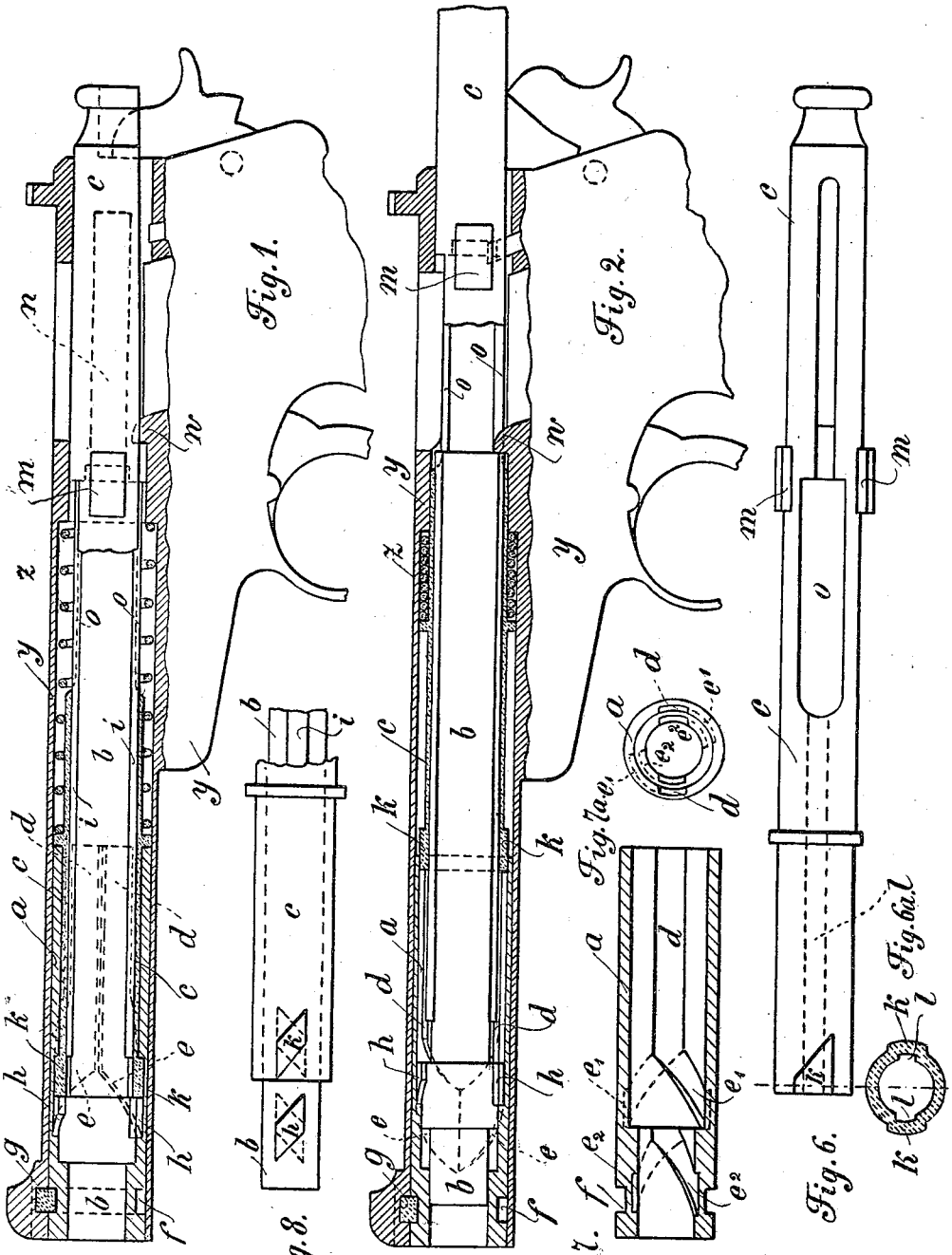
No. 676,995. Patented June 25, 1901.

G. ROTH & C. KRNKA.

AUTOMATIC FIREARM.

(Application filed Aug. 18, 1900.)

(No Model.) 3 Sheets—Sheet 1.



Witnesses:

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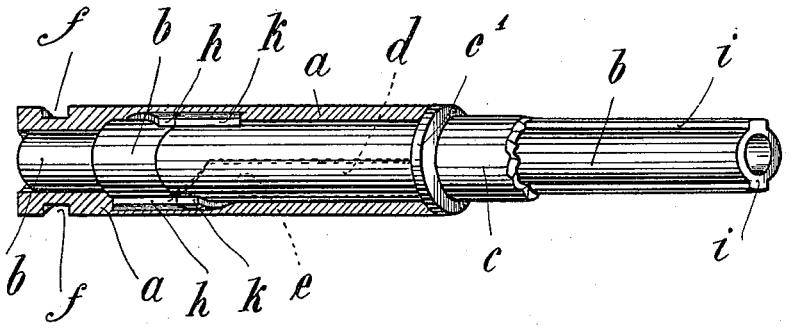
(No Model.) 3 Sheets—Sheet 2.

Fig. 1a.



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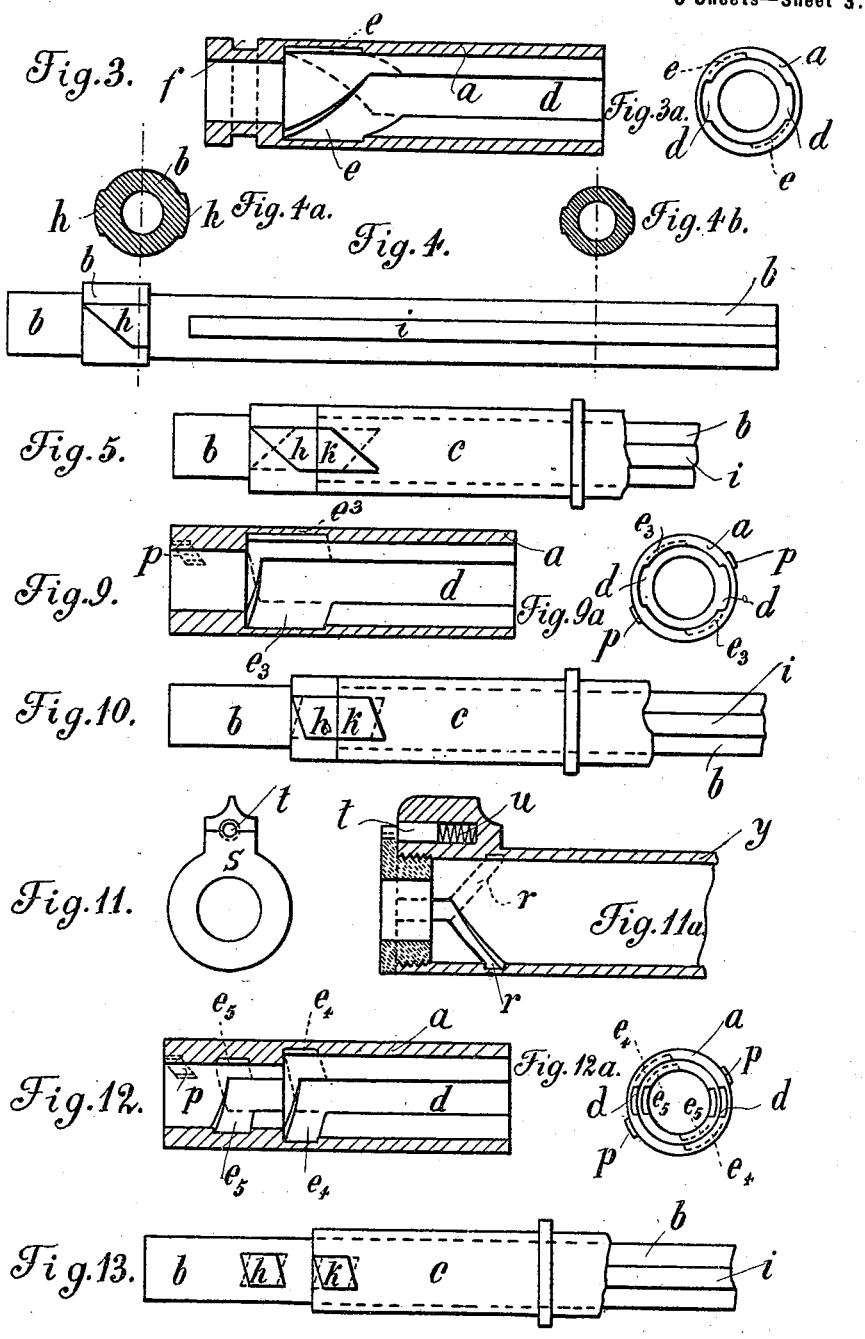

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UNITED STATES PATENT OFFICE.

GEORGES ROTH AND CHARLES KRNKA, OF VIENNA, AUSTRIA-HUNGARY.

AUTOMATIC FIREARM.

SPECIFICATION forming part of Letters Patent No. 676,995, dated June 25, 1901.

Application filed August 18, 1900. Serial No. 27,344. (No model.)

To all whom it may concern:

Be it known that we, GEORGES ROTH, manufacturer, and CHARLES KRNKA, engineer, subjects of the Emperor of Austria-Hungary, and residents of No. 50 Rennweg, Vienna, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Automatic Firearms, of which the following is a full, clear, and exact description.

The present invention relates to mechanism for locking and unlocking the breech-bolt and barrel of automatic firearms, and the object is to effect both these operations, the latter at the recoil and the former on the forward movement of the breech-bolt and barrel, without imparting a partial turn to either the barrel or the breech-bolt. Both these parts are guided longitudinally in the stock of the weapon and entirely prevented from turning. The coupling and uncoupling of the parts are effected by a locking-cylinder inclosing a part of the breech-bolt and the barrel and which effects the locking and unlocking of the parts by a partial rotation on its longitudinal axis.

The invention may be carried out by causing the locking-cylinder to perform either a rotary movement on its axis or a combined rotary and longitudinal movement—*i. e.*, a movement in the line of a spiral.

The invention may be carried out in many ways, but the four embodiments hereinafter described will cover substantially the best and necessary features of the invention.

In order to render the present specification easily intelligible reference is had to the accompanying drawings, in which similar letters of reference denote similar parts throughout the several views.

Figure 1 is a longitudinal section through an automatic pistol, showing the breech closed. Fig. 1ª is a perspective view of a part of the breech-bolt and barrel and shows the locking-cylinder in longitudinal section; Fig. 2, a similar section with the breech open; Fig. 3, a longitudinal section through the locking-cylinder; Fig. 3ª, an end elevation of the same seen from the right-hand end; Fig. 4, a side elevation of the barrel; Figs. 4ª and 4ᵇ, cross-sections through the same as indicated; Fig. 5, a part side elevation of the combined breech-bolt and barrel; Fig. 6, a plan of the breech-bolt, and Fig. 6ª, a cross-section taken at the left-hand end of the bolt as indicated. The above figures illustrate a form of the invention in which the lugs of the breech-bolt and the barrel are both locked in a common groove of the locking-cylinder. Figs. 7 and 8 show a modified form of the invention, according to which separate sets of locking-grooves are provided for the breech-bolt and the barrel, this embodiment having the additional advantage that the initial rearward movements of the two parts at the recoil of the weapon may be differentiated by slightly altering the pitch of the spiral grooves, so that the empty cartridge-case may be loosened at the beginning of the backward movement of the parts, ready to be ejected. Fig. 7 is a longitudinal section through the modified locking-cylinder; and Fig. 7ª an end elevation of the same seen from the right-hand end, Fig. 8 being a part side elevation of the locking-cylinder and barrel combined. Figs. 9 to 11 show a further embodiment in which the locking-cylinder is caused to perform a movement in the path of a spiral, Fig. 9 being a longitudinal section through the locking-cylinder, Fig. 9ª an end elevation of the same, Fig. 10 a part elevation of the cylinder and barrel, and Fig. 11 a front elevation of the barrel-housing; and Fig. 11ª a part longitudinal section through the front end of the housing or stock. Figs. 12 and 13 show a further modification in which the locking-cylinder performs a spiral-like movement, and separate grooves are provided for the lugs of the barrel and the breech-bolt, thus allowing the initial differential movement of these two parts, as previously mentioned in connection with the second embodiment of the invention.

Referring first to Figs. 1 to 6ª, the breech-bolt *c* is mounted to slide longitudinally in the housing or stock *y*, being prevented from rotation therein on its axis by means of the guide-lugs *m m*, adapted to move in guide-grooves *n n* of the housing *y*. This bolt is provided with the breech-opening *o* and with interior longitudinal guide-grooves *l l* for the guide-lugs of the barrel *b*. At the forward end of the breech-bolt, which is provided with a forward cylindrical extension, as illustrated, at the top and bottom of the same, the lugs *k k* are provided, having straight for-

ward end and inclined rearward end. The barrel is illustrated in Figs. 4 to 4[b] and has the longitudinal ribs *i i*, which slide in the grooves *l l* of the breech-bolt and are guided therein. The barrel is further provided with an enlargement at its forward end on which are arranged the lugs *h h*, having a forward inclined surface and a rearward straight surface adapted to close onto the corresponding surface of the lugs *k k* of the breech-bolt and form together therewith a lug *h k*, as illustrated in Fig. 5. The coupling-cylinder is illustrated in Figs. 3 and 3[a] and is advantageously mounted in the forward end of the housing *y*. This locking-cylinder is provided with an exterior annular groove at its forward end, as at *f*, into which a key *g* of the housing takes and prevents the longitudinal movement of the said locking-cylinder, while allowing a rotary movement of the same. Within the said cylinder two spirally-running grooves *e e* are formed, extending from the top and bottom of the cylinder in opposite directions and being prolonged at each side of the said cylinder to longitudinal grooves *d d*, the said spiral part of the grooves being adapted to receive the combined lugs *h k* of the barrel and breech-bolt. The rearward movement of the barrel is limited by the projection *w*, extending into the housing and into the path of movement of the barrel, while the breech-bolt is limited in its rearward movement by the lugs *m* contacting with the ends of the guide-grooves *n*. The spring *z* effects the forward movement of the breech-bolt, which then moves the barrel forward by reason of its contact with the enlargement at the forward end of the latter.

The device operates in the following manner: Before the weapon is discharged the parts are in the position shown at Fig. 1, the combined lugs *h k* are in the forward end of the spirally-formed grooves *e*, and the spring *z* is extended. As soon as the shot is fired the barrel and breech-bolt will recoil, and the inclined edges of the composite lug *h k* working in the cam-grooves *e e* will cause the locking-cylinder to turn, thus bringing the lugs into line with the straight grooves *d d*. Here, however, the barrel and breech-bolt will part company, the former being arrested by the lug *w* and the latter passing, with its lugs *k*, along the straight portion of the grooves *d*, the parts occupying the position shown at Fig. 2 at the end of their rearward strokes. The spring *z* now forces the breech-bolt forward again, and toward the end of its forward stroke the lugs *k* meet and combine with the lugs *h* of the barrel, which, on passing into the spirally-wound portion *e* of the locking-cylinder grooves, turn the latter axially, and thus again lock all the parts in their firing position.

Referring to the embodiment illustrated in Figs. 7 and 8, the operation of the parts is substantially the same as previously described, with the exception that separate lugs and lug-guiding grooves are provided. As will be seen from Fig. 8, the grooves *h h* of the barrel and *k k* of the breech-bolt have both ends inclined, while the interior of the locking-cylinder is provided with two sets of spirally-wound grooves *e' e²*, the latter for the reception of the lugs *h* of the barrel and the former for those *k* of the breech-bolt. If now the pitch of the pair of grooves *e'* is made slightly greater than that of the pair *e²*, the breech-bolt will receive an initial movement slightly in excess of that of the barrel, and thus the cartridge-case will be loosened preparatory to its being ejected.

In the modification shown at Figs. 9 to 11[a] a spirally-wound or combined movement is imparted to the locking-cylinder. Here again a common groove is provided in the interior of the locking-cylinder adapted to receive both lugs *h* and *k*, said groove being indicated by *e³*. The pitch of the groove pair *e³* is very small, so that an auxiliary lug *p* and groove *r* is provided to turn the locking-cylinder, and thus release the lugs of the breech-bolt and barrel. The pair of grooves *r* are formed in the interior surface of the housing *y*, and a nut *s* is provided, screwed into the end of the said housing to prevent the locking-cylinder from being pushed out of the housing. The nut *s* may be locked by means of a spring-pin *t*, actuated by the spring *u* to enter a recess in the periphery of the nut when the latter has been screwed home. In this device the locking is more positive, since the grooves *e³* are almost at right angles to the longitudinal parts *d*, while the locking-cylinder is positively turned by means of the pair of lugs *p* and the grooves *r*.

The device covered by Figs. 12 and 13 is substantially similar to the one just described, with the exception that separate lugs *h* and *k* and separate groove pairs *e⁴ e⁵* are provided, so that the advantages of the embodiment described with reference to Figs. 7 and 8 are attained with the positive locking of the parts. The operation of this device will be obvious from the drawings and the foregoing specification and needs no further description.

The devices might be modified in a number of ways without departing from the spirit of the present invention. For instance, it is not absolutely necessary that the locking-cylinder be arranged at the forward end of the barrel, although this arrangement appears advantageous. The other parts of the firearm are not described, they being generally known and forming no part of the present invention.

We claim as our invention—

1. In an automatic firearm the combination of longitudinally-movable, axially non-rotatable barrel and breech-bolt, a locking-cylinder surrounding the parts and means in connection therewith for locking the two parts together at their forward movement and unlocking the same at the recoil in the manner and for the purpose substantially as described.

2. In an automatic firearm, the combination of a longitudinally-movable, axially non-rotatable barrel and breech-bolt, a locking-cylinder surrounding them and means in connection therewith for rotating said cylinder and for locking and unlocking the breech-bolt and barrel at their forward and backward movements respectively when the said locking-cylinder is turned in the manner and for the purpose substantially as described.

3. In an automatic firearm the combination of longitudinally-movable, axially non-rotatable barrel and breech-bolt, a locking-cylinder surrounding the same, means in connection with the parts for locking the barrel and breech-bolt together and disengaging them at the forward and backward movement of the said breech-bolt and barrel and means for differentiating the movements of the said barrel and breech-bolt at the commencement of their rearward movement substantially as described.

4. In an automatic firearm the combination of a breech-bolt longitudinally guided in the housing and prevented from axial rotation, a barrel longitudinally and non-rotatably guided within the said breech-bolt, a locking-cylinder surrounding the end of the barrel and breech-bolt, lugs having inclined surfaces on the barrel and breech-bolt, cam-grooves on the interior walls of said locking-cylinder to receive the said lugs and straight prolongations to said cam-grooves to receive the lugs of the breech-bolt and means for arresting the barrel at the commencement of the said straight parts of the grooves in the manner and for the purpose substantially as described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

GEORGES ROTH.
CHARLES KRNKA.

Witnesses:
ALVESTO S. HOGUE,
AUGUST FUGGER.