FOR GUNS HAVING DIFFERENTIAL RECOIL.

955,796. Specification of Letters Patent. **Patented Apr. 19, 1910.**

Original application filed June 17, 1909, Serial No. 502,848. Divided and this application filed February 16, 1910. Serial No. 544,145.

To all whom it may concern:

Be it known that I, KONRAD HAUSSNER, a subject of the Emperor of Germany, residing at Eisenach, Germany, have invented certain new and useful Improvements in Retarding Apparatus for Guns Having Differential Recoil, of which the following is a specification.

The present invention has reference to guns of the differential recoil type, and has for its purpose to provide, in addition to the recuperator, a means associated therewith for restraining the gun barrel from moving forwardly out of the guides of its carriage under certain conditions of firing.

The disclosure shown herein forms a divisional application of subject matter for United States patent filed June 17, 1909, and bearing the Serial No. 502,848.

It is characteristic of the present invention that the running out gear serves also as the accumulator for arresting the forward movement of the gun barrel as above stated.

The invention is shown by way of example in the accompanying drawings, wherein:

Figure 1 shows a construction partly in longitudinal section, with a spring as the running out gear and accumulator. Fig. 2 is a transverse section on the line 2—2 of Fig. 1; Fig. 3 shows the rear spring abutment in elevation; Fig. 4 shows the gun at the limit of its running out position; Fig. 5 shows a construction in which the running out gear consists of a rubber bar upon which tension is put; Fig. 6 is a transverse section of Fig. 5 on the plane 6—6; Fig. 7 is the same transverse section but with the barrel and rubber bar omitted; Figs. 8 to 11 show a construction in which compressed air is employed as the running out medium; Fig. 8 is a longitudinal section through the upper carriage E^4, the barrel A being shown in the loaded position; Fig. 9 is a section on the line 9—9 thereof looking from the rear; Fig. 10 is the same section looking from the front, and Fig. 11 is a section on the line 11—11 looking from the front.

Referring to the figures in further detail and wherein like characters of reference indicate corresponding parts in the several views shown, A designates the gun barrel and E^2 the carriage therefor and whereon said barrel has movement, and to allow which the carriage E^2 is provided with track members *b* engaged by grooved arms *a* fixed to the barrel A.

The combined running out gear and accumulator herein disclosed consists of a spring C^2 that is mounted upon a supporting rod e^2, which is in turn fixed to and moves with the gun barrel A through the medium of the barrel projection or horn c^2. The rod e^2 is fitted with a fixed collar f^2, which when the gun is in position ready for firing seats against a disk or washer d^2. The collar f^2 and washer d^2 coöperate with a collar I^2 fixed internally of the carriage E^2 and a second disk m^2, to keep the spring C^2 compressed as shown in Fig. 1.

The means for holding the gun barrel in firing position comprises a trigger *h* normally held in position, by a spring *m*, to engage with a collar g^2 carried on the rear end of the rod e^2. A horn B fixed to the rear end of the gun carriage E^2 supports said trigger and its controlling spring.

The spring abutment m^2 is loosely supported from projections or hangers m^1 m^1 from guiding ribs *o* provided in the carriage, and by reason of which said member m^2 serves simultaneously as a slide bearing for the spring supporting rod e^2. The internal collar or ring I^2 has an internal diameter which is larger than the diameter of the rear collar g^2 of the spring supporting rod.

The front end wall k^2 of the upper carriage has a circular hole, the diameter of which is larger than that of the front spring-supporting rod collar f^2, but is less than the external diameter of the disk d^2. The rubber disk *n* serves to cover up the hole. The length of the course from the commencement of the movement of the barrel up to the return of the barrel when the shot is fired, is so proportioned in this instance, that it is equal or approximately equal, to the distance of the rear collar g^2 of the spring-supporting rod e^2 from the disk m^2, which distance again is made equal, or nearly equal, to that of the spring-supporting rod collar f^2 from the front upper carriage wall k^2. From this arrangement, it will be readily seen that should an explosion not take place or if only a blank cartridge be fired, the barrel then continues to move forward, whence the disk d^2 bears against the front wall k^2 and the front spring pressure is thus transmitted from the barrel to the

carriage. At the same time, or approximately thereto, the collar g^2 on the spring rod bears against the disk m^2 and the spring C^2 is in this way compressed by the forwardly moving barrel, until, as shown by Fig. 4, the barrel has come to a standstill. The barrel is held in this position either automatically by a mechanism, or in default of such, the barrel is hurled back again by the spring whereupon the hereinbefore described operation is repeated in the reverse order and the spring cocks itself afresh for the loading position, and the barrel, which has again come to rest is prevented from flying forward by a special device (not shown).

In the structure shown in Figs. 5 to 7, the rear end collar c^3 of the rubber bar C^3 is supported against the annularly shaped barrel projection d^3. The front end collar e^3 of the rubber bar bears against the front wall h^2 of the upper carriage which has an opening in it. This opening corresponds exactly with the one in the bearing g^3 secured to the upper carriage as shown in Fig. 7.

The front projection f^3 of the barrel has exactly the same shape as the rear one d^3 shown in Fig. 6, and both can consequently pass with clearance through the opening in the front wall h^2 and in the bearing g^3.

The course which the barrel passes over when the shot is fired is nearly equal to the distance of the rear barrel projection d^3 from the abutment g^3 or of the projection f^3 from the front end wall h^2. If, however, the explosion apparatus has failed to act, the barrel will continue to be accelerated by the rubber bar, until the end collar c^3 thereof bears against the bearing g^3 and the pressure of the rubber is thus taken off the barrel. Since the projection f^3 now bears against the end collar e^3 of the rubber bar, the bar stretches afresh, and by this counter-force which ensues the barrel comes gradually to rest. When the barrel is brought back again, the same operation is performed as in the construction hereinbefore described.

In the structure shown in Figs. 8 to 11, the barrel projection c^2 has mounted thereon the air piston rod f^4 and the collar e^4 of the rod is pressed against the barrel projection c^2 by the compressed air behind the piston g^4. The rear part of the air cylinder C^4 is carried in the abutment i^3 attached to the upper carriage, and which has an opening of such kind, that the rear barrel projection k^3 can pass through without hindrance.

The distance covered by the barrel when the shot is fired, is preferably less or at most equal to the distance of the barrel projection c^2 from the front end wall c^4. If, however, the explosion has not taken place, the barrel continues to be accelerated until the collar e^4 on the rod bears against the projection c^5 and the pressure of the compressed air is taken off the barrel and transferred to the carriage. At the same time or somewhat later or sooner, the rear barrel projection k^3 also bears against the bottom of the cylinder, which for the purpose of mitigating the shock when the barrel projection k^3 strikes, is provided with a pair of plate springs h^3. By this means the rear cylinder bottom is now moved toward the now immovable piston, and the air is consequently compressed until the barrel comes to rest. When the barrel is not held in this foremost position by an automatically-acting device, the compressed air thrusts the barrel with acceleration rearward, until the rear cylinder bottom again bears against the abutment i^3 and the projection c^2 again carries the collar e^4 on the piston rod with it. The air pressure now acting upon the projection c^2 brings the barrel to rest with a retarded motion whereupon it automatically secures itself, and is then brought back completely into the loading and pointing position by a further apparatus.

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

1. In a gun having differential recoil, the combination with the gun barrel and its carriage, of a running out gear, and means whereby the running out gear serves also as an accumulator for bringing the barrel to a standstill when the same moves out beyond the firing position.

2. In a gun having differential recoil, the combination with the gun barrel and its carriage, of a running out gear, and means whereby said running-out gear serves after the completion of its running out movement, as an accumulator for bringing the barrel to a standstill when the same moves out beyond the firing position.

3. In a gun having differential recoil, the combination with the gun barrel and its carriage, of a running out gear comprising a spring, a bar fixed to the gun barrel on which said spring is mounted, and means whereby said spring performs with said bar the running out movement of the gun barrel, and wherein said spring and bar serve as an accumulator to bring the barrel to a standstill when the same moves out beyond the firing position.

4. In a gun having differential recoil, the combination with the gun barrel and its carriage, of an accumulator and running-out gear comprising a spring, a bar fixed to the gun barrel on which said spring is mounted, and means on the bar coöperating with said spring whereby the latter serves to impart running out movement to the gun barrel, and on the completion thereof serves to arrest said running out movement.

5. In a gun having differential recoil, the combination with the gun barrel and its

carriage, of a running out gear and accumulator mounted within said carriage, said running out gear and accumulator comprising a spring, a bar mounted on the gun on which said spring is supported, a means for taking up the expansion of the spring when it acts as the running out medium, and a means on the bar adapted to compress the spring whereby said spring serves as an accumulator for bringing the barrel to a standstill when the same moves out beyond firing position.

6. In a gun having differential recoil, the combination with the gun barrel and its carriage, of a running out gear and accumulator comprising a spring, a bar carried by the gun barrel on which said spring is mounted, said carriage having means providing a stop for arresting the running out movement of the spring, and a collar carried by said bar adapted to compress said spring on the completion of the running out movement of the latter whereby said spring acts as an accumulator for bringing the barrel to a standstill when the same moves out beyond the firing position.

The foregoing specification signed at Erfurt, Germany, this 31st day of January, 1910.

KONRAD HAUSSNER.

In presence of—
PETER BLANKENBACH,
GUSTAV LAUTER, Jr.