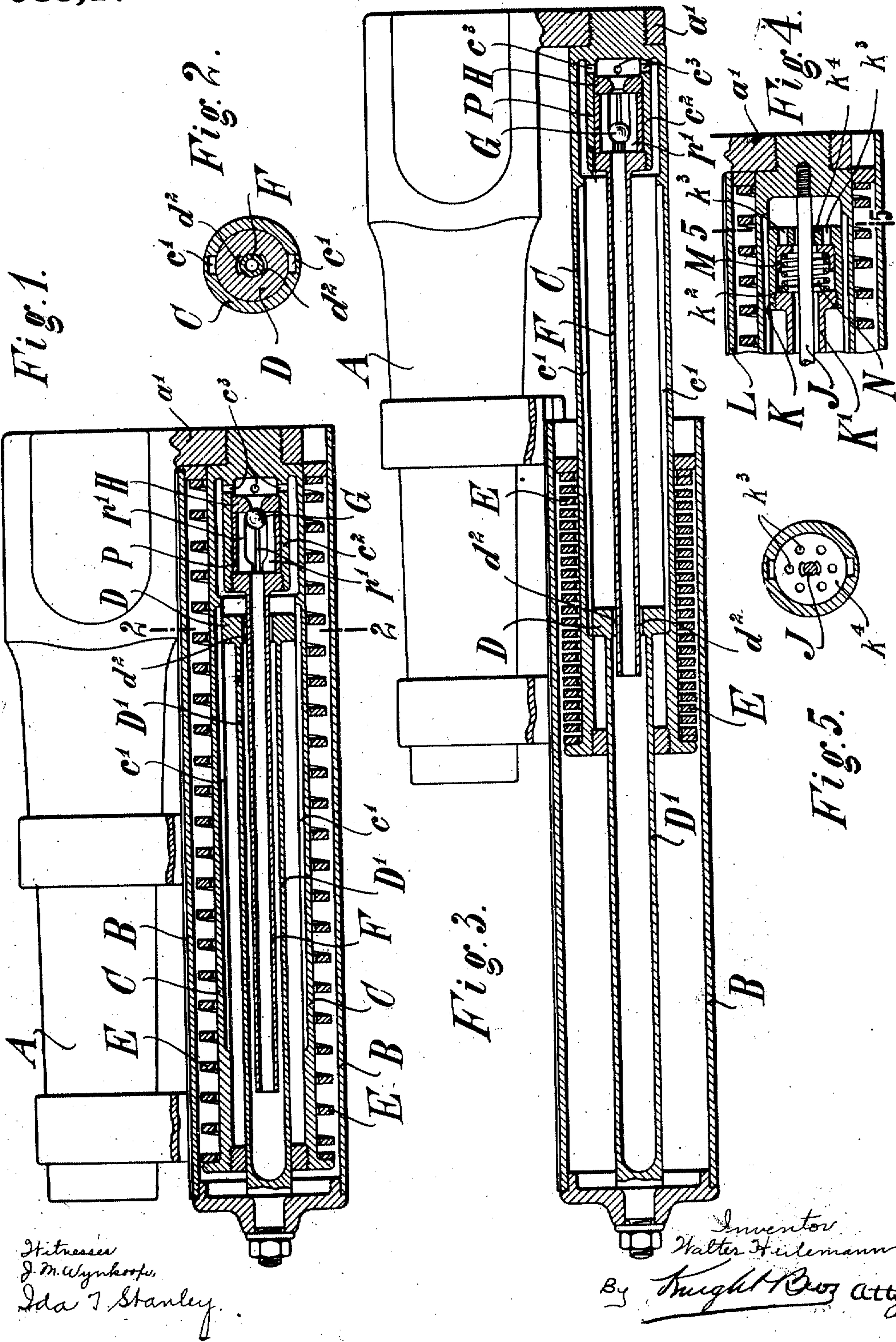


985,170.



UNITED STATES PATENT OFFICE.

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FLUID-BRAKE FOR GUNS.

985,170.

Specification of Letters Patent.

Patented Feb. 28, 1911.

Application filed April 10, 1907. Serial No. 367,347.

To all whom it may concern:

Be it known that I, WALTER HEILEMANN, a subject of the Emperor of Germany, and a resident of Essen-on-the-Ruhr, Germany, have invented certain new and useful Improvements in Fluid-Brakes for Guns, of which the following is a specification.

The present invention relates to fluid-brakes for guns provided with a hollow piston rod and with a return rod which, during the return movement of the recoiling parts, causes the brake-fluid to pass out from the hollow piston rod.

An object of the invention is to provide a brake of this type in which the recoil braking action may be more easily calculated and a longer return braking action secured.

In the accompanying drawing: Figure 1 shows one embodiment of the invention and parts of a recoil-gun, partly in vertical longitudinal section and partly in elevation. The parts are shown in the positions which they occupy when the gun-barrel is in firing position; Fig. 2 is a section of a detail on line 2—2, Fig. 1; Fig. 3 is a view corresponding to Fig. 1 and showing the parts in the relative positions which they assume at the end of the recoil; Fig. 4 shows a part of a second embodiment in a view corresponding to that shown in Fig. 1, and Fig. 5 shows a detail in section on line 5—5, Fig. 4, seen from the right.

Reference will first be had to the embodiment shown in Figs. 1 to 3. The gun barrel A is in the customary manner mounted to slide on the cradle B which incloses both the recuperator spring E and the fluid brake. The fluid brake consists of the brake cylinder C, the brake piston D, its hollow piston-rod D' and the return rod F. The brake cylinder C is rigidly connected to the horn a' of the gun barrel and the piston rod D' is rigidly connected to the cradle B. The wall of the brake cylinder is provided with channels c' for the passage of the brake fluid from one side of the piston D to the other, and in the embodiment shown constitutes the recoil throttling section of the brake, which, generally speaking is the smallest section of the by-pass through which the braking fluid is passing at any given time during recoil. The return rod F is screwed

into a projection c^2 which is arranged on that end of the brake cylinder that is secured to the horn a' . The rod F is guided in a central bore in the piston D and projects so far into the hollow piston rod D' that it does not leave the piston rod when the gun barrel recoils (Fig. 3). Flat channels d^2 (Fig. 2) are provided in the wall of the central bore in the piston D. The return rod F and the projection c^2 are hollow. Channels c^3 , which have a larger cross-sectional circulation area than the channels d^2 , lead from the projection c^2 into the brake cylinder. Reckoned from the piston-rod side, the channels c^3 consequently open to the other side of that cross-sectional circulation area for the brake fluid which comes into consideration for the recoil-braking. As the channels c' increase in depth in the direction of recoil the aforesaid cross-sectional circulation area will, in any position of the brake cylinder relatively to the piston, be located in the plane of that face of the piston which forms the end wall for the piston-rod side of the brake cylinder. In the projection c^2 a check valve G H is mounted, and has its valve body G guided by ribs p' in a bushing P arranged in the projection c^2 .

When the gun-barrel is in the firing position the parts of the fluid brake assume the relative positions shown in Fig. 1. All the spaces of the brake are filled with fluid. The brake cylinder C and the return rod F partake of the recoil and return movement while the piston rod D' and piston D remain stationary. During the recoil of the gun barrel the brake fluid is forced from the piston-rod side of the brake cylinder through the channels c' to the other side—in the following referred to as the "piston side"—of the brake cylinder, and a braking of the recoil-movement is obtained in the known manner by reason of the throttling of the fluid in the channels c' . Simultaneously with this the fluid space in the hollow piston rod is increased. The vacuum thereby created in the piston rod is, however, filled by brake fluid passing from the piston side of the brake cylinder through the channels c^3 and around the valve body G to the piston rod. On the return movement, the return rod tends to displace fluid from the

hollow piston rod and the brake piston tends to force fluid from the piston side to the piston-rod side of the brake cylinder. As, however, the cross-section of the channels d^2 in proportion to the pressure surface of the return rod F is much smaller than the cross-section of the channels c' in proportion to the pressure surface of the brake piston D, the pressure in the piston rod is greater than on the piston side of the brake cylinder and the valve G H will consequently become closed. The brake fluid can then pass out from the hollow piston rod only through the flat channels d^2 . The fluid therefore becomes very much throttled and the return movement of the gun-barrel is subjected to a strong braking action which is assisted by the fact that the fluid passing through the channels c' from the piston side of the brake cylinder to the piston rod side is also throttled during its passage through the channels c' . When the return movement has come to an end, the difference in pressure in the several spaces of the fluid brake ceases and the parts again assume the positions seen in Fig. 1.

In the embodiment shown in Figs. 4 and 5 the return rod J is solid and is directly screwed into that end wall of the brake cylinder L which is connected to the horn a' . The piston K is provided with a chamber k^2 which communicates with the bore in the piston rod K' and is connected with the piston side of the brake cylinder through the medium of channels k^3 . In the chamber k^2 is an annular valve body M which by a spring N is pressed against the end wall k^4 of the piston which has the channels k^3 and which serves as a valve seat. This arrangement operates in substantially the same manner as the embodiment first described.

The only previously known fluid brakes, in which the filling of the hollow space of the piston rod takes place from the piston side of the brake cylinder, accomplish this purpose by using a return rod which is so short that it passes out of the bore of the piston rod on recoil. The drawbacks of this arrangement are especially apparent when the recoil is of varying length, in which case the return rod must be so short that it passes out of the piston rod also when the recoil is shortest. The return braking is then very deficient on long recoil. The present fluid brake differs from the aforesaid known type of brakes for the reason that the return rod may be as long as possible and that the return, therefore, can be braked during a long distance. A long braking travel gives a steadier return than a short one. Compared with those brakes of the aforesaid kind in which the channels, which effect the filling of the hollow space of the piston-rod, open at the piston-rod side of the brake cylinder, the brake according to the present

invention presents the advantage that the recoil braking action is more easily calculated because the brake fluid from the piston rod side of the brake cylinder has only one outlet, viz., the passage-channels to the other side of the brake cylinder.

Having thus described my invention what I claim is:

1. In a fluid brake in which fluid passes from one side of the piston to another, the combination with the cylinder and the piston, of a hollow piston rod having its hollow space closed toward the piston rod side of the cylinder, a rod moving in the hollow piston rod, means providing communication between the hollow space of the piston rod and the piston side of the cylinder to permit fluid to pass from the piston side of the cylinder to said hollow space during recoil, and means whereby said communication is partially cut off during return movement to throttle the flow of fluid from said hollow space to the piston side of the cylinder.

2. In a fluid brake, a piston having a hollow piston rod, a cylinder having a passage through which the fluid can pass from one side of the piston to another, a rod moving in said piston rod, a restricted passage providing continuous communication between the hollow space of the piston rod and the piston side of the cylinder, a second passage leading from the hollow space of the piston rod to the piston side of the cylinder, and means whereby said last-named passage is automatically closed during return movement.

3. In a fluid brake, a cylinder, a piston provided with a hollow piston rod having its hollow space closed toward the piston rod side of the cylinder, a passage providing communication between the piston side and the piston rod side of the cylinder, a rod moving in the hollow piston rod, means providing communication between the piston side of the cylinder and the hollow space of the piston rod, and means whereby said communication is partially cut off during return movement.

4. In a fluid brake for guns in which a fluid passes from one side of a piston to another, the combination with the cylinder and the piston, of a hollow piston rod, an inlet to the hollow piston rod communicating directly only with that space of the cylinder into which the fluid enters after having passed the recoil throttling section of the brake, and means permitting a full flow through said inlet only to fill the piston rod.

5. In a fluid brake for guns, the combination with the cylinder having throttling grooves provided within its inner wall for a portion of its length; of a hollow piston rod; a hollow return rod mounted to telescope within said piston rod and communicating at one end with said cylinder; a valve in said

return rod adapted to prevent flow there-
through during the return movement of the
gun; and a piston carried by the inner end
of said hollow piston rod, said piston being
5 provided with a continuously open channel
between the hollow piston rod, and the pis-
ton end of the cylinder.

The foregoing specification signed at Dus-
seldorf, Germany, this twenty ninth day of
January, 1907.

WALTER HEILEMANN.

In presence of—

ALFRED POHLMAYER,
M. ENGELS.