No. 724,398. PATENTED MAR. 31, 1903.

A. RESOW & O. LAUBER.

FLUID BRAKE FOR GUNS.

APPLICATION FILED JULY 28, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

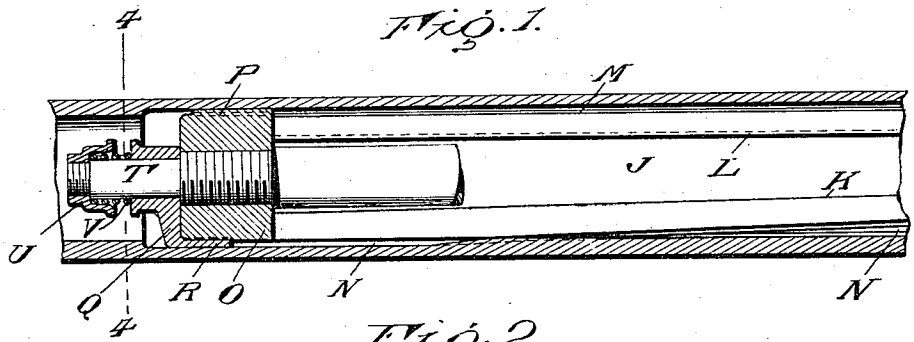


Fig. 2.

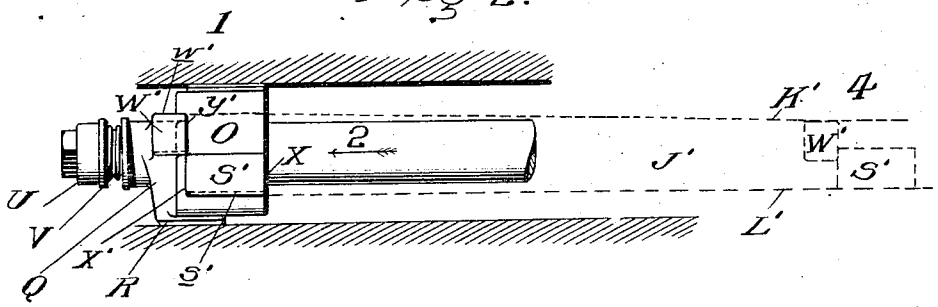


Fig. 3.

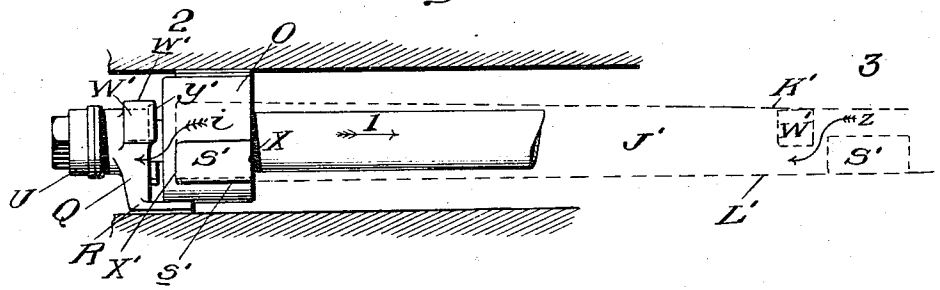
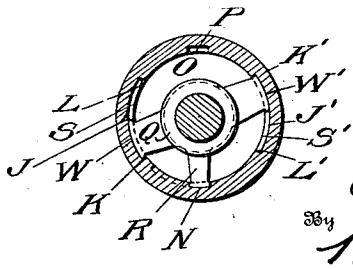


Fig. 4.



Witnesses

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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 5.

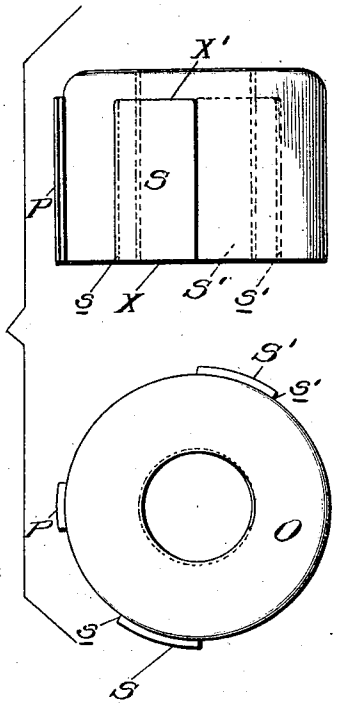
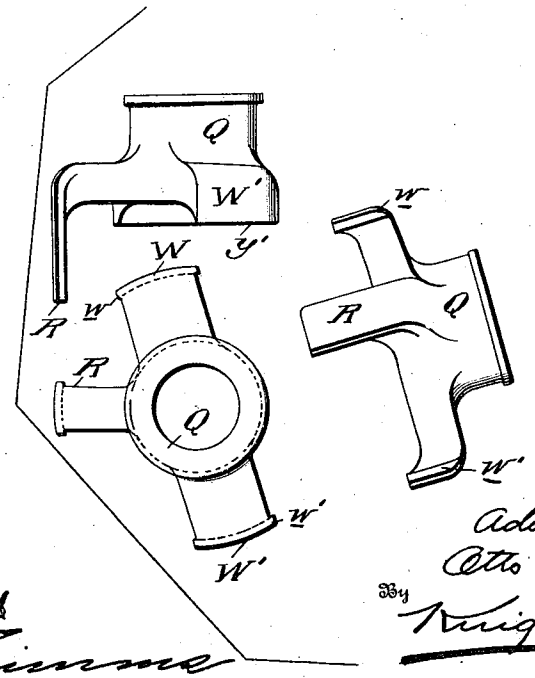


FIG. 6.



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ADOLF RESOW AND OTTO LAUBER, OF ESSEN-ON-THE-RUHR, GERMANY, ASSIGNORS TO FRIED. KRUPP, OF ESSEN-ON-THE-RUHR, GERMANY.

FLUID-BRAKE FOR GUNS.

SPECIFICATION forming part of Letters Patent No. 724,398, dated March 31, 1903.

Original application filed August 18, 1900, Serial No. 27,339. Divided and this application filed July 23, 1902. Serial No. 117,350. (No model.)

To all whom it may concern:

Be it known that we, ADOLF RESOW, residing at 99 Rellinghauserstrasse, and OTTO LAUBER, residing at 36/2 Holsterhausen, Essen-on-the-Ruhr, Germany, subjects of the Emperor of Germany, have invented a certain new and useful Improvement in Fluid-Brakes for Guns, of which the following is a specification.

This invention has reference to improvements in fluid-brakes for guns in which the reciprocating brake-piston displaces the liquid contained within the brake-cylinder through a space between the piston and the walls of the cylinder from one side of the piston to the other. The transfer of liquid from one side of the piston to the other takes place in such brakes through channels formed either in the wall of the cylinder or in the periphery of the piston. If the channels are formed in the walls of the cylinder, the cross-section thereof is gradually diminished in the direction of the recoil—that is, in the backward movement of the piston. If, however, the channels are formed in the piston, said channels are engaged by rails which are located on the walls of the cylinder and have an increased cross-section in the direction of the recoil or backward movement of the piston.

The present invention has a special reference to a construction for the purpose of braking the running out of the gun in fluid-brakes of the kind described by means of which the usual running-out brake-cylinder may be omitted, and consequently the production of a fluid-brake with but a single piston and without any piston-packing is made possible.

In our copending application, filed August 18, 1900, Serial No. 27,339, of which this case is a division, we have claimed, broadly, the idea of providing the brake-piston contiguous to the previously-described channels with a movable throttling device or devices which are operated by the flow of the fluid through the channel or channels and which when in one position open the entire cross-section for the passage of the liquid, while in the other position narrow the cross-section for the purpose of braking the running out of the gun; and the object of this invention is to improve upon the construction therein claimed.

This invention consists of certain parts and combinations of parts, as will be hereinafter described, and pointed out in the appended claims.

Referring to the drawings forming part of this specification, Figure 1 is a longitudinal section of a fluid-brake embodying our invention. Fig. 2 is a side view of the piston at rest—that is, in the position for running out the gun. Fig. 3 is a similar view showing the piston moving in the direction of the recoil of the gun. Fig. 4 is a transverse section on the line 4 4, Fig. 1, looking from the left; and Figs. 5 and 6 are detail views of parts of the construction illustrated in Figs. 1 to 4.

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

The invention is applied to a fluid-brake in which the brake-cylinder has two diametrically opposite channels J and J', having the same depth throughout their length, while the width decreases in the direction of the arrow 1 shown in Fig. 3—that is, in the backward or recoil movement of the piston O. This decrease in the width of the channels is effected by running one side wall L and L' of each channel in a straight line—that is, parallel with the axis of the cylinder—while the other side walls K and K' are run in a helical path. The channels J and J' are engaged by two lugs S and S', formed on the periphery of the piston O and shown in Fig. 5 on a larger scale. During the reciprocation of the piston the lugs S S' are compelled by the lug P, which is also secured to the piston and which travels in a straight groove M of the brake-cylinder, to engage, with their sides *s* and *s'*, with the straight walls L and L' of the channels J and J'. Since these lugs S and S' are not as wide as the channels J and J', a portion of the cross-section of the channel remains open, which opening offers a gradually-decreasing cross-section for the passage of liquid during the backward or recoil movement of the pis-

ton. In order to close off this cross-section for flow of liquid in the forward or running-out movement of the piston to the greatest extent, there is placed on the extension T of the piston-rod a throttling device Q, which is shown in Fig. 6 on an enlarged scale. The throttling device is pressed toward the piston by a spring V bearing against the same, and a nut U and is provided with two lugs W W', which, similarly to the lugs S S' of the piston, engage with the channels J J', and the sides $y\ y'$ of said lugs W W' are in line with and adjoin the ends $x\ x'$ of the lugs S S' when the throttling device is against the piston O. The throttling device Q is provided with a lug R, which travels in a groove N, running parallel to the edges K K' of the channels J J', and consequently, in view of the helical path of said guide-groove N, the throttling device is compelled to turn on the rod T and the lugs W W' thereon to follow, with their sides $w\ w'$, the helical walls K K' of the channels J J'. The width of the lugs W W' is such that they fill up the cross-section of the channels J J' left free or open by the lugs S S' at the widest part of said channels. However, care must be taken to permit passage of the liquid on the forward movement of the piston—say by leaving a small portion of the cross-section free or open. This may be accomplished by having a little clearance between the ends $y\ y'$ and $x\ x'$ or between the sides $w\ w'$ and the walls K and K', or it may be accomplished in any other suitable manner. The lug R of the throttling device is of such construction that it does not leave the groove N even when in the position shown in Fig. 3, and consequently always closes off the latter from passage of liquid. In their normal positions the separate parts take the position shown at I in Fig. 2. As soon as the piston moves under the recoil the throttling device Q is thrown away from the piston against the pressure of the spring V by the pressure of the liquid, (see Fig. 3,) and the liquid can while the piston is moving backward pass in the direction of arrow i to the front portion of the cylinder, and its passage is gradually throttled in view of the gradually-reduced width of the cross-section of the channels J and J'. During this movement of the piston the throttling device Q is compulsorily turned in such a manner that its lugs W W' glide along the walls K K' of the channels J J' and in part cover the lugs S S' on the piston O, (see position 3, Fig. 3,) without, however, interfering with the passage of the liquid in the direction of arrow z, since the lugs W W' are lifted from the lugs S S'. As soon as the piston starts its return or running-out movement in the direction of arrow 2 in Fig. 2 the throttling device is thrown against the piston O by the action of the spring V and the pressure of the liquid, so that the lugs W W' and S S' together close the cross-section of the channels J J' almost entirely, (see position 4, Fig. 2,) and by thus strongly throttling the liquid a smooth return or running-out movement of the parts is effected. The guide-groove N for the lug R of the throttling device need not be parallel to the edges K K' of the channels J J'. If desired, they may be run in a different manner, so as not to cause the throttling device to entirely close off at the beginning of the return stroke the cross-section of the channels, but to leave open a greater or smaller part of the cross-section and gradually close the same as the running out proceeds.

It is of course to be understood that instead of a plurality of channels W W' one channel of sufficient cross-section would answer.

What we claim is—

1. In a fluid-brake, the combination of a cylinder having a channel formed therein, which decreases in width toward one end, a piston, and a throttling device adapted to enter the channel.

2. In a fluid-brake, the combination of a cylinder having a channel formed therein, which decreases in width toward one end, a piston, and a throttling device adapted to turn relatively to the piston.

3. In a fluid-brake, the combination with a cylinder having a channel formed therein, one of the walls of which is parallel with the axis of the cylinder, while the other wall is run in a helical path, of a piston, and a lug on the piston adapted to move within the channel.

4. In a fluid-brake, in which the fluid in the cylinder passes from one side of the piston to the other through a suitable channel, the combination with the piston, of a throttling device carried by the piston and mounted to move toward and from the piston and to turn relatively thereto.

5. In a fluid-brake, the combination with the cylinder having a channel formed therein, and a piston, of a throttling device carried by the piston and adapted to turn relatively thereto.

6. In a fluid-brake, the combination of a cylinder having a channel formed therein, which decreases in width toward one end, a piston, and a throttling device carried by the piston and adapted to turn relatively thereto.

7. In a fluid-brake in which the liquid in the cylinder passes from one side of the piston to the other through a suitable channel, the combination of a piston provided with a lug engaging said channel but of less width than the same, a throttling device carried with the piston and mounted to move toward and from the piston and to turn with respect to the same, and said device being provided with a lug adapted to engage with the channel, and means for causing the throttling device to turn relatively to the piston, substantially as described.

8. In a fluid-brake, the combination of a cylinder having a channel formed therein, which decreases in width toward one end, a piston provided with a lug engaging said chan-

nel but of less width than the same, and a throttling device adapted to conform to the differences in the width of the channel.

9. In a fluid-brake, the combination of a cylinder having a channel formed therein, which decreases in width toward one end, a piston provided with a lug engaging said channel but of less width than the same, means guiding the piston, a throttling device carried with the piston and mounted to move toward and from the piston, and to turn with respect to the same, and means for causing the throttling device to turn relatively to the piston.

10. In a fluid-brake in which the fluid passes from one side of the piston to the other through a suitable by-pass, means for gradually reducing the size of the by-pass on recoil, and reducing the flow through the by-pass on the return.

The foregoing specification signed at Dusseldorf, Germany, this 28th day of June, 1902.

ADOLF RESOW.
OTTO LAUBER.

In presence of—
WILLIAM ESSENWEIN,
PETER LIEBER.