

**No. 695,854.**

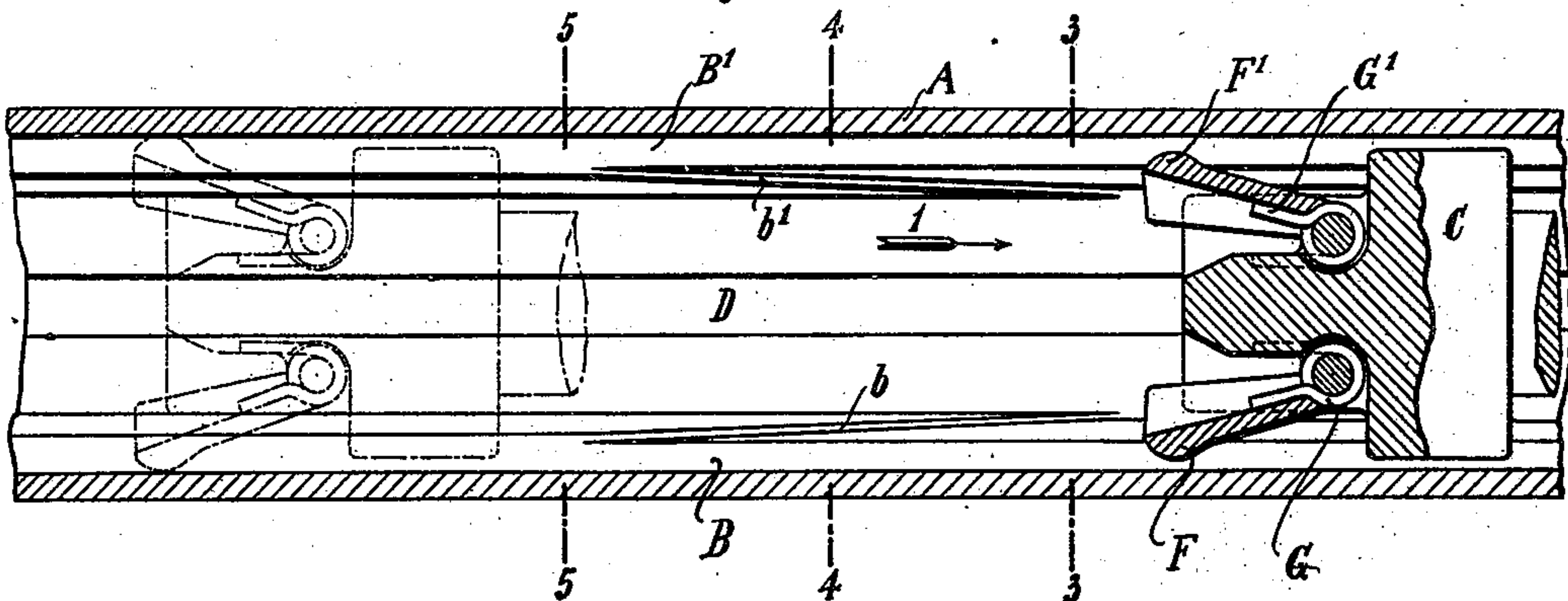
**Patented Mar. 18, 1902.**

**O. BEHNKE.**  
**FLUID BRAKE FOR GUNS.**

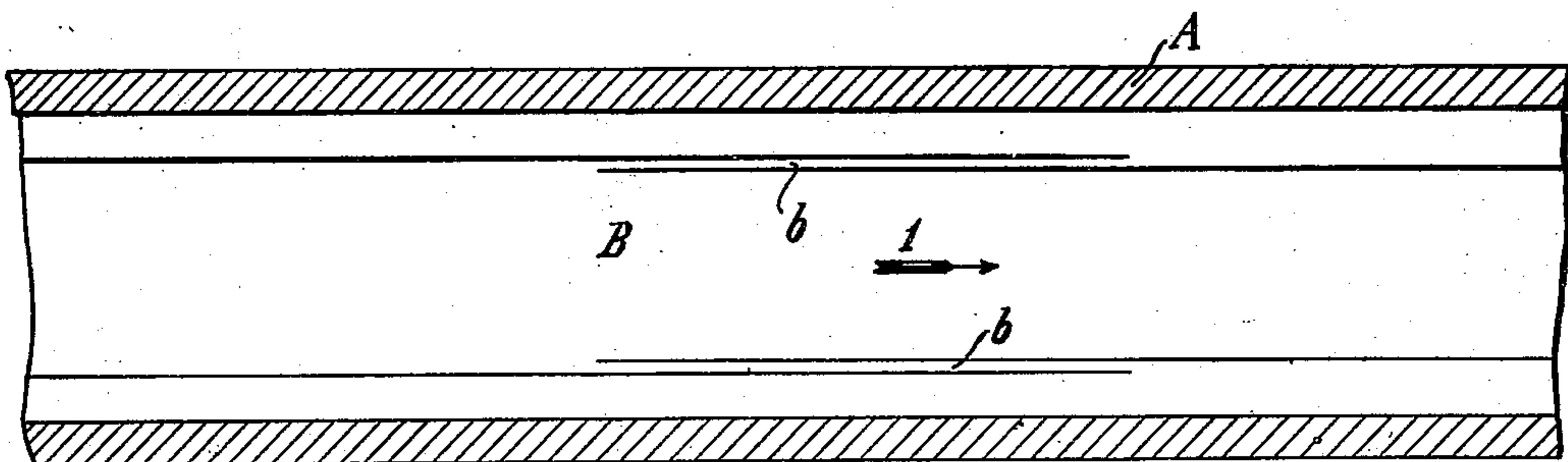
(Application filed Mar. 28, 1901.)

(No Model.)

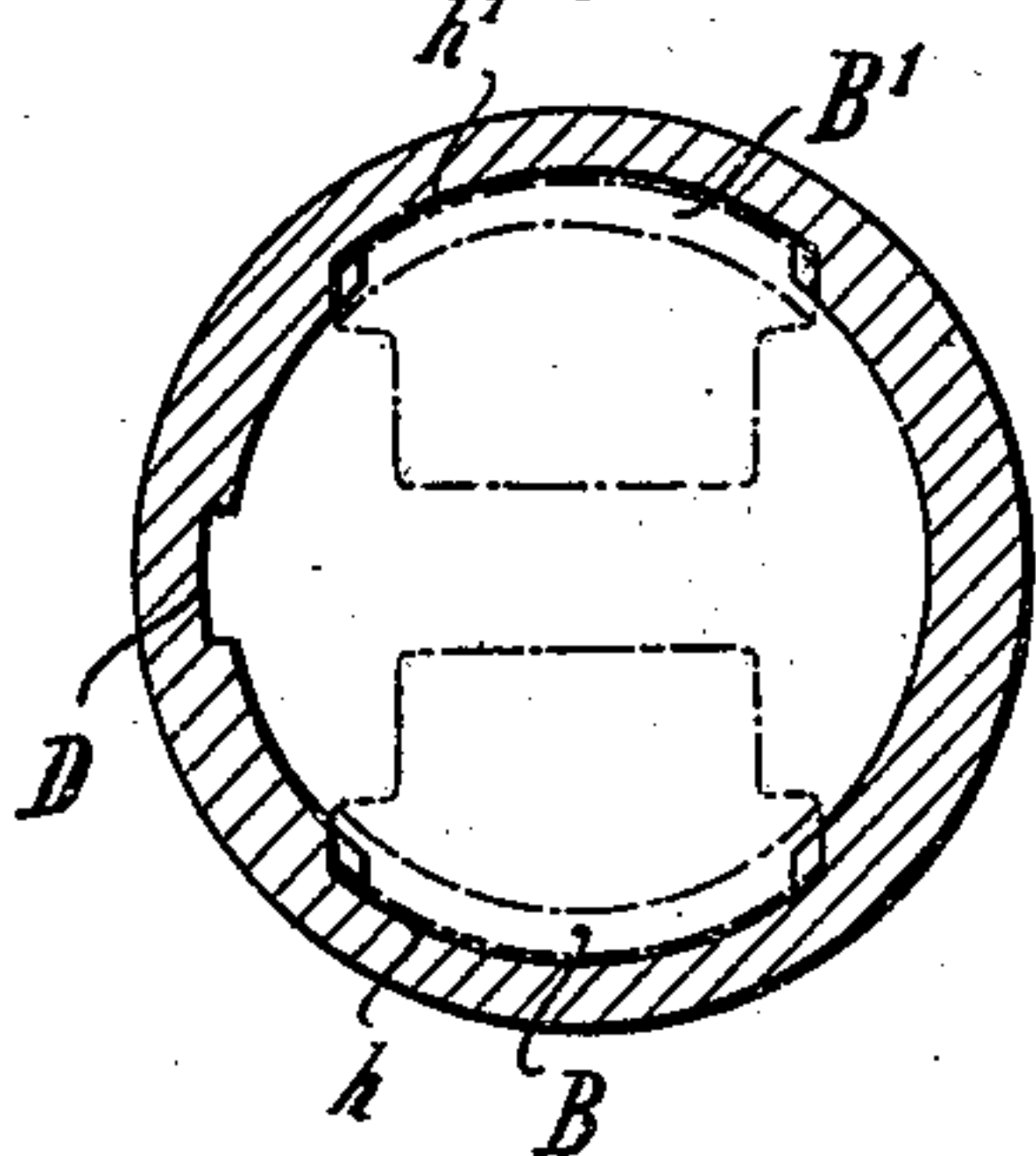
*Fig. 1.*



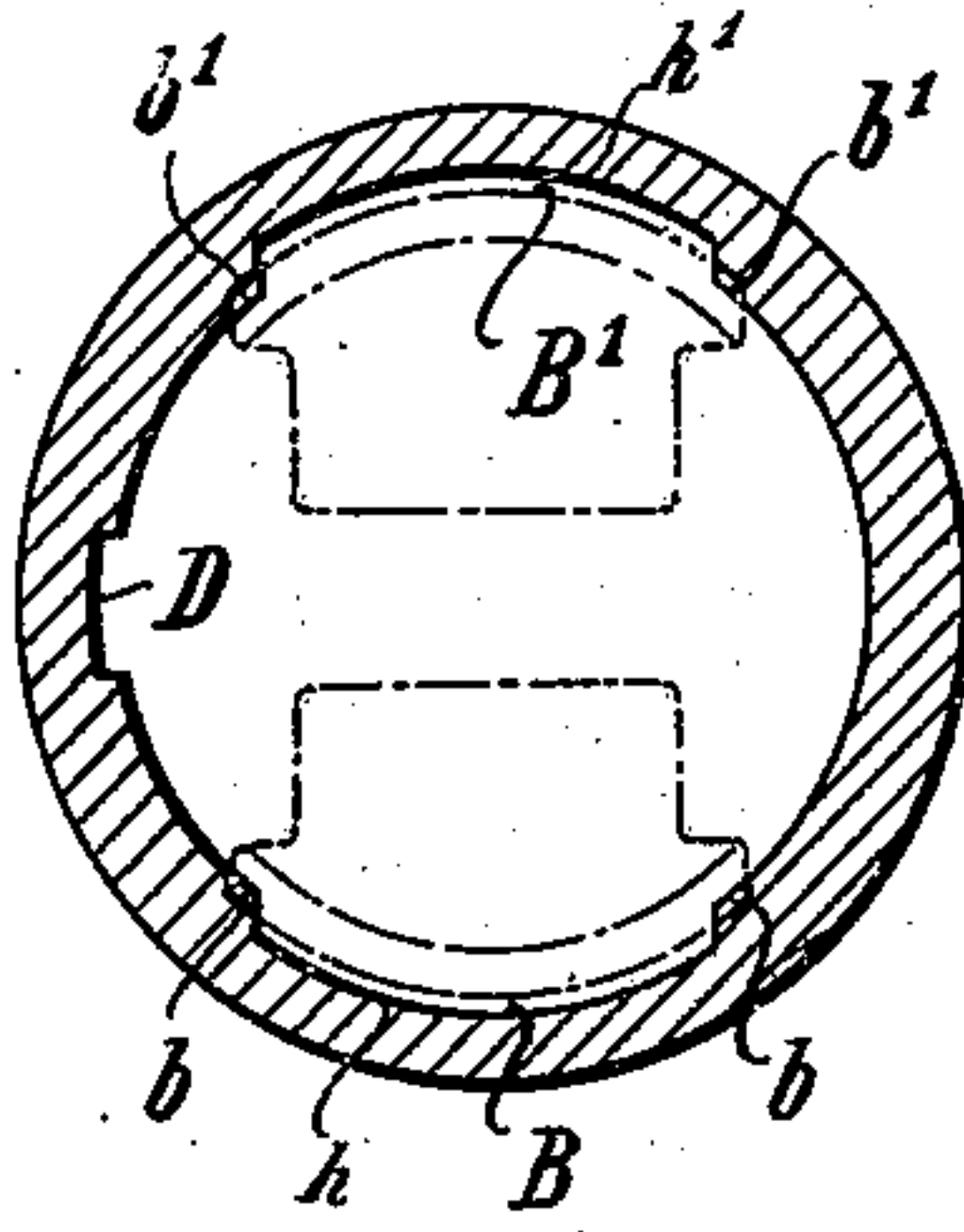
*Fig. 2.*



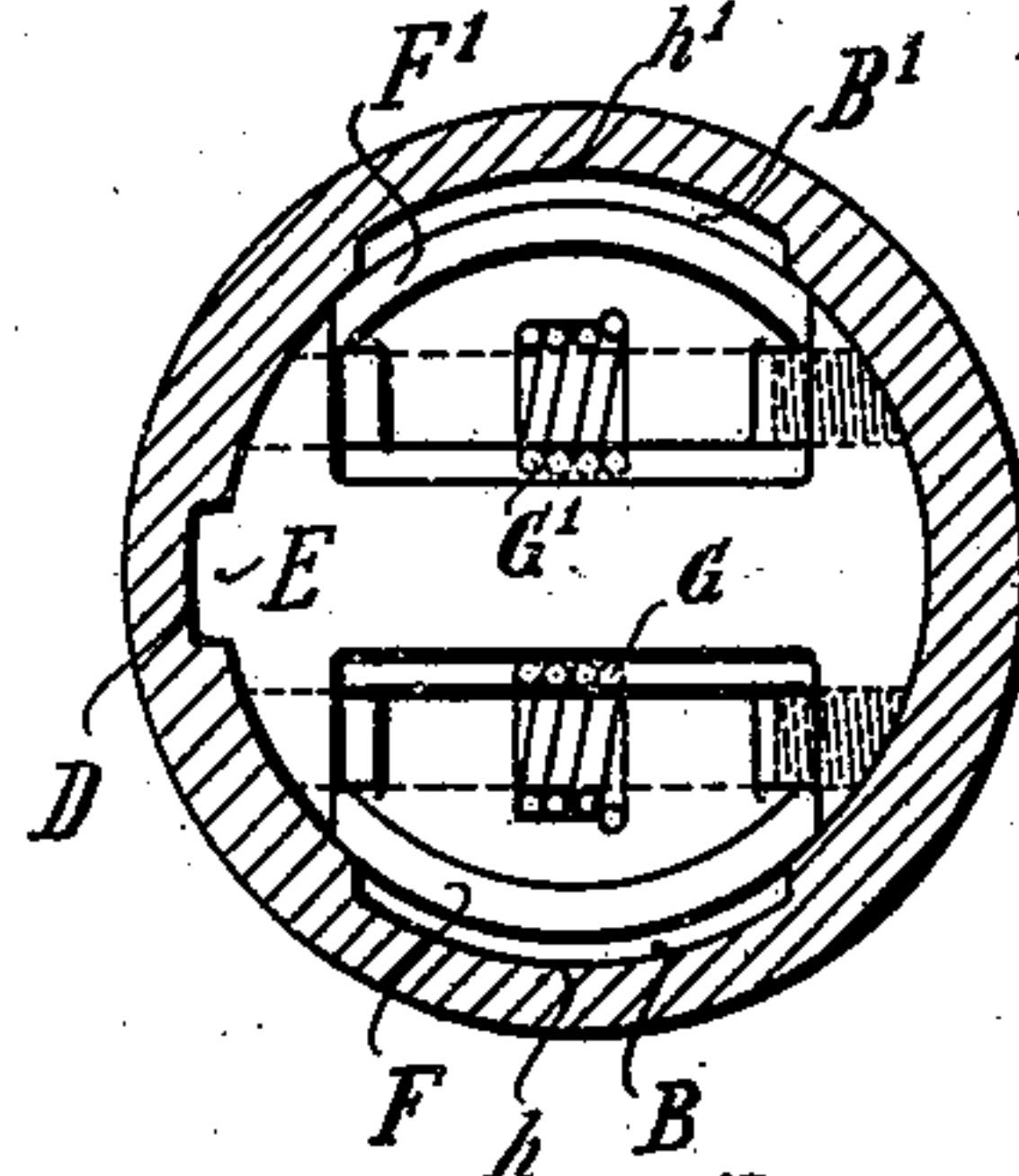
*Fig. 5.*



*Fig. 4.*



*Fig. 3.*



**WITNESSES.**

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# UNITED STATES PATENT OFFICE.

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## FLUID-BRAKE FOR GUNS.

SPECIFICATION forming part of Letters Patent No. 695,854, dated March 18, 1902.

Application filed March 26, 1901. Serial No. 52,900. (No model.)

*To all whom it may concern:*

Be it known that I, OTTO BEHNKE, engineer, a citizen of the German Empire, residing at 36 Bismarckstrasse, 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 has reference to improvements in fluid-brakes for guns of the class in which the liquid passes from one side of the piston to the other through channels in the cylinder or in the piston.

The present invention relates particularly to improvements in that form in which the passage is throttled by spring flap-valves. Heretofore it has been proposed to have the flap-valves come into action at the instant when after completion of the recoil the direction of motion of the piston is reversed and by the action of their springs and the fluid action within their passages the valves enter the passages and suddenly close them almost entirely.

In my present invention I employ throttling devices partaking of the nature of puppet-valves which operate as throttling-bodies to regulate the running-out motion of the gun; but instead of having them operate as heretofore I provide means whereby the throttling flap-valves are positively guided during the running out of the piston, so as to be primarily out of engagement with the grooves, while they are gradually guided to enter the grooves during the continued movement of the piston.

The nature of the invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 represents a vertical longitudinal section of the improved brake. Fig. 2 is a horizontal section of the brake-cylinder. Fig. 3 is a vertical section on the line 3 3, Fig. 1, looking from the left. Fig. 4 is a similar section on the line 4 4, Fig. 1. Fig. 5 is a similar section on the line 5 5, Fig. 1.

Similar letters of reference designate corresponding parts throughout the several views of the drawings.

Referring to the drawings, the letter A designates the brake-cylinder, which is provided on its interior with diametrically opposite

channels B B', the bases of which are parts of a cylindrical surface, while their depth decreases in the direction indicated by arrow 1, Figs. 1 and 2, that being the direction of recoil of the piston. Each of the channels B B' is constituted of a longer and wider part and a shorter and narrower part, each of which is, however, of constant width throughout its length. The narrower part of the channels is located at the right hand of Fig. 1—that is, at the end toward which the arrow 1 points—and is the part in which the piston starts on its running-out course. The change from the narrower to the wider channel takes place by the base of the wider groove or channel as far as it projects on both sides beyond the sides of the narrower channel, gradually tapering upward until it finally comes up to the inner surface of the cylinder, while the remaining part of the base coincides with the base of the narrower part. By this means inclined offsets *b b'* are formed on both sides of the narrower channel at the transition place. Opposite the channels B B' and in position to enter the same are pivotally secured flap-like throttling-bodies F F' within suitable recesses formed in the brake-piston C. These flaps are so arched in their width that their cross-section fills the wider part of the channels with but little play. The total width of the flaps, however, is such that they cannot enter the narrower part of the channels B B'. Suitable springs G G', placed on the pivots of the flaps F F', engage with the flaps and constantly hold the same in engagement with the channels. The piston C is prevented from turning by a lug E on the latter, which engages a guide-groove D in the inner wall of the cylinder. The brake-cylinder, as usual, is entirely filled with liquid.

During the recoil the piston moves in the direction of the arrow 1 and displaces the liquid in front of it to the opposite side. The pressure of the liquid passing through keeps the valves out of engagement with the passages or channels. As soon as the running out commences the throttling-flaps, under the pressure of the springs and of the liquid, tend to reënter the channels. This, however, is not possible during the first part of the running-out motion, because the flaps



are opposite those parts of the channels having a less width than the flaps. Therefore the flaps glide along the edges of the channels without contracting the cross-section open to the flow of liquid. The consequence is that at first the running out is but little checked; but when the piston reaches the place of transition from the narrower to the wider part of the channels the flaps on further forward motion of the piston glide upon the inclined offsets  $b$   $b'$  and gradually pass into the channels or grooves, thereby gradually diminishing the openings and correspondingly checking the running-out motion. (See Figs. 4 and 5, where the flaps are shown in dotted lines.) After passing the transition part the flaps have fully passed into the channels (see in Fig. 1 the position of the piston, shown in dotted lines) and from there to the end of the running-out motion almost completely close up the passages, whereby the liquid is considerably throttled and the running-out motion correspondingly checked.

Instead of making the change from the wider parts of the channels to the narrower ones in the above-described manner a transition-groove of decreasing width might be inserted between the two parts of the channels. In this case during running out the flaps would first glide upon the parallel edges of the narrow channel without entering and when gliding over the diverging edges of the transition-channel gradually enter the same.

Without deviating from the nature of the invention the forced motion of the flaps may also be produced by other means than the particular shape of the through-channels. For instance, while the width of the channels remains constant throughout the whole length a lever arm or projection may be connected with the flaps, which in running out

slides in a narrow guide-groove of increasing depth, thereby causing the flaps to gradually enter the channels.

What I claim as new is—

1. A fluid-brake comprising a piston provided with radially-hinging throttling-flaps, and a cylinder having by-pass channels entered and restricted by the throttling-flaps at one end of the piston's stroke, and guides intercepting portions of the paths of said throttling-flaps and holding them out of said channels for a portion of the piston's stroke.

2. A fluid-brake, comprising a piston having outwardly and inwardly hinging throttling-flaps, and a cylinder formed with longitudinal channels entered and restricted by the flaps, at one end of the piston's stroke; the walls of said channels intercepting portions of the paths of travel of said flaps, and providing guides holding the flaps out of the channels for a portion of the piston's stroke.

3. In a fluid-brake of the character specified, a piston provided with throttling-flaps, and a cylinder provided with channels consisting of a wider and a narrow part, which latter is located at the end where the piston commences its running-out motion, and which gradually slopes into the wider one, while the width of the throttling-flaps corresponds to the broader part, so that during the first part of the running-out motion the flaps glide upon the edges of the narrower part without entering the same, but on passing the transition part gradually enter the channels.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

OTTO BEHNKE.

Witnesses:

WILLIAM ESSENWEIN,  
PETER LIEBER.