March 21, 1939. C. WANINGER 2,151,288

GUN LOADING DEVICE

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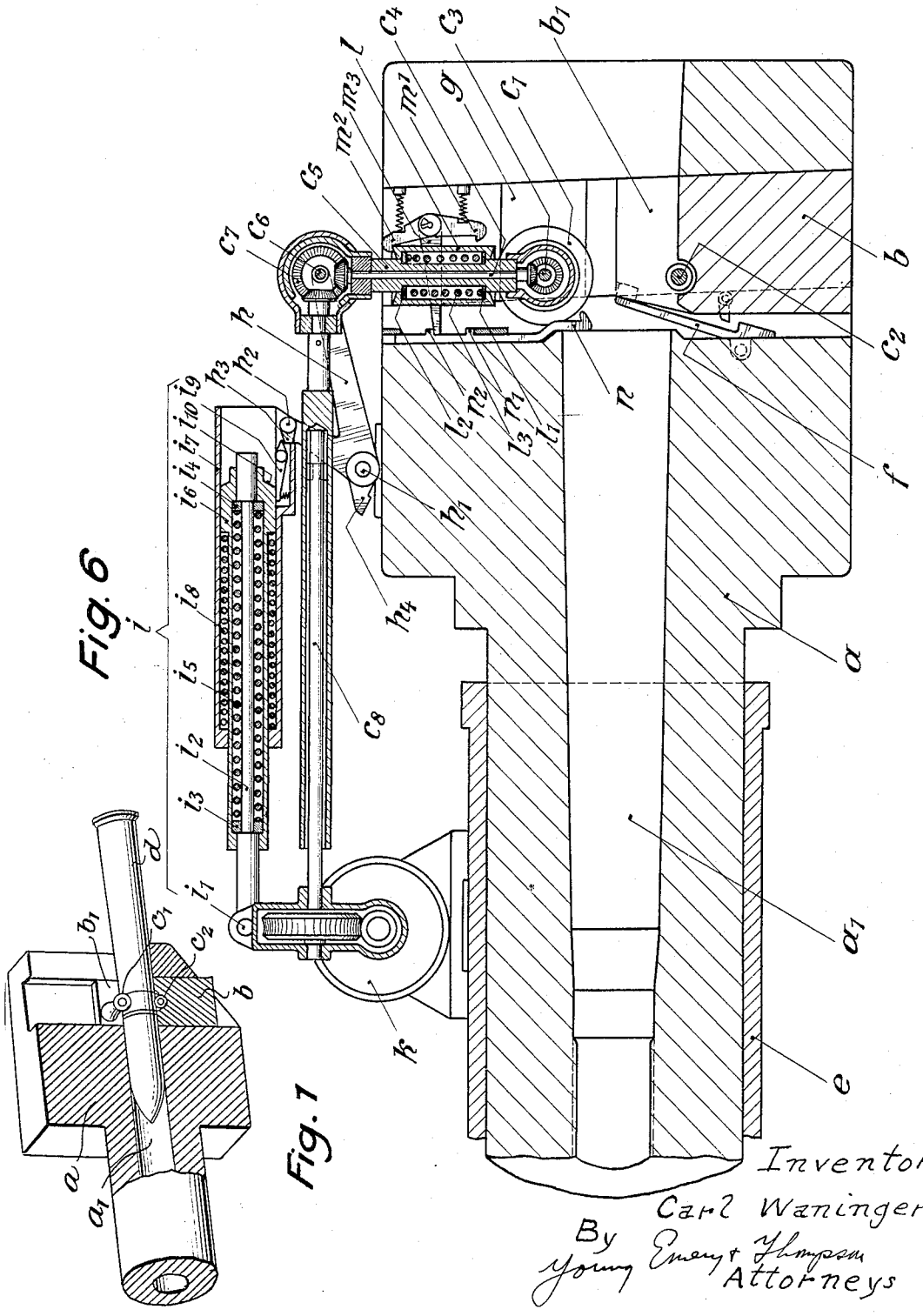

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Fig. 2.

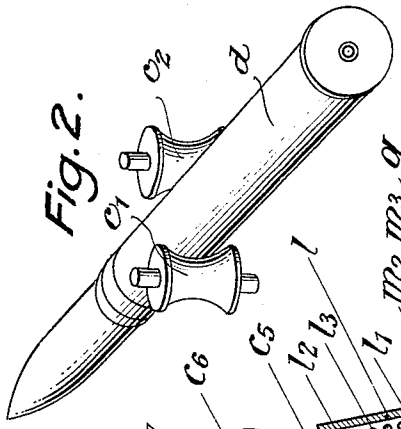

Fig. 8

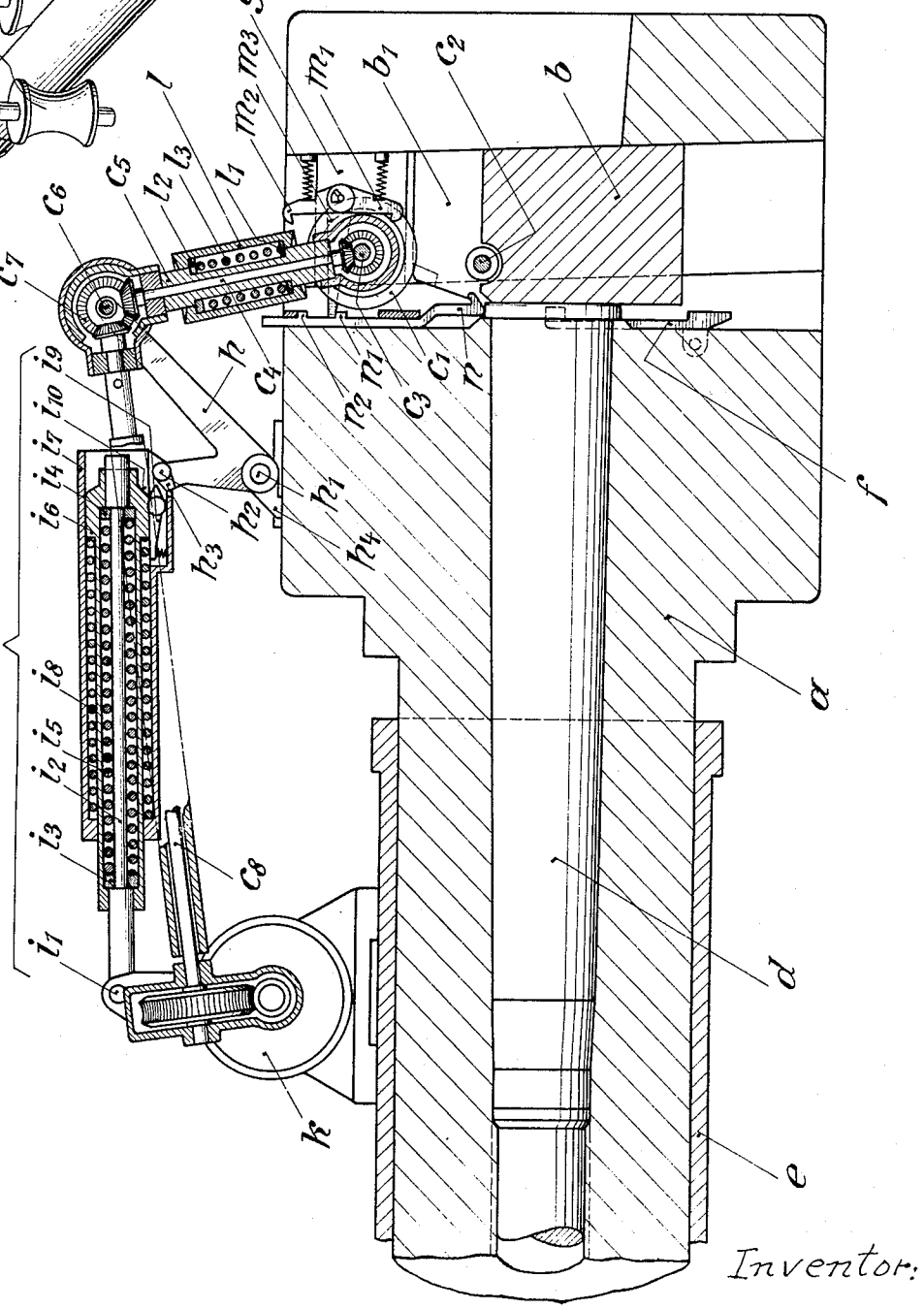

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Fig. 3

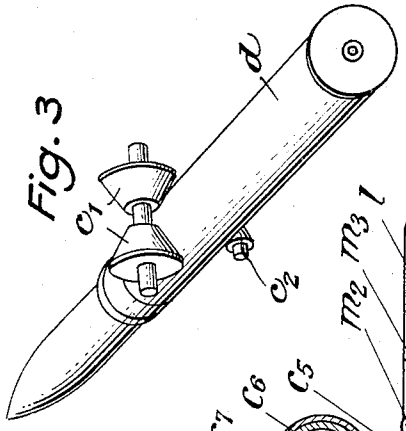

Fig. 7

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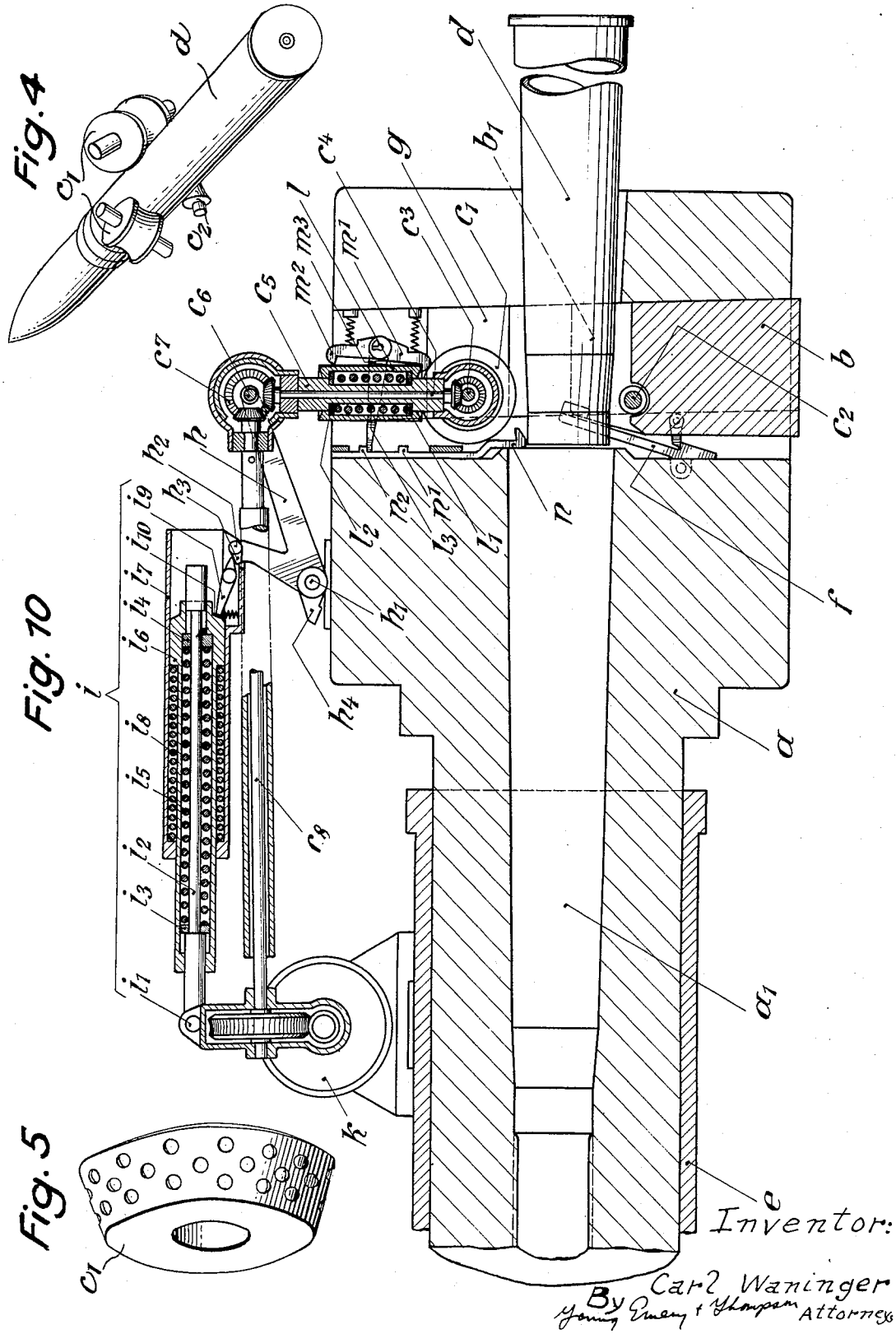

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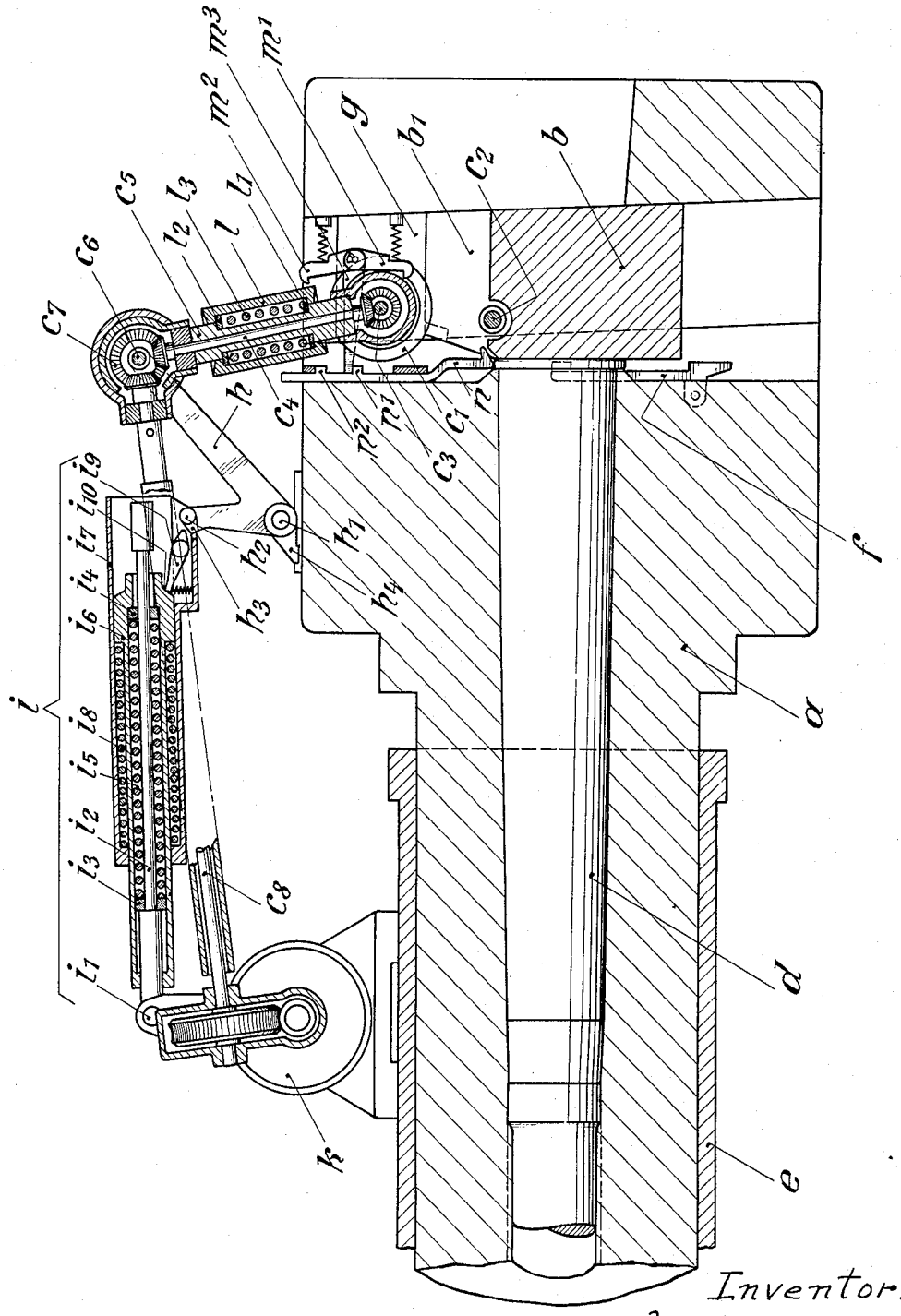
Fig. 9



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UNITED STATES PATENT OFFICE

2,151,288

GUN LOADING DEVICE

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In Germany September 12, 1930

8 Claims. (Cl. 89—33)

The ammunition of guns of the smaller calibres has hitherto always been introduced and advanced into the barrel chamber by hand; in the case of heavy ordnance mechanical loading devices including rammers are used, and these devices which are arranged behind the gun permit the latter to be loaded only when the barrel is in a particular loading position. These devices generally operate in the same manner as do the cartridge loading devices usually employed in automatic small arms, machine guns, and also automatic guns, and a rammer, adapted to be displaced in the direction of the bore of the barrel, engages behind the ammunition placed on a fixed guide and, moving forward, thrusts it into the barrel chamber. There have also already been provided movable charging carriers and among them have been belt feeding devices having an endless band which carry the ammunition resting thereon briskly to the loading aperture of the barrel, and in consequence of the kinetic energy thus imparted to it the ammunition is caused to slide forward into the chamber in the desired position.

The loading device according to the invention, however, is carried on the gun barrel and is accommodated in the loading aperture itself.

The device comprises one or more rollers which are arranged in an extension of the barrel bore and, on being rotated, to seize any ammunition introduced to the breech and thrust it past them forward into the chamber.

The new ammunition loader is suitable for guns of widely different kinds and calibres and may be applied to all guns, without the projecting parts of the loader getting in the way during laying, firing or otherwise handling, in which the ammunition was formerly thrust into the chamber only by hand. The new loader is capable of operating at any degree of elevation of the barrel and is, therefore, particularly advantageous, from the point of view of ease and speed, for anti-aircraft guns. Moreover, it permits the height of the pivoting or trunnion axis to be reduced as, by its use, even in the case of high angle fire, the free space behind the base of the barrel need no longer be as long as the full length of a new charge, as the latter can be inserted laterally into the breech loading opening.

The loading device may be provided with one or with a number of rollers, all or only some of which are rotated by hand or by means of a mechanical drive to serve as driving rollers. The rollers are preferably arranged in pairs between which the ammunition is supported and when being thrust forward so that a sliding friction between the ammunition and the barrel is avoided as much as possible. In order to make allowance for the varying diameter of the ammunition (projectile, cartridge case) over its length, at least one part of the roller system is arranged to be displaceable transversely to the axis of the bore, and to bear resiliently against the sides of the ammunition when it is introduced into the breech. The rollers may be in themselves elastic, for example be made of rubber, and, in order to increase the driving force exerted on the ammunition to be loaded, may be provided on their periphery with suckers or other means for increasing adhesion and friction.

In order that the ejection of spent cartridge cases may not be impeded, the rollers are arranged so that they can be moved out of their operative position into a "ready" position in which their outer surfaces are out of the path of the ejected case. The outward movement of the rollers takes place after the ammunition has been inserted into the barrel chamber, its subsequent return to the operative position occurring as soon as the spent cartridge case has been ejected, preferably automatically, by means of a mechanical force controlled by a feeling device.

In the accompanying drawings which illustrate the invention, Fig. 1 is a perspective view partly in section of the end of the gun barrel and a cartridge,

Figs. 2 to 4 are perspective views of the cartridge and rollers,

Fig. 5 is a perspective view of a roller, and

Figs. 6 to 10 are longitudinal sectional views illustrating the operation of the loading device.

Fig. 1 illustrates the underlying principle of the loading device, it being shown on a gun barrel *a* having a laterally movable wedge acting breech block *b*. In the loading trough *b'* of the breech block there are mounted two rollers c_1 and c_2 which are adapted to rotate about axes disposed at right angles to the bore of the barrel and which are set in rotation by a suitable driving device (not shown), the mounting being such that, when the breech is open, the rollers grip a cartridge inserted in the charging trough which now forms an extension of the bore, from two opposite sides, and, by friction, thrust the cartridge forward into the chamber a_1 of the barrel.

The rollers c_1 and c_2 shown in Fig. 2 are mounted so as to rotate about vertical axes. Their profile is preferably complementary to that of the cartridge at its mean diameter. Of the hori-

zontal pair of rollers shown in Fig. 3 whose arrangement corresponds to that shown in Fig. 1, the lower roller c_2 is considered as mounted on the breech block, while the second, upper roller, is a displaceable pressure and driving roller.

It is subdivided into two side rollers, mounted on a common shaft, between which a driving member may be arranged by its middle portion being cut away.

According to Fig. 4, two upper rollers c_1, disposed obliquely with respect to each other, press the cartridges between them and against a fixed lower roller. As shown in Fig. 5, the peripheral surface of the rollers may be provided with suckers or other recesses or projections which increase the adhesion of the rollers to the ammunition which is moved by them.

Figs. 6–10 show a typical form of construction of the new loading device in various positions during the loading operation and while firing, on a gun of the recoil operated type having a laterally movable wedge action breech block. The loading device operates automatically, its rollers being set in rotation by mechanical means, and are moreover moved out of the operative position and also returned into the operative position at the appropriate moment by means of a mechanical drive controlled by a feeling device.

Fig. 6 shows the gun barrel a, longitudinally slidable in a cradle e, ready for loading, its breech block b being held in the open position by an ejector f in known manner against the influence of an automatic closing device not shown in the drawings. The arrangement and construction of the rollers of the charging device correspond fundamentally to that illustrated diagrammatically in Fig. 3. The two-part driving roller c_1 is adapted to rotate about the axle c_3 mounted in a frame g adapted to be displaced in the wedge-shaped aperture of the base member of the barrel; the non-driven counter roller c_2 is located opposite it in the bottom of the charging trough b_1 of the breech block b. The roller c_1 and the frame g are pivotally suspended on one arm of a bell crank lever h at the point c_6 by means of a hollow bar c_5 containing the roller driving shaft together with a bevel-pinion transmission device, said bell crank lever being mounted on a pivot h_1 mounted on the top on the base member of the barrel. The bell crank lever, by the articulated connection of its second arm at the point h_2, is, with a resilient energy-accumulator i articulated to the cradle e at i_1 and which is hereinafter described in detail, swung in one or the other direction of rotation. What is, in effect, a continuation of the roller-driving shaft c_4, is provided by a bevel pinion mechanism c_7 and a telescopically extensible shaft c_8, the latter being driven, by way of a worm gearing, by a motor k fixed to the cradle e.

The energy-accumulator i inserted between the bell crank lever h and the cradle e comprises a rod i_2 articulated to the cradle at i_1 and on this rod, between two annular abutments i_3, i_4, and adapted to be displaced on it, is a pre-stressed spring i_5 which is enclosed by a casing i_6 which engages over the abutments i_3, i_4. On the casing i_6—with the interposition of a further pre-stressed spring i_8—there is displaceably arranged a second casing i_7 which is pivotally connected with the bell crank lever h at h_2. A spring loaded latch i_9, controlled by a projection h_3 of the bell crank lever h is adapted to lock the casings i_6, i_7 thus preventing them from being thrust back one in the other, by engaging behind the shoulder i_{10} of the casing i_6, the springs i_5, i_8 then being tensioned and thereby—the spring i_5 being inoperative—to cause the spring i_8 to act directly on the lever h.

The outer spring i_8 of the energy-accumulator i acts as a disengaging device when the bell-crank lever h is turned anti-clockwise when it causes the driving roller c_1 to be raised from the position shown in Fig. 6, while the inner spring i_5 serves as an engaging device, as it tends to lower the raised roller c_1 when the lever h is turned clockwise. The strength of the two springs i_5, i_8 is so related and they are brought into such mutual relation that when the energy-accumulator i is extended first of all the weaker, outer spring i_8 is fully stressed and the casing i_6 thrust into the casing i_7, before the inner spring i_5 is stressed beyond the initial stress already imparted to it.

In order that the springs i_8 and i_5 of the energy-accumulator i operate correctly and, therefore, the disengagement and engagement of the driving roller e_1 may be initiated automatically at the right moment, a locking device is provided in the wedge shaped aperture of the base member of the barrel. This is controlled automatically by a feeling device which touches the ammunition introduced into the chamber a_1 of the barrel. Moreover, on the bar c_5 connecting the driving roller c_1 with the bell crank lever there is mounted a cylinder l which is adapted to be displaced against the action of a pre-stressed spring l_3 located between two relatively displaceable annular abutments l_1, l_2. One (m_1) of two spring-urged catches m_1, m_2, pivotally mounted in the base member of the barrel is adapted to engage behind the lower, and the other catch behind the upper face of the cylinder l and thus, in turn and at the appropriate moment, counteract the influence of the energy-accumulator i and prevent the roller c_1 from disengaging or engaging. In order to ensure satisfactory operation of the locking device, the spring l_3 is pre-stressed so strongly that its natural tendency even exceeds the action by the springs i_8 and i_5 of the energy-accumulator i to raise and lower the roller c_1. The catches m_1 and m_2 are swung by means of a lever m_3 which is actuated by two projections n_1 and n_2 of a displaceable feeling bar n, which under the influence of a spring projects its lower end into the mouth of the chamber a_1.

In the following description of the mode of operation it will be supposed that the parts are initially in the position illustrated in Fig. 6. The gun barrel is now ready for loading, with the breech open. The driving roller c_1 set in rotation by the motor k, is in its operative position, into which it has moved from above, and lies within the prolongation of the chamber a_1. The spring i_8 of the energy-accumulator i tends to raise the roller c_1, but is, however, prevented from doing so by the catch m_2 which engages behind the cylinder l.

A cartridge d now inserted with the point of the projectile in the loading aperture of the gun barrel and between the two rollers c_1 and c_2 is, as shown in Fig. 6, drawn by the force of the driving roller c_1 which bears against its casing between the rollers and into the chamber a_1. In accordance with the diameter of the cartridge which increases in size from the point to the base, the roller c_1 is raised somewhat, the spring l_3 being tensioned. When the cartridge d has run through the rollers c_1, c_2 and has assumed its final position in the barrel the rim of the cartridge case lifts the feeler-bar n to such an ex-

tent that its projection n_1, by way of the lever m_3, lifts the catch m_2 out of engagement with the cylinder l. The outer spring i_8 of the energy-accumulator i now becomes effective and extends, swinging the lever h, to draw the roller c_1 together with the guide frame g, locking the cylinder l and the shaft c_4 upwards, as shown in Fig. 8, until an abutment h_4 on the lever h stops further movement.

Thus the roller c_1 and its supporting and guiding members are thrust upwards in the wedge-shaped aperture to such an extent that the breech block is released by the rim of the cartridge d from the ejector f which has meantime been holding it, and can assume its firing position.

The gun is now ready for firing.

On the recoil of the barrel which takes place after a shot is fired, first of all the outer spring i_8 of the energy-accumulator i is loaded. Its spring-loaded catch i_9 springs into position behind the shoulder i_{10} of the casing i_6 and, acting as a fixed abutment as shown in Fig. 9 when the barrel recoils, loads the inner spring i_5. Now the energy-accumulator i has reversed its action on the roller c_1; it tends to lower it again, but this is first of all prevented by the guide-frame g bearing against the breech block b which is still closed.

When the breech is opened and thrust downwards, under the pressure of the spring l_5, the roller c_1 follows this movement until the catch m_1 engages under the lower face of the cylinder l and holds it fast. Then, as seen in Fig. 10, the roller c_1 still remains above the path of the cartridge case d just withdrawn by the ejector f and thrown backwards. As at the same time the breech block b and with it also the counterroller c_2 mounted therein is temporarily lowered in known manner somewhat beyond the normal open position, the cartridge case is ejected without in any way coming into contact with parts of the loading device or being hindered by it. When the mouth of the ejected cartridge case has passed under the feeler bar n, under the influence of its spring the latter flies downwards and thereby, by carrying along the lever m_3 by means of its upper projection n_2, disengages the lower catch m_1 from the cylinder l. The released driving roller e_1 is now moved by the spring i_5 of the energy accumulator i completely into its operative position and at the same time, by means of the projection h_3 of the bell crank lever h, the catch i_9 is pressed from behind the shoulder i_{10} of the casing i_6.

The energy-accumulator i reverses its action automatically.

Its outer spring i_8 tends to raise the roller c_1 again, but this, however, is prevented by the catch m_2 which has now come into position behind the upper face of the cylinder L. The parts now assume the position shown in Fig. 6 and the gun is again ready for loading.

If it is desired to use separate projectiles and cartridges for charging with a charging device of this type, there is placed behind the projectile a ramrod of suitable shape, which is also driven forward by the rollers into the chamber and after the projectile has been placed in position is withdrawn automatically by the rollers, whose direction of rotation has been temporarily reversed by a switch controlled by the feeler bar n.

I claim:

1. Mechanism for entering cartridges in the breech chamber of a gun comprising a plurality of rollers arranged in the breech around the axis of the gun barrel with their axes of rotation transverse to the said gun axes, means for rotating the rollers, means for moving the rollers translationally away from and towards the cartridge, and spring means for pressing at least one of the rollers against the cartridge to be entered.

2. Mechanism for entering cartridges in the breech chamber of a gun comprising a plurality or rollers arranged in the breech with their axes of rotation transverse to the axis of the gun barrel, a motor mounted on a non-recoiling part of the gun, driving connections between the motor and the rollers including an extensible shaft, means for rotating the rollers, means for moving the rollers translationally away from and towards the cartridge, and spring means for pressing at least one of the rollers against the cartridge to be entered.

3. Mechanism for entering the cartridges in the breech chamber of a gun comprising a plurality of rollers arranged in the breech with their axes of rotation transverse to the axis of the gun barrel, driving means for at least one of the rollers, a lever mounted on the gun one arm of which lever carries at least one of the rollers, an energy accumulator device connected to another arm of said lever, means connecting said accumulator device to a non-recoiling part of the gun, and spring means for pressing at least one of the rollers against the cartridge to be entered.

4. Mechanism for entering cartridges in the breech chamber of a gun of the kind having a breech block slidable in said chamber transversely to the gun barrel, comprising a plurality of rollers mounted in the breech of the gun with their axes of rotation transverse to the axis of the gun barrel, driving means for at least one of the rollers, means on said breech block for moving at least one of the rollers towards and away from the barrel axis along with the movements of said breech block, and spring means for pressing at least one of the rollers against the cartridge to be entered.

5. Mechanism for entering cartridges in the breech chamber of a gun of the type having a breech block slidable in said chamber transversely to the gun barrel, comprising a plurality of rollers arranged in an opening in the breech with their axes of rotation transverse to the axis of the gun barrel, drive means for at least one of the rollers, an energy accumulator device co-operating with said slidable breech block and at least one of the rollers, a housing for the roller drive means disposed in said opening, pawls co-operating with said housing respectively to hold the rollers in working position against the cartridge and in a ready position retracted therefrom, a feeler lever controlling the pawls and operated by the cartridge being entered, and spring means for pressing at least one of the rollers against the cartridge to be entered.

6. Mechanism for entering cartridges in the breech chamber of a gun of the type having a breech block slidable in said chamber transversely to the gun barrel, comprising a plurality of rollers arranged with their axes of rotation transverse to the axis of the gun barrel, drive means for at least one of the rollers, means for moving at least one of the rollers transversely to the axis of the gun barrel, a housing for said roller drive and moving means, pawls co-operating with said housing respectively to hold the rollers in operative position against the cartridge and in a ready position retracted therefrom, a

feeler lever controlling the pawls and operated by the cartridge being entered, a spring mounted in the housing, and a guide member slidably mounted in said housing, said guide member being connected to the rollers and slidable in the housing against the pressure of the spring.

7. Mechanism for entering cartridges in the breech chamber of a gun of the type having a breech block slidable in said chamber transversely to the gun barrel, comprising a plurality of rollers mounted in an opening in the breech of the gun on axes transverse to the axis of the gun barrel, at least one of said rollers being mounted on the breech block, a motor mounted on a non-recoiling part of the gun, driving connections between the motor and the rollers, said connections including an extensible shaft, a two-armed lever on the gun having one arm connected to at least one of said rollers, an energy accumulator device connected to the other arm of said lever, means connecting said accumulator device to a non-recoiling part of the gun, a housing for the drive means disposed in said opening, pawls co-operating with said housing respectively to hold the rollers in working position against the cartridge and in a ready position retracted therefrom, a feeler lever controlling said pawls and operated by the cartridge being entered, a spring mounted in said housing, and a guide member connected to at least one of said rollers and slidable against the pressure of the spring of the housing.

8. Mechanism for entering cartridges in the breech chamber of a gun of the type having a breech block slidable in said chamber transversely to the gun barrel, comprising at least one pair of rollers arranged in an opening in the gun breech with their axes of rotation transverse to the axis of the gun barrel, a roller mounted on said breech block and co-operating with the first mentioned rollers, a motor mounted on a non-recoiling part of the gun for driving at least one of said rollers, driving connections between said motor and said rollers having an extensible shaft, an energy accumulator device arranged to move at least one of the rollers transversely to the barrel axis of the gun, means for connecting said accumulator device to a non-recoiling part of the gun, pawls for controlling the action of said energy device on the rollers, a housing for the drive means, said housing supporting said roller pair in said opening, means for respectively maintaining the housing with the rollers in working position against the cartridge and in a ready position retracted therefrom, a feeler member controlling said pawls and operated by the cartridge, a spring mounted in said housing, and a guide member connected to at least one of said rollers and slidable in the housing against the spring.

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