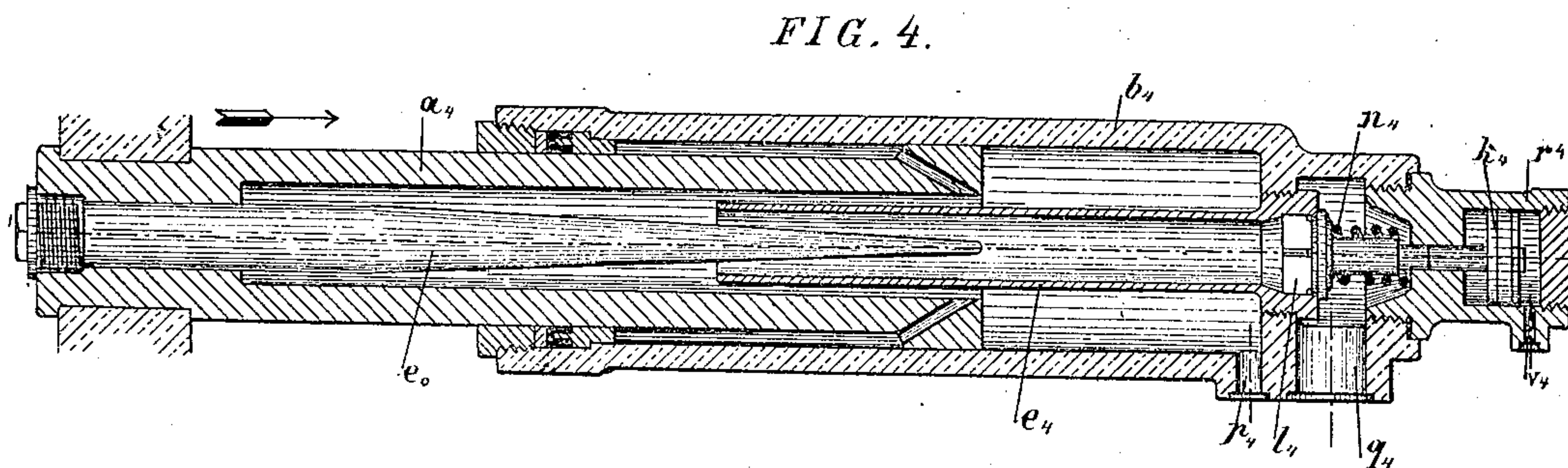
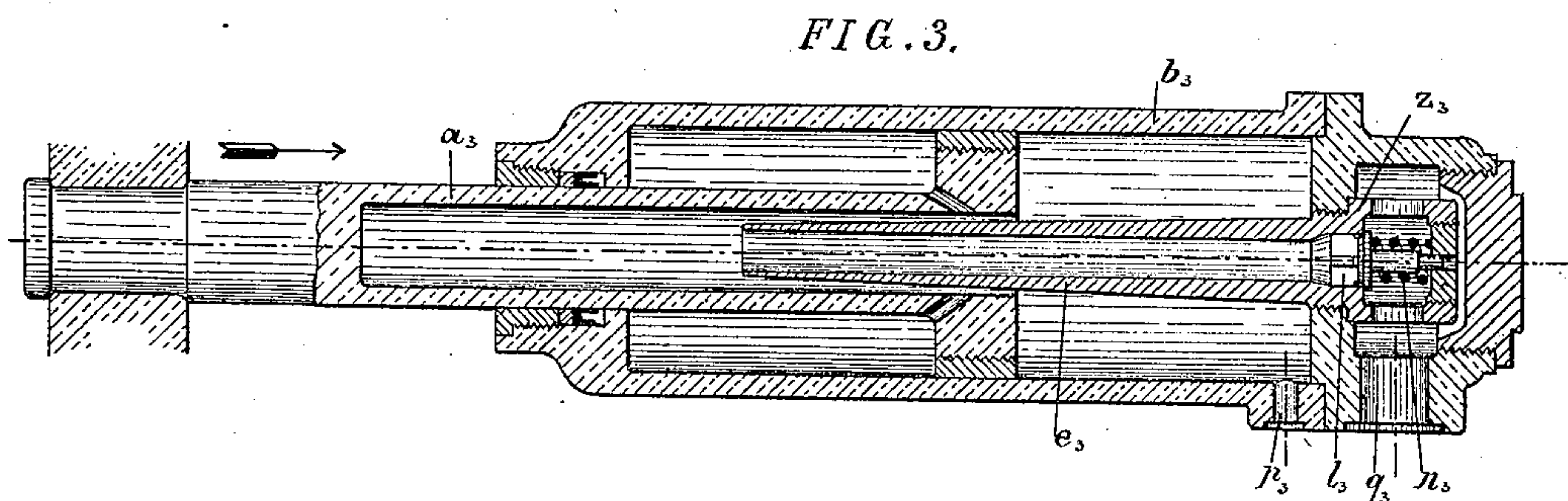
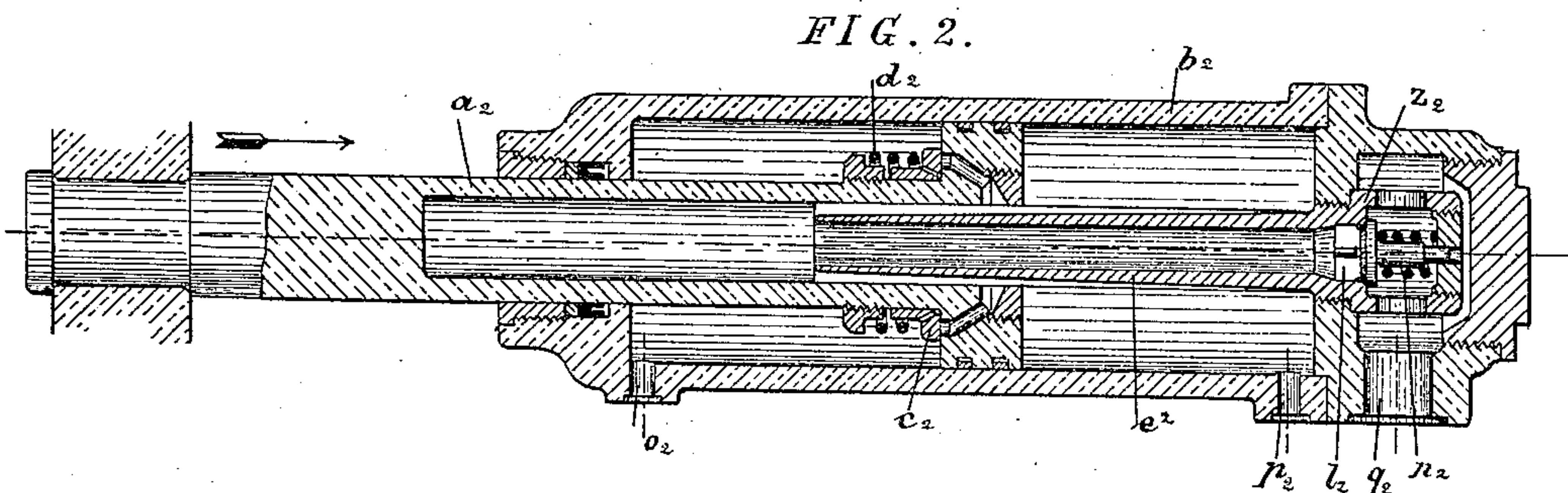
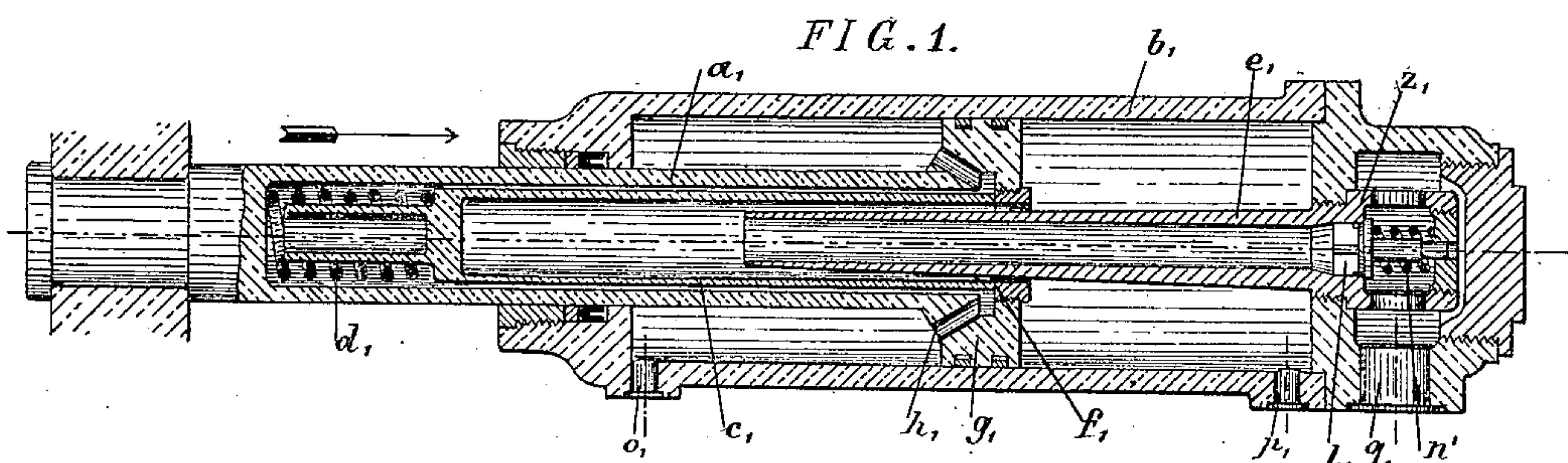


(No Model.)

J. KRONE.
HYDRAULIC BRAKE FOR ORDNANCE.

No. 461,347.

Patented Oct. 13, 1891.



Witnesses
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UNITED STATES PATENT OFFICE.

JOHANNES KRONE, OF ESSEN, GERMANY, ASSIGNOR TO FRIEDRICH KRUPP,
OF SAME PLACE.

HYDRAULIC BRAKE FOR ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 461,347, dated October 13, 1891.

Application filed May 23, 1890. Serial No. 352,926. (No model.)

To all whom it may concern:

Be it known that I, JOHANNES KRONE, a subject of the King of Saxony, residing at Essen, in the Kingdom of Prussia, Germany, have invented new and useful Improvements in Hydraulic Brakes for Ordnance, of which the following is a specification.

My invention is an improvement upon that form of hydraulic brakes shown in my prior application, Serial No. 286,191, filed September 24, 1888.

The object of the invention is to provide a new and improved brake which is simple and durable in construction, offers a uniform resistance on the ordnance on recoil, and permits of withdrawing the fluid, on firing of the ordnance, at the back end of the cylinder.

The invention consists of a tube arranged in the brake-cylinder to change the area of the passage or escapement connecting one side of the piston with the other.

The invention also consists of certain parts and details and combinations of the same, as will be hereinafter fully described, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Figs. 2, 3, and 4 are like views of modified forms of the same.

The arrangement and the fixing of the foregoing brake to a piece of ordnance is effected by the usual known method—namely, that the top carriage is firmly connected either with the piston or the brake-cylinder, while the respective other part of the brake-cylinder or piston is firmly fastened to the frame-work of the carriage. The recoil of the piece of ordnance is received by the part of the brake that is movable with the top carriage, and in fact works with the fixed cylinder the movable piston and with the fixed piston the movable cylinder.

The piston-rod a' of the brake-cylinder b' (represented in Fig. 1) is bored, so that it may receive the regulating-tube e' , which is fastened to the cover of the cylinder and connected with the escape-valve. The tube e' is tapered or shaped conically on the out-

side, and variation of diameter is determined by special calculation, according to circumstances.

The automatic escape-valve consists of the valve l' , situated in the chamber z' , and is kept against its seat by a spring n' . The cover of the brake-cylinder is chamber-formed for the purpose of receiving this valve and closed with a cover-plate. The brake-valve c' has a tubular form and is kept against its seat by a spring d' . The seat f' of this valve is situated in the body g' of the piston, which contains an annular cavity which is in connection with the front portion of the brake-cylinder by apertures h' .

Upon the discharge of the piece of ordnance the brake-piston enters the cylinder. When in consequence of the recoil the brake-valve c' in the piston is opened, the connection between the two sides of the piston is effected and the liquid can flow forward from the back side of the piston g' , whereupon the sectional area of the outflow decreases in proportion to the increasing thickness or diameter of the conical tube. The fluid situated behind the piston passes through the continually-decreasing area of the outflow in the piston partly toward the front side of the piston, partly (corresponding to the volume of the piston-rod) through the regulating-pipe e' and the escape-valve from the cylinder. The entrance and exit of the pressure-fluid upon the forward and backward movement of the piece of ordnance are effected by means of tubular connections fitted to parts o' and p' . The escape of the fluid forced out by the recoil is through the passage q' in the cover either into the waste pipe, or if an accumulation of power is intended during the recoil, into an accumulator.

In Fig. 2 the tube-formed brake-valve is replaced by a circular valve c^2 and the conical-shaped tube by a cylindrical tube e^2 with conical grooves. The action is the same as in the above-described arrangement.

In the arrangement represented in Fig. 3 the piston is without a brake-valve. The pressure-fluid enters the cylinder through the passage-way p^3 and serves only for the forward movement of the piston.

The escape-valve connected with the regu-

lating-pipe may also be provided with a counter-pressure cylinder when it is intended to diminish as much as possible the initial pressure in the cylinder. This arrangement is represented in Fig. 4. The shaft of the valve l^4 is connected with a piston k^4 , which is movable in a cylinder r^4 . At v^4 is situated the connection pipe for the pressure-fluid, which enters behind the piston k^4 as soon as the slide-valve for the forward movement of the gun is opened. The valve is thereby held closed because the piston k^4 is of larger area than the valve l^4 . When the gun and the slide-valve serving for the movement thereof are in firing position, by a special arrangement of this slide-valve the access of the pressure-fluid to the brake-cylinder is cut off and at the same time the discharge of the pressure-fluid from r^4 through v^4 is effected, so that the valve is only loaded by the spring n^4 , which only offers slight resistance to the opening of the valve.

Instead of a tube which alters the area of the flow of fluid, a tube e^4 , fastened in the bottom of the cylinder, with a conical rod e^0 fixed into the hollow piston-rod and projecting into the tube, may also be applied, as shown in Fig. 4. This arrangement permits the possibility of the rod being easily changed from the outside, which in special cases may be desirable.

The specified improvements may be applied to guns of different calibers and systems.

I claim—

1. In hydraulic brakes for ordnance, the combination, with a piston-head having ports, a piston-rod, and a piston-cylinder connected, respectively, to the slide or top carriage and the carriage proper, of the open-ended regulating-tube, which is fastened to the cover of

the cylinder, and the automatic escape-valve held to its seat in the rear end of the tube by a spring and located in a chamber having a lateral escape-passage, substantially as shown and described, to operate as specified.

2. In hydraulic brakes for ordnance, the combination, with a piston-head having ports, a piston-rod, and piston-cylinder connected, respectively, to the slide or top carriage and carriage proper, of the regulating-tube, whose outer end is fastened to the cover of the cylinder and provided with a chamber having a lateral escape-passage, the automatic escape-valve located in said chamber and normally closing the rear end of the tube, and the spring for holding said valve seated against a certain predetermined pressure, as shown and described, to operate as specified.

3. In hydraulic brakes for ordnance, the combination, with a piston-head having ports, a piston-rod, and piston-cylinder, of the regulating-tube provided with a chamber having a lateral escape-passage, the automatic escape-valve located in said chamber and normally closing the rear end of the tube, a spring for holding said valve seated against a certain predetermined pressure, the conical rod e , fixed to the hollow piston-rod and projecting into the regulating-tube, the counter-pressure cylinder r^4 , having the lateral discharge-aperture v^4 , and the piston k^4 , working the latter and fixed on the extended valve-stem, all as shown and described.

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

JOHANNES KRONE.

Witnesses:

FRITZ MOELLENHOFF,
HERMANN KUHUS.