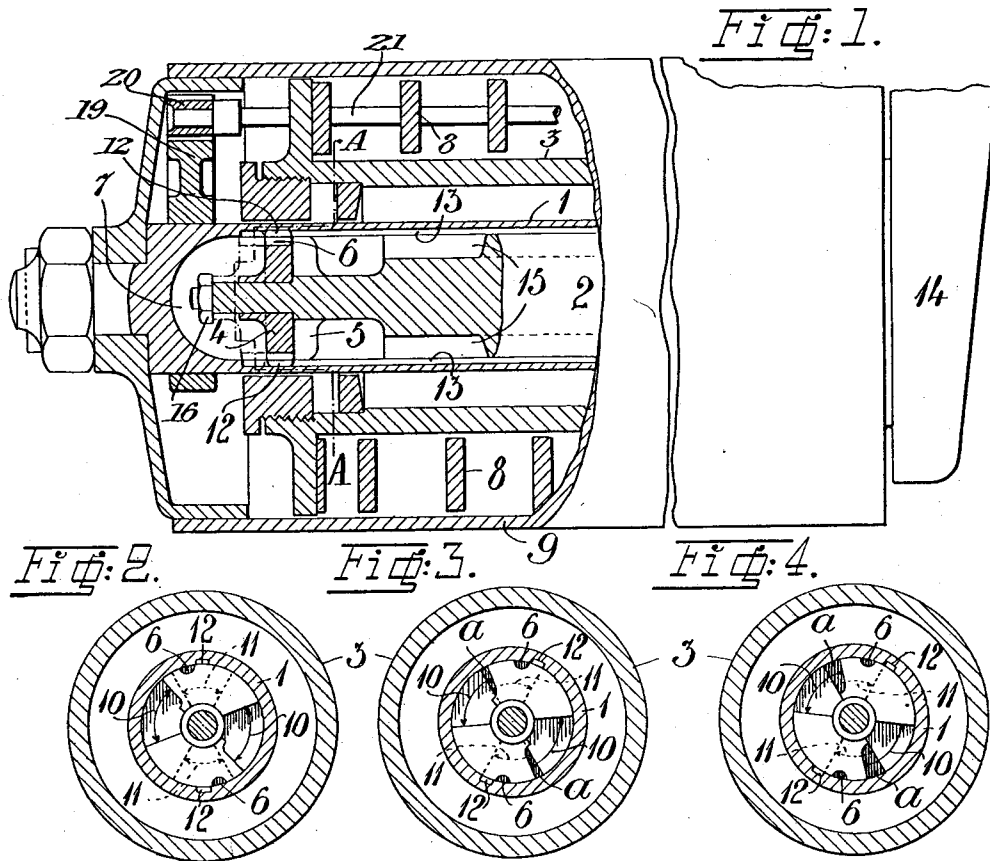


E. OLSSON.
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APPLICATION FILED NOV. 12, 1909.

1,029,555.

Patented June 11, 1912.

2 SHEETS-SHEET 1.



WITNESSES

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INVENTOR

Emil Olsson

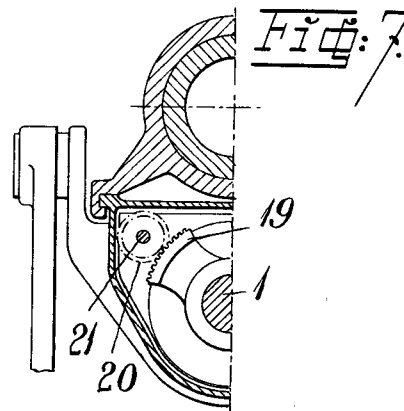
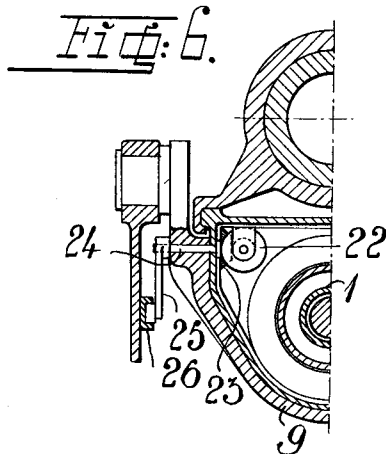
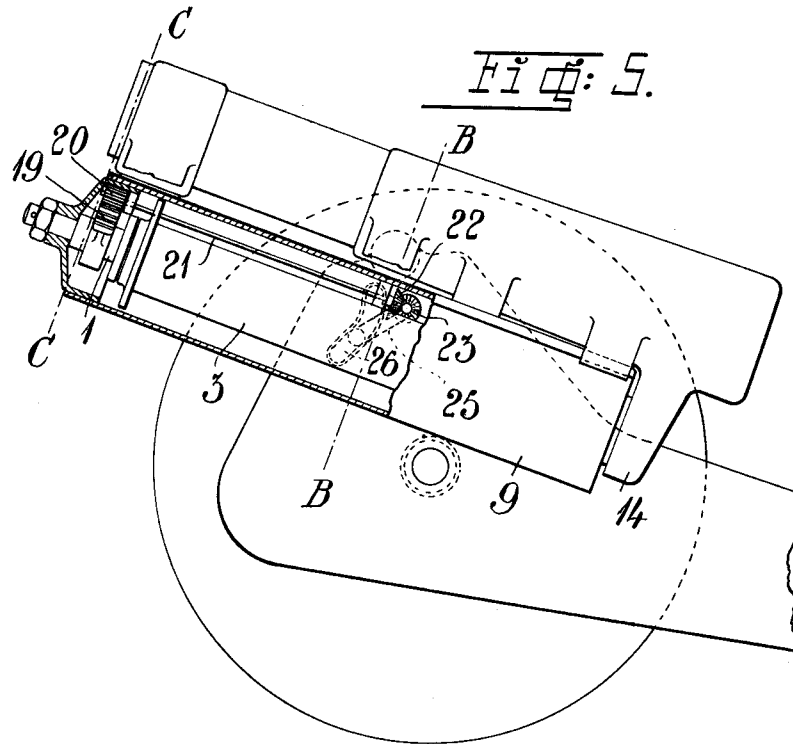
BY *Wm. M. H. H. H.*
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

EMIL OLSSON, OF BOFORS, SWEDEN, ASSIGNOR TO AKTIEBOLAGET BOFORS-GULLSPÅNG,
OF BOFORS, SWEDEN, A LIMITED COMPANY.

VALVE FOR HYDRAULIC BRAKES IN GUNS WITH RECOILING BARRELS.

1,029,555.

Specification of Letters Patent.

Patented June 11, 1912.

Application filed November 12, 1909. Serial No. 527,677.

To all whom it may concern:

Be it known that I, EMIL OLSSON, chief engineer, a subject of Sweden, residing at Bofors, Sweden, have invented new and useful Improvements in Valves for Hydraulic Brakes in Guns with Recoiling Barrels, of which the following is a specification.

The present invention relates to an arrangement in such hydraulic brakes for guns with recoiling barrel, which are provided with a hollow piston rod embracing a controlling rod, and where, in elevating the gun, the recoil is shortened by rotating, automatically or by hand, either the piston rod or the controlling rod, the purpose of the invention being to control, simultaneously with the recoil length, also the passage areas for the braking liquid during the counter-recoil, so that in a horizontal position of the barrel axis a greater resistance against the counter-recoil may be obtained than in an elevated position, when the propelling force is reduced by the action of gravity. The said passage areas can also be automatically varied during the counter-recoil. These purposes are effected by means of a special valve provided on the front end of the controlling rod and so arranged, that it will admit the braking liquid freely into the interior of the piston rod during the recoil, but will force the same liquid during the counter-recoil to pass openings, the size of which is controllable in the above-mentioned way.

The invention is illustrated in the accompanying drawing where—

Figure 1 shows a recoil brake in a side view with the front part in longitudinal section, showing the construction of the valve in question, Figs. 2-4 cross sections on the line A—A in Fig. 1 with the valve in different positions, Fig. 5 shows a partial sectional elevation of the gun in a smaller scale, illustrating means for automatically rotating the piston rod when the elevation of the gun is changed, Fig. 6 a partial cross section on the line B—B in Fig. 5, and Fig. 7 a cross section on the broken line C—C in Fig. 5.

The piston rod 1 (Figs. 1-4) is rotatably connected to the cradle 9. The brake cylinder 3 surrounding the piston and piston rod and the controlling rod 2 plunging into the interior 7 of the hollow piston rod are rigidly connected with the lug 14 of the barrel. On

the front end of the rod 2 a valve 4 in the shape of a disk is provided so as to be rotatable and longitudinally movable on the rod and adapted to rest, during the counter-recoil, against a disk-shaped seat 5 secured to the rod 2, but to take position at some distance from the said seat during the recoil. The valve disk is provided not only with comparatively large openings 10 adapted to cooperate with corresponding openings 11 in the seat 5 for admitting more or less liquid corresponding to the mutual angular position of valve and seat, but also with smaller openings 6 arranged to admit liquid independently of the position of the valve. The latter is guided by means of projections 12 in straight or suitably curved grooves 13 in the piston rod 1.

On the piston rod 1 a tooth segment 19 is fixed, said segment meshing with a pinion 20 on a shaft 21. The latter is capable of being rotated, by means of a bevel gearing 22, 23, from a shaft 24 journaled in the cradle 9 and carrying, at its outer end, a lever 25. A pin on the end of said lever is guided in a grooved piece 26 secured to the carriage of the gun. The shape of the groove is such, that in elevating the gun, the lever 25 is rotated together with shaft 24, thus also rotating, by means of the described mechanism the piston rod 1, whereby the recoil length may be varied simultaneously with the elevation of the gun, as, for instance, in the manner set forth in my United States Letters Patent No. 997,411.

During the recoil of the gun liquid from the pressure side of the brake cylinder is forced into the hollow piston rod and flows through channels 15 provided for this purpose in the controlling rod 2 in the direction of the valve. The liquid presses away the valve 4, which is stopped by the nut 16 (position shown in dash and dotted lines in Fig. 1), whereupon it flows through the openings 11, the clearance between valve and seat and the openings 10 into the interior space 7 of the piston rod, which thus is filled with liquid. When the recoil is ended and the counter-recoil begins, the valve 4 under the pressure, which now acts in the opposite direction, resumes its position against the seat 5, whereby a more or less total closing of the valve is effected, depending upon the mutual angular position between valve and seat.

When the barrel is elevated at small angles, the aforesaid angular position is such that liquid during the counter-recoil is admitted only through the small openings 6, but when the elevation is increased and the piston rod 1 simultaneously displaced angularly in relation to the controlling rod 2 for adjusting the recoil length, the valve 4 is also turned by means of the grooves 13 and projections 12, so that upon a certain angle being reached, the openings 10 and 11 will register to form admitting areas *a*, the size of which can be increased at will by making the said openings 11 and 10 of suitable shape (Figs. 2-4). By this means the hydraulic resistance against the counter-recoil of the barrel can be controlled according to the propelling force, which depends upon the elevation, so that the motion takes place with suitable speed. By making the grooves 13 suitably curved the areas *a* can be automatically varied during the counter-recoil.

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. A hydraulic brake for artillery guns with recoiling barrel, comprising in combination, a brake, cylinder, a hollow piston rod, a controlling rod embraced by the same, means for rotating one of said rods relatively to the other when the elevation of the gun is changed, means for admitting liquid into the hollow piston rod, a valve arranged on the end of said controlling rod embraced by said piston rod and means for guiding said valve in the piston rod so as to change during the counter-recoil, the passage areas for the liquid through the interior of the piston rod in accordance with the mutual angular position of said piston rod and controlling rod.

2. A hydraulic brake for artillery guns with recoiling barrel, comprising in combina-

tion, a brake cylinder, a hollow piston rod, a controlling rod embraced by the same, means for rotating one of said rods relatively to the other when the elevation of the gun is changed, means for admitting liquid into the hollow piston rod, a valve member and seat on the end of the controlling rod plunging into the hollow piston rod, said valve member being rotatable and longitudinally movable on the controlling rod, projections on said valve member engaging guiding grooves in the piston rod, and co-acting openings in said valve member and seat registering more or less according to the mutual rotation of said piston rod and said controlling rod.

3. A hydraulic brake for artillery guns with recoiling barrel, comprising in combination, a brake cylinder, a hollow piston rod, a controlling rod embraced by the same, means for rotating one of said rods relatively to the other when the elevation of the gun is changed, means for admitting liquid into the hollow piston rod, a valve member and seat on the end of the controlling rod plunging into the hollow piston rod, said valve member being rotatable and longitudinally movable on the controlling rod and guided in the piston rod, openings in said valve member coöperating with openings in the valve seat during the counter-recoil for admitting more or less liquid depending upon the mutual position of the valve member and seat, and additional small openings in the valve member coöperating with the openings in the seat to admit a constant quantity of liquid.

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

EMIL OLSSON.

Witnesses:

BIRGER NORDFELDT,
H. TELANDER.