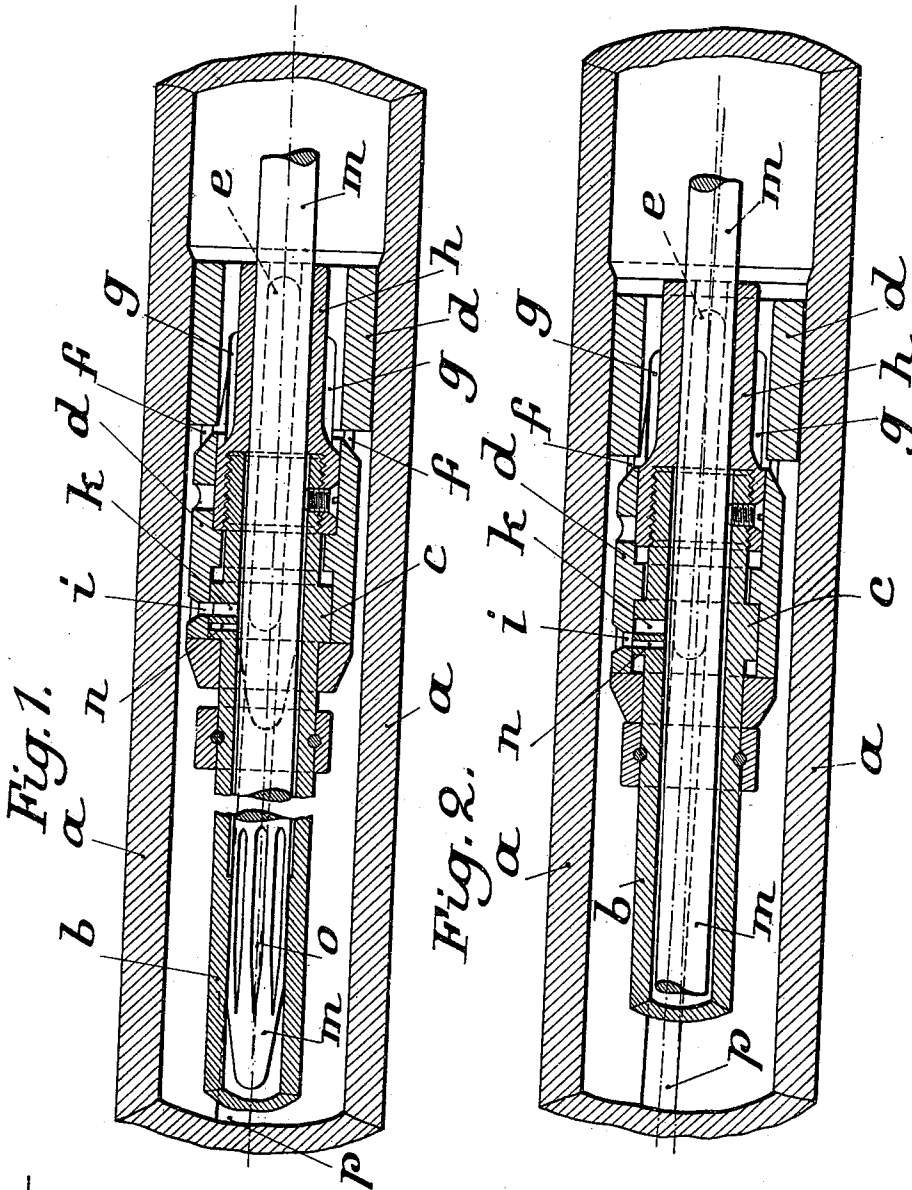


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HYDRAULIC BRAKE FOR GUNS HAVING RECOILING BARRELS.  
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993,003.

Patented May 23, 1911.



WITNESSES  
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# UNITED STATES PATENT OFFICE.

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993,003.

Specification of Letters Patent.

Patented May 23, 1911.

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*To all whom it may concern:*

Be it known that I, KARL VÖLLER, engineer, a subject of the German Emperor, residing at 17 Jülicherstrasse, Dusseldorf, Germany, have invented certain new and useful Improvements in Hydraulic Brakes for Guns Having Recoiling Barrels; 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 invention relates to a hydraulic brake for guns having a recoil barrel, in which the cross section of the passage for the braking liquid during the recoil and return movements is adjusted by an annular slide coaxial with the piston rod and adapted to rotate and to move axially. In old arrangements of this kind, during the recoil the braking liquid passes through the piston from one end of the cylinder to the other, while simultaneously the piston rod leaves the cylinder. It follows that at that end of the cylinder containing the piston rod a vacuum is produced corresponding with the volume of that part of the piston rod which has left the cylinder. At the beginning of the return movement the gun barrel and parts running with it run forward first of all without braking until the brake piston meets the resistance of the braking liquid, that is until it has covered the volume necessary to equalize the vacuum. At this moment the parts in motion have already a considerable velocity and the braking action starts suddenly with great violence. The gun carriage therefore receives a concussion which may in some cases cause the whole gun to be carried forward. Now brakes are already known in which this disadvantage is removed by braking the return by means of a rod sliding inside the hollow piston rod the interior of which is put into communication with the pressure chamber during the recoil. In this manner, immediately the return movement begins, the piston rod is filled with braking liquid and the said sliding rod meets with a resistance, since the passage through which the braking liquid had previously passed is closed automatically by a check valve, that is to say, the braking begins immediately.

The present invention achieves the same effect with brakes having rotating annular

slides without increasing the parts and particularly without having to provide a further device for the desired effect, such as a separate check valve.

The annular slide which controls the passage for the braking liquid from one end of the cylinder to the other, has now to make and interrupt the communication between the chamber in the piston rod and that end of the cylinder which is under pressure during the recoil. For this purpose there are provided in the piece on which the annular slide slides, passages in addition to those for the braking of the recoil and return, which additional passages make communication with the chamber in the hollow piston rod. In the annular slide there are perforations corresponding with these additional passages, which are so arranged that the communication afforded by these passages between the cylinder and the chamber in the piston rod is open during the recoil but is closed at the beginning of the return movement by the axial movement of the annular slide, simultaneously with the channels for controlling the braking pressure during the recoil. The rod extending into the chamber within the piston rod and rigidly connected with the brake cylinder, is constructed to close the open end of the chamber and thus to force the braking liquid, as it moves into the said chamber through the channels regulating the braking pressure on the return movement, back into the cylinder chamber without however affecting the braking effect as was the case in the previous constructions.

The invention is illustrated in the accompanying drawings, Figure 1 being a longitudinal section through the brake mechanism showing the parts in the position which they have during recoil, and Fig. 2 being a like section showing the parts in the position which they have during the return.

The brake cylinder *a* is connected in the usual manner with the gun barrel and moves with the barrel during recoil and return. Inside the cylinder is the hollow piston rod *b*, which is fixed to the front end plate of the upper carriage. On the enlarged head *c* of the piston rod *b* there is mounted free to rotate and to slide axially the piston *d* formed as an annular slide, and having feathers *e* fitting helical grooves *p* in the cylinder *a*; thus during the recoil and the return the piston *d* rotates on the piston rod. During the recoil the

left hand end of the cylinder is under pressure and the piston *d* takes up the position shown in Fig. 1 on the piston rod. The passages *f* in the piston *d* are in register with the channels *g* in the extension *h* screwed on the head of the piston rod, and throttle the braking liquid flowing from the left hand end of the cylinder to the right end during the recoil. In the piston *d* there is a further passage *i* which in the position shown in Fig. 1 registers with the channel *k* in the head of the piston rod. The channel *k* leads to the chamber within the piston rod *b*, so that during the recoil the braking liquid fills up this chamber.

The bore of the extension *h* is of smaller diameter than that of the piston rod and in it tightly fits a rod *m* which shares the recoil movement. This rod shuts off the chamber in the piston rod from the right hand end of the cylinder and prevents the braking liquid from passing through channel *k* to this end of the cylinder. The end of the rod *m* at the end of the recoil movement is shown by the dotted lines in Fig. 1. At the beginning of the return movement the piston *d* moves in the known manner into the position shown in Fig. 2. In the first place the channel *k* is closed and the passage *i* in piston *d* registers with the passage *n* in the head of the piston rod. During the return movement the rod *m* again enters the hollow piston rod and forces the braking liquid through channel *n* back to the left hand end of the cylinder. By the simultaneous rotation of piston *d* on the piston rod head *c* the passage is varied in the desired manner.

The axial movement of the piston *d* does not cut off communication of passages *f* with channels *g* owing to the length of the channels *g*. At the beginning of the return movement indeed the communication is quite or almost quite cut off in consequence of the turning of ring valve *d*, but during the return movement until the vacuum in the right hand end of the cylinder is compensated, the passage becomes so wide that the braking liquid which passed during the recoil to the right hand end of the cylinder

can return to the other end without any substantial resistance. Fig. 2 shows an advanced point of the return movement wherein the ring valve has moved so that openings *f* and *g* again register. The rod *m* is cylindrical along its length up to the taper at its forward end, in the drawing the left hand end, where it has a number of longitudinal grooves *o*. That part of the bore of the piston rod *b* at which this end of the rod is situated in the position of rest is reduced to the diameter of the rod. In this manner the rod *m* is held fixed at its free end in the position of rest so that shocks such as may occur when the gun is traveling on the ground do not affect it.

I claim:

1. In combination with a gun, a liquid brake comprising a cylinder, a ring valve piston in the cylinder, and a hollow piston rod on which the piston moves; said piston having an opening which completes a through passage for the liquid between the end spaces of the cylinder and an opening which completes the passage from the cylinder space of high pressure to the interior of the piston rod during the recoil movement of the gun incident to firing; said piston also closing said latter passage at the beginning of the return movement.

2. In combination with a gun, a liquid brake comprising a cylinder, a ring valve piston in the cylinder and a hollow piston rod on which the piston moves, said piston having an opening which, during the recoil movement of the gun incident to firing, connects the high pressure space of the cylinder with the interior space of the piston rod, and which, during the return movement of the gun registers with a smaller passage to the interior space of the piston rod so that the liquid is throttled.

In testimony whereof I have affixed my signature, in presence of two witnesses.

KARL VÖLLER. [L. s.]

Witnesses:

OTTO KÖNIG,  
WILLY KLEIN.