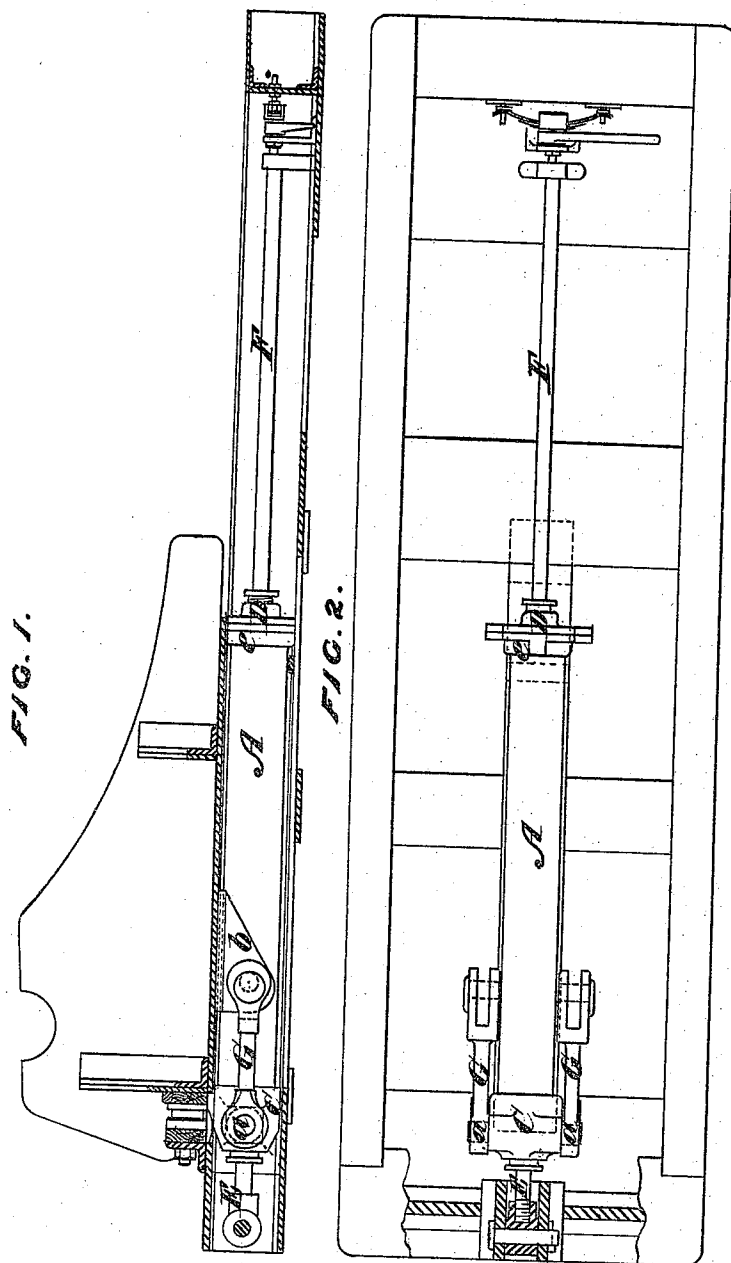


A. KRUPP.
HYDRAULIC BRAKES FOR GUN-CARRIAGE.
No. 182,121.
Patented Sept. 12, 1876.



Witnesses

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FIG. 3.

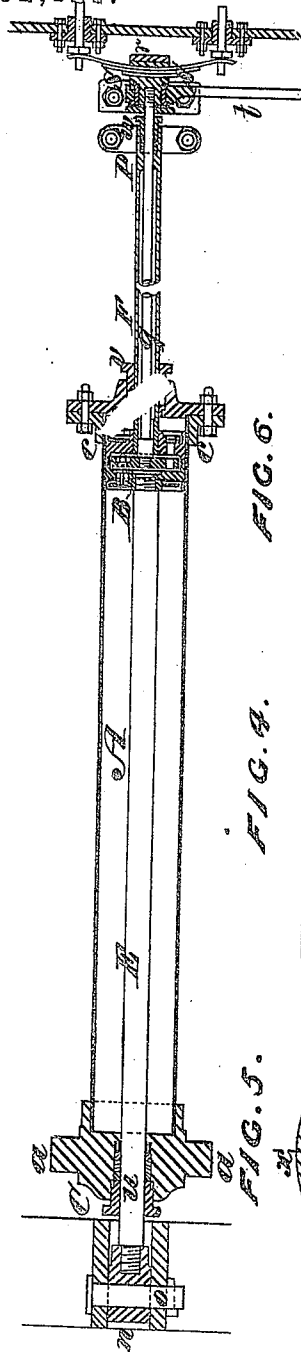


FIG. 6.

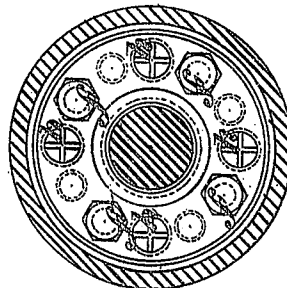


FIG. 4.

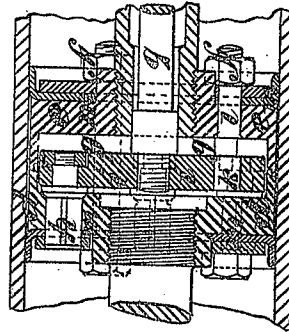
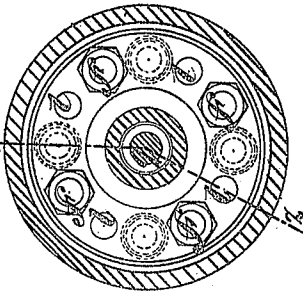


FIG. 5.



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FIG. 9.

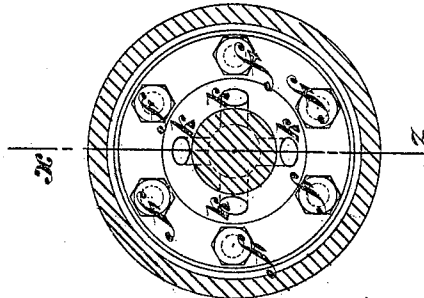


FIG. 7.

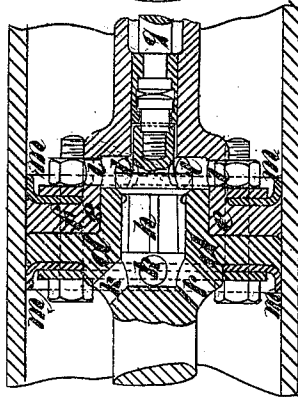
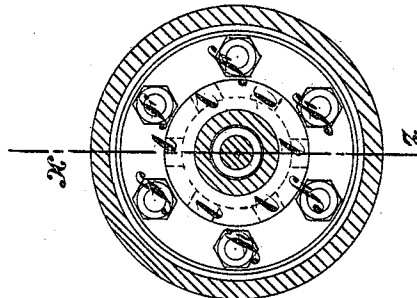


FIG. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

ALFRED KRUPP, OF ESSEN, PRUSSIA.

IMPROVEMENT IN HYDRAULIC BRAKES FOR GUN-CARRIAGES.

Specification forming part of Letters Patent No. 182,121, dated September 12, 1876; application filed June 23, 1876.

To all whom it may concern:

Be it known that I, ALFRED KRUPP, of Essen, in the Kingdom of Prussia, cast-steel manufacturer, have invented certain Improvements in the Hydraulic Brakes of Gun-Carriages, of which the following is a specification:

The object of this invention is to so construct the hydraulic brakes of gun-carriages that a perfect control can be had at will over the sliding of the gun, so that when desired the gun may be retained in any position on the slide. This will be found of great service for naval guns, particularly in bad weather, and when, from the rolling or pitching of the vessel, the gun is liable to break away from its lashings. During the firing of the gun, however, this hydraulic brake is self-acting, and checks the recoil of the gun in the ordinary manner. This is effected by means of a specially-constructed piston, fitted with a series of valves, and packed with leather. The piston-rods pass through both covers of the hydraulic cylinder.

The hydraulic brake of the ordinary construction only checks the recoil of the gun-carriage in connections therewith, and is therefore only applicable to guns used in land-batteries, or on level platforms. For naval purposes, where the level of the platform is always liable to alteration through the motion of the sea, the hydraulic brake heretofore used does not act as a check upon the gun in its forward sliding, and offers no means of fixing the gun-carriage in any position that may be desired.

By means of this improved arrangement the gun-carriage can be fixed in any desired position, by preventing the liquid in the hydraulic cylinder from passing through the valves in the piston, these valves always being kept closed by a spring, which spring can, however, be operated upon by means of a lever, and thus the valves are opened, and the liquid in the cylinder allowed to pass through the piston, and the gun-carriage is able to move upon its slide.

In the ordinary hydraulic brake the cylinder is fixed, and the piston-rod is attached to the gun-carriage, and moves with it; but in this

improved arrangement the cylinder is attached to the gun-carriage and traverses with it.

In the drawings hereunto annexed is shown the method in which this invention is carried into effect, the hydraulic brake being represented as applied to a naval gun-carriage.

Figure 1, Sheet I, is a side elevation, partly in section; and Fig. 2, a plan of this improved construction of brake. Fig. 3, Sheet II, is a section through the hydraulic cylinder. Fig. 4 is an enlarged section of the piston taken through the lines *xyz* of Fig. 5, which is an end view of the piston. Fig. 6 is a view of the piston, one-half of which is removed in order to show the valves in the other half.

The same letters of reference indicate similar parts in each of the figures.

In this arrangement, the piston is shown fitted with four valves. *A* is the cylinder fitted with a cover, *C*, having formed upon it two strong pins, *aa*. *G G* are two connecting-rods, attached at one end to the pins *aa*, the other ends being formed into forks, which embrace and are attached by strong bolts to brackets *b* riveted firmly to the under side of the gun-carriage *H*. By this means the cylinder is attached to the gun-carriage, and moves with it. The other or back end of the cylinder is furnished with a wrought-iron flange, *c*, to which the cylinder-cover *D* is attached with screws. *B* is the piston, which forms the essential part of this invention. This piston *B* is formed in two halves, *d* and *e*, which are fitted into each other with lap-joints, as shown, and then firmly secured by the bolts and nuts *f*. *E* and *F* are two piston-rods, the rod *E* being screwed into the half *d* of the piston, and the rod *F* to the other half *e*. Both piston-rods pass through stuffing-boxes in the covers of the cylinder. The cylinder is filled with the ordinary fluid, notwithstanding any position of the piston, and the two piston-rods have the same dimensions so that their displacement of the fluid in the cylinder is equal on each side of the piston. The two halves of the piston are turned out on the inside, so as to form a cylindrical space, *g*, in the combined piston, as shown. *h h* are four valve-spaces formed in the forward half of the piston. *i* is a metal disk, which is capable of

moving to and fro in the space *g* in the piston, and has fitted to it four valves corresponding in position to the valve-spaces *h* in the shaft-piston *d*. *k k* are four holes drilled through the disk *i*, and corresponding with four holes drilled through the back half *e* of the piston, so that when the valves *h h* are open the fluid in the cylinder can freely pass through the piston. *m m* are leather packings to the piston to prevent the liquid in the cylinder passing at any time between the circumference of the piston and the cylinder.

The forward piston-rod *E* is fixed to the front end of the slide by means of a cross-head, *n*, and bolt *o*, passing through the iron frames, forming part of the slide, while the hinder rod *F* is attached to the bracket *P*, and is thus secured against any lateral movement. This hinder rod *F* is hollow, as shown in the drawings, and through it is passed a rod, *q*, one end of which is secured into the disk *i*, which carries the valves, while the other end is connected with a strong spring, *S*, by means of the coupling *r*. This spring *S* presses upon the rod *q*, and forces it forward, and thus brings the valves on the disk *i* down upon their seats, and closes them. *t* is a screw-lever, the action of which, when it is raised up, is to depress the spring and draw back the disk *i*, and open the valves in the forward half of the piston, and allow free passage of the liquid in the cylinder through the piston. The valves in the piston are closed by depressing the lever, and then the spring forces the rod *q* forward, and with it the disk *i*, bringing the valves down upon their seats. The action of this brake is as follows:

Presuming the brake to be in the position shown in Figs. 1 and 2, Sheet I, the gun would then be forward ready for firing. The liquid in the cylinder would be in front of the piston. Directly the gun is discharged the recoil of the carriage would commence, and then the pressure on the liquid in the cylinder would be very great, and far beyond the pressure of the spring *S*, which would therefore be forced back by the pressure of the liquid against the valves, which would consequently be opened, and the liquid in the cylinder would pass through the piston, as in the ordinary brake, and this passage of the liquid would continue until the pressure due to the recoil is below the pressure of the spring *S*, and then the spring would come into action, and, forcing forward the rod *q*, would bring the valves on the disk *i* down upon their seats, and all further passage of the liquid is stopped.

It will be thus seen that until the valves are opened by raising the lever *t* the capability of the gun to move in either direction is quite

prevented, and therefore the gun cannot be run forward until the lever is raised and the valves are opened. This arrangement, therefore, admits of perfect control over the action of the gun, and for naval purposes this brake will be found of great advantage, as, while the lever is down and the valves closed, the passage of the fluid is impossible through the piston, and therefore in the heaviest sea there could be no danger of the gun breaking loose, even if no lashings are used to fasten the gun.

For greater security at sea, and when the guns are not required for use, a block or stop may be placed so as to prevent any possibility of depressing the spring *S*; but care must be taken to remove this block or stop before firing the gun.

The brake just described is shown with four valves, but the invention is not confined to this number, as more or less may be applied with equal facility; and in Figs. 7, 8, 9, Sheet III, is shown a piston fitted with only one valve. The piston is made in two halves, firmly attached together by the bolts *f f*. The front and back piston-rods are shown in one piece, with their respective portions of the piston. The back piston-rod is also hollow, and through it is passed the rod *q*, having attached to its front end the valve *h*.

k k are holes drilled through the neck of the piston-rod *E*, and communicating with the valve *h*; and *l l* are holes through the boss of the piston-rod *F*. The rod *q* is attached to a spring exactly in the same way as described in reference to the brake with four valves, and shown in Sheets I and II, and the action of this arrangement is precisely similar.

When the recoil takes place the pressure forces back the spring, and, thus opening the valve *h*, the fluid can flow in through the holes *k k*, and, passing through the valve *h*, escapes through the holes *l l* into the back part of the cylinder. When the gun is to be run forward the spring is depressed, which opens the valve *h*, and the flow of the liquid is thus reversed—viz: it enters through the holes *l l*, and, passing through the valve *h*, escapes through the holes *k k*. In all other respects the brake is the same, and is attached to the gun-carriage in a similar manner, as before described.

I claim—

In a hydraulic brake for gun-carriages the combination of the two-part piston, piston-rod, disk, and valves, substantially as and for the purposes set forth.

ALFRED KRUPP.

Witnesses:

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ERNST HELPERS.