(No Model.)

2 Sheets—Sheet 1.

J. VAVASSEUR.

GUN MOUNTING.

No. 345,744. Patented July 20, 1886.

Fig. 1.

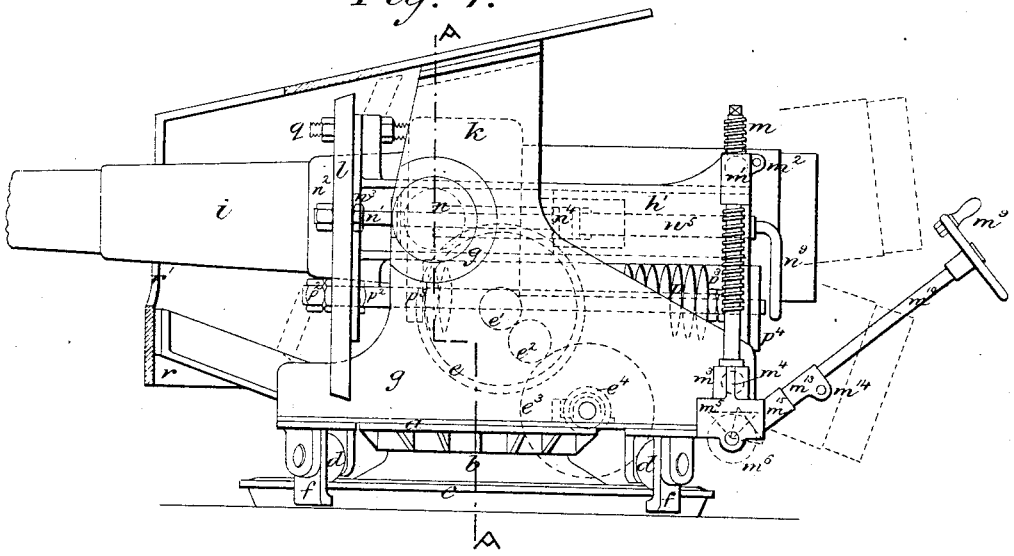
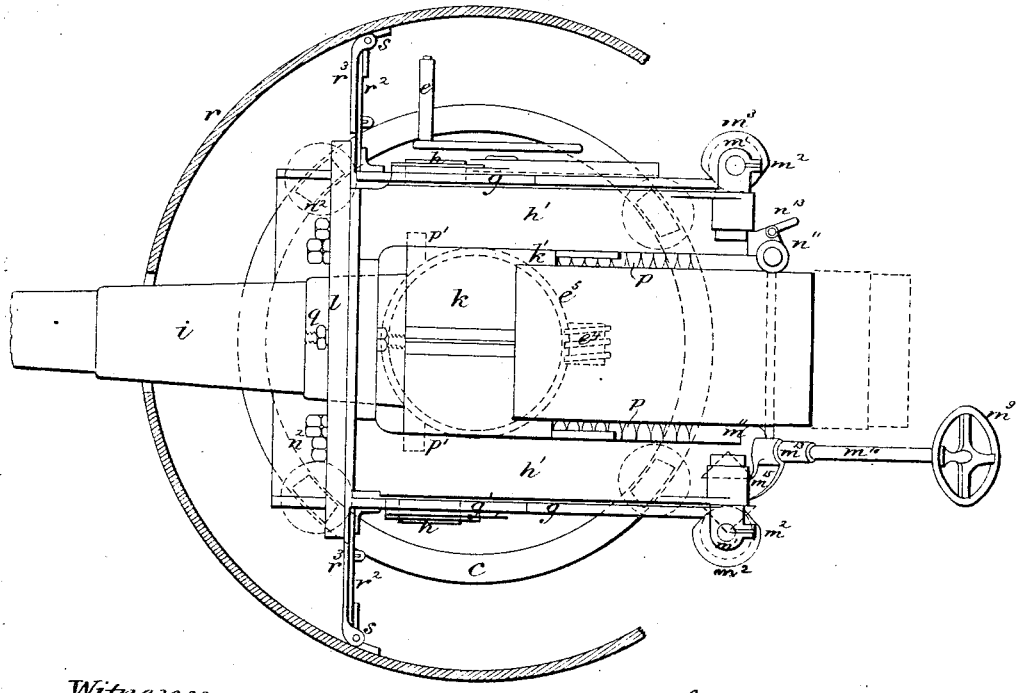


Fig. 2.



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(No Model.)

2 Sheets—Sheet 2.

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GUN MOUNTING.

No. 345,744. Patented July 20, 1886.

Fig. 3.

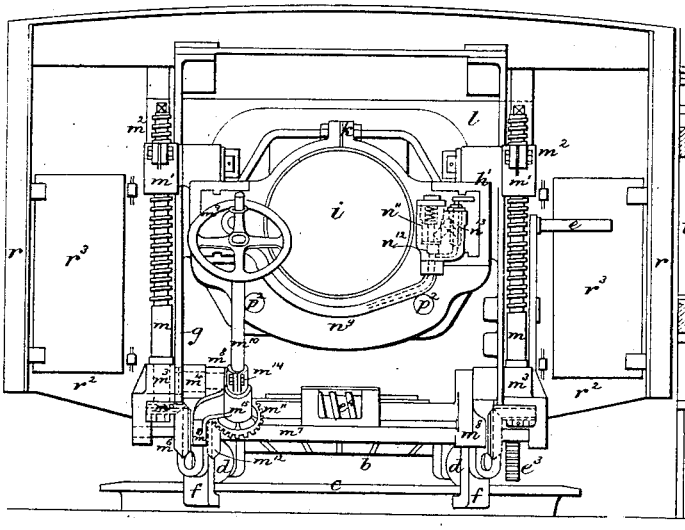


Fig. 4.

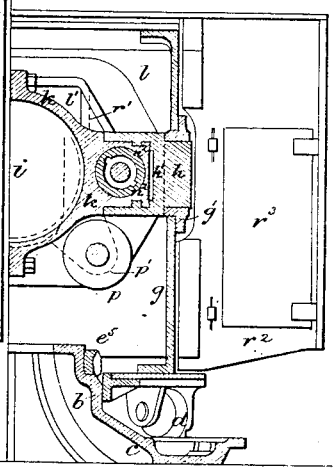
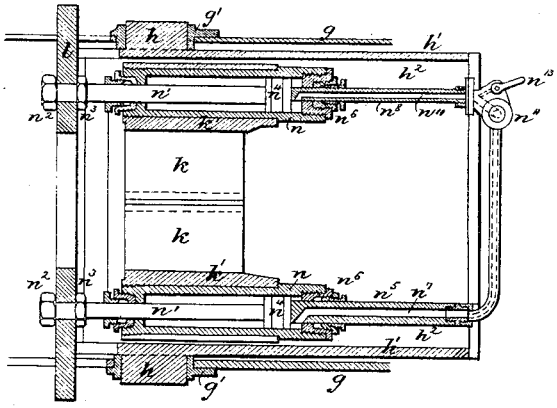


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSIAH VAVASSEUR, OF SOUTHWARK, COUNTY OF SURREY, ENGLAND.

GUN-MOUNTING.

SPECIFICATION forming part of Letters Patent No. 345,744, dated July 20, 1886.

Application filed February 26, 1886. Serial No. 193,289. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH VAVASSEUR, of the London Ordnance Works, Southwark, in the county of Surrey, England, engineer, a subject of the Queen of Great Britain, have invented certain new and useful Improvements in Gun-Mountings, of which the following is a specification.

This invention has for its object improvements in gun-mountings. The lower portion or under frame of the gun-mounting pivots either at its fore end or about a pivot centrally arranged, as the case may require. It is supported on training-rollers and is worked by training-gear in the same way as an ordinary slide. There are standards upon this lower portion of the mounting, and these receive trunnions formed upon a guide-frame or trunnion-frame within which the gun, which is without the usually-provided trunnions, is able to recoil. At its fore end the guide-frame carries an armor-plate shield with a hole or embrasure through which the gun projects. The trunnioned guide-frame at its rear end is supported by elevating-screws passing through trunnion-nuts jointed to the guide-frame. On the elevating-screws at their lower ends are beveled pinions engaging with corresponding pinions upon a horizontal axis, which receives its motion from a hand-wheel through suitable gear; or, in place of employing elevating-screws with nuts, racks and pinions may be used, but less conveniently. The recoil of the gun is controlled by hydraulic compressors. The cylinders of these are preferably secured to the gun by clips passing around it. The piston-rods pass out from the cylinders at their fore ends, and are fixed to the armor-plate shield or to the fore part of the trunnioned guide-frame. Springs are also provided which are compressed by the gun when it recoils. The springs are arranged upon rods or spindles fixed to the armor-plate shield, and lugs upon the clip which secures the hydraulic cylinders to the gun abut upon these springs. Preferably the compressor-cylinders are secured one on either side of the gun, and the cylinders form the blocks to travel in the guides of the trunnion-frame when the gun recoils, and afterward returns by the operation of the springs. The buffer-springs are of sufficient power and range to return the gun to the firing position, even when elevated to a high angle, and to maintain it there. The firing position to which the gun is brought by the reaction of the springs is controlled by stops fixed to the shield or to the trunnion or guide frame, and these stops are adjustable, so that when the gun is forward the balance of the parts about the trunnions may be such as to admit of the gun being elevated or depressed by rocking the trunnioned frame by a moderate force applied to the elevating-gear. In this arrangement it will be seen that the recoil in no way interferes with the elevating-gear, and takes place in an axial direction, whatever may be the position of the gun when it is fired. To control the return of the gun after recoil I provide on one of the pistons of the hydraulic compressors, on the side opposite to the piston-rod, a trunk of larger diameter than this rod. This trunk passes through the end of the cylinder by a suitable packed joint. As the trunk enters the cylinder during recoil some of the liquid contents is necessarily ejected. I provide a passage longitudinally through the trunk, by which this liquid passes out. The other piston of the hydraulic compressor I also, in like manner, provide with a trunk; but in this case the trunk is of smaller diameter than the piston-rod, consequently when, during the recoil, the piston-rod emerges from the cylinder, although the trunk at the same time enters a void, space is left within the cylinder, or would be left if provision were not made to fill it. I make use of this space to receive the liquid ejected from the other cylinder of the hydraulic compressor. The liquid enters the receiving-cylinder by a passage through the trunk similar to that which leads the liquid out of the other cylinder. I connect the two trunks by a pipe, in the course of which a valve-box is provided containing a valve. This valve allows the ejected liquid to pass freely from cylinder to cylinder during recoil; but it prevents return when the gun tends to move in the opposite direction. The gun consequently cannot run out until this valve is lifted, or until a by-pass is opened for the liquid, which is usually more convenient.

In order that my said invention may be most fully understood and readily carried into

effect, I will proceed to describe the drawings hereunto annexed.

In the drawings, Figure 1 is a side view of a gun-mounting. Fig. 2 is a plan of same. Fig. 3 is a rear end view. Fig. 4 is a half transverse section on line A A of Fig. 1. Fig. 5 is a sectional plan of the compressor-cylinder, showing the arrangement for controlling the run-out.

The lower portion or under frame, *a*, of the mounting works on a centrally-placed pivot formed by the raised tubular portion *b* of the circular plate *c*, fixed to the deck or platform on which the gun is mounted. The mounting may also be arranged to work on a front pivot. The under frame, *a*, is supported on training-rollers *d*, and is trained from the hand-wheel *e* through spur-wheels $e' e^2 e^3$, which drive the worm e^4, gearing with the worm-wheel e^5, fixed on the tubular pivot *b*. On the axles of the training-rollers *d* are fitted clips *f*, to prevent the lift of the mounting when the gun is fired. On the base *a* are placed standards *g*, provided with trunnion-bearings *g'*, which receive trunnions *h*, formed upon a guide-frame, *h'*, within which the gun *i* can recoil. The gun is made without trunnions, and is held in a strap, *k*, forming part of the sliding blocks *k'*. The trunnion guide-frame *h'*, while adapted to rock, does not reciprocate. It is fitted with guiding-tongues h^2, on which the blocks *k'* work, and these serve to keep the two parts or opposite sides of the guide-frames from spreading apart out of position when the gun is fired. At its fore end the trunnioned cradle-like guide-frame *h'* carries an armor-plate *t*, provided with a hole or embrasure, *t'*, through which the gun projects. The rocking non-reciprocating trunnioned guide-frame at its rear end is supported by elevating-screws *m*, passing through trunnion-nuts *m'*, jointed to the guide-frame *h'* at its upper part. The nuts *m'* are split, so that by means of the clamp-nuts m^2 any play due to wear may be suppressed. The elevating-screws work in bearings m^3, capable of turning on the pivots m^4, carried in bearings in the standard *g*. The lower ends of the elevating-screws are provided with bevel-pinions m^5, engaging with corresponding pinions m^6 upon the horizontal shaft m^7. This shaft is carried in bearings, those at the outer ends being formed on m^3, and the inner bearing, m^8, being keyed on the ends of the pivots m^4, so that the whole of these bearings and the shaft m^7 with the bevel-wheel turn on the pivots m^4, following the fore-and-aft movement given to the screws *m* as the nuts *m'* work up and down in the circular path described from the center of the trunnions *h*. Motion is given to the screws *m* from the hand-wheel m^9, placed at the end of the shaft m^{10} sufficiently to the rear to be clear of the gun at the end of recoil. The shaft m^{10} drives the bevel-pinion m^{11}, gearing with the corresponding pinion m^{12} on the horizontal shaft m^7. The shaft m^{10} is by preference made so as to be readily removed by fitting into a socket, m^{13}, in which it is clamped by the bolt m^{14}. The bearing m^{15} for the shaft m^{10} is formed on the inner bearing, m^8, of the horizontal shaft m^7.

In place of using screws for elevating, as shown by these drawings, racks and pinions may be employed, but not so conveniently.

The recoil of the gun is controlled by hydraulic compressors, the cylinders of which are secured to the gun and recoil with it. The cylinders may either be formed in one piece with the straps *k* and guide-blocks *k'*, or may be inserted in those blocks and secured by being screwed into them, as shown, or in any equivalent way. The piston-rods *n'* pass out of the cylinders at the fore end, and are secured by the nuts $n^2 n^3$ to the armor-plate *t*, or they may be secured to the fore end of the guide-frame *h'*.

The pistons and valves n^4, for controlling recoil, I make by preference according to my well-known system—that is to say, I provide passages in the pistons and disks to cover these passages. When the piston moves along the cylinder, the disk is turned around upon the piston by the operation of rifle-grooves within the cylinder, so that during recoil the passages are progressively closed. Both the piston-rods are arranged to act in tension during recoil, and, in order to keep the cylinders full of liquid, and also to provide a means of holding the gun in at the end of recoil, and to control the speed at which it is to return to the firing position, I make on one of the pistons n^4, on the side opposite to the piston-rod, a trunk, n^5, of larger diameter than the rod *n'*. The trunk n^5 passes through the end of the cylinder by a suitably-packed joint, n^6. As the trunk n^5 enters the cylinder during recoil some of the liquid contents is necessarily ejected. I provide a passage, n^7, longitudinally through the trunk, by which this liquid passes out. The piston n^4 of the opposite hydraulic cylinder I also in like manner provide with a trunk, n^8; but in this case the trunk is of smaller diameter than the piston-rod *n'*, consequently, when during the recoil the piston-rod *n'* emerges from the cylinder, although the trunk n^8 at the same time enters a void, space is left within the cylinder, which space is employed to receive the liquid ejected from the other cylinder. The liquid passes to the receiving-cylinder during recoil by the passage n^7 through the connecting-pipe n^9 to the passage n^{10} in the trunk n^8. The relative volumes of the trunks $n^5 n^8$ are arranged so that their sum is equal to the volumes of the two piston-rods *n'* and their difference as small as possible, regard being had to the pressure generated in the receiving-cylinder when the gun is held in at the end of recoil. In the course of the connecting-pipe I fit a valve-box, n^{11}, having a valve, n^{12}, held lightly on its seat by a spring, so that it rises and allows the liquid to pass freely to the receiving-cylinder during recoil, but closes and prevents its return when the gun tends to run out. The gun is consequently held in and cannot run out until the valve n^{12} is lifted; but in or-

der to avoid disturbing this valve I provide a by-pass with a screw-plug, n^{13}, in a passage communicating with the passage n^{10}, and entering the valve-box below the valve n^{12}. By raising the screw-plug n^{13} the liquid in the receiving-cylinder can pass back to the opposite cylinder, and the gun may go out; or, if the screw-plug is closed before firing, the gun will remain in. The mounting is arranged so that at all angles of elevation the gun recoils in the line of fire. To run the gun out again, springs p are provided. These are compressed during recoil by means of the brackets p', formed on the straps or sliding blocks h'. They are arranged upon rods p^2, secured at the fore end to the armor-plate t or may be secured to the guide-frame h'. The necessary compression is given to the springs p to keep the gun in the firing position at the greatest angle of elevation and insures its running out by means of the nuts p^3. A plate, p^4, secured to the guide-frame h' supports the rear ends of the rods p^2.

The firing position to which the gun is brought by the reaction of the springs is controlled by the adjustable stop q, (more or less,) fitted to the shield t or placed in any other suitable position. A circular shield, r, with port r', for the gun to pass through, is shown secured to the standard s by side wings, r^2, giving additional lateral protection. Hinged doors r^3 are provided in these wings to give access to the front of the mounting. It is so arranged that when the gun is in firing position the balance of the parts about the trunnions h may be such as to admit of the gun being elevated or depressed by a moderate force applied to the elevating-gear. It will also be seen that the recoil of the gun in no way interferes with the elevating-gear.

What I claim is—

1. The combination, substantially as set forth, of the pivoted under frame, a trunnioned frame having its trunnions mounted in bearings of the said under frame, a trunnionless gun within the trunnioned frame and sliding along it, and springs which check the recoil and return the gun to the firing position.

2. The combination, substantially as set forth, of the under frame, a trunnioned frame having its trunnions mounted in bearings of the said under frame, the trunnionless gun within the trunnioned frame and recoiling along it, and hydraulic compressors which control the movement of the gun, as set forth.

3. The combination, substantially as set forth, of the under frame, the trunnioned frame having its trunnions mounted in bearings of the said under frame, the trunnionless gun within and recoiling along the trunnioned frame, the springs which return the gun to the firing position, and the hydraulic compressors for controlling the movements of the gun, as set forth.

4. The combination, substantially as set forth, of the under frame, the trunnioned frame having its trunnions mounted in bearings of the under frame, the trunnionless gun within and recoiling along the trunnioned frame, and the elevating-gear which connects the trunnioned frame and the under frame.

5. The combination, substantially as set forth, of the under frame, the trunnioned frame having its trunnions mounted in bearings of the under frame, the armor-plate shield fixed to the trunnioned frame and partaking of its movements, and the trunnionless gun within and recoiling along the trunnioned frame.

6. The combination, substantially as set forth, of the trunnionless gun, the trunnioned frame within which the gun is mounted and along which it slides, the hydraulic compressors which connect the gun with the trunnioned frame, the pistons with aperatures, the trunks or plungers attached to the pistons, the connecting passage for conveying liquid from one compressor-cylinder to the other during the recoil, and the check-valve which controls the return of the liquid and the running out of the gun.

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