J. B. EADS.

Operating Ordnance.

No. 46,342. Patented Feb. 14, 1865.

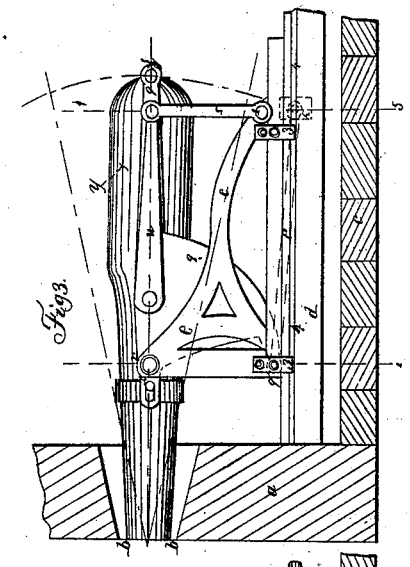

Fig. 3.

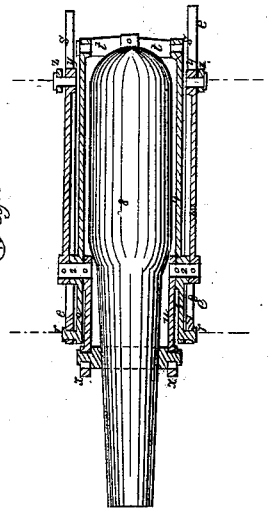

Fig. 4

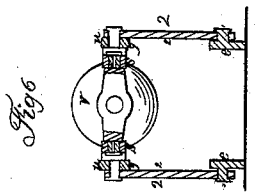

Fig. 6

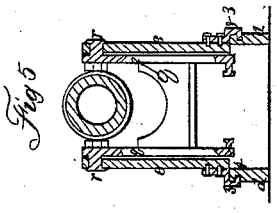

Fig. 5

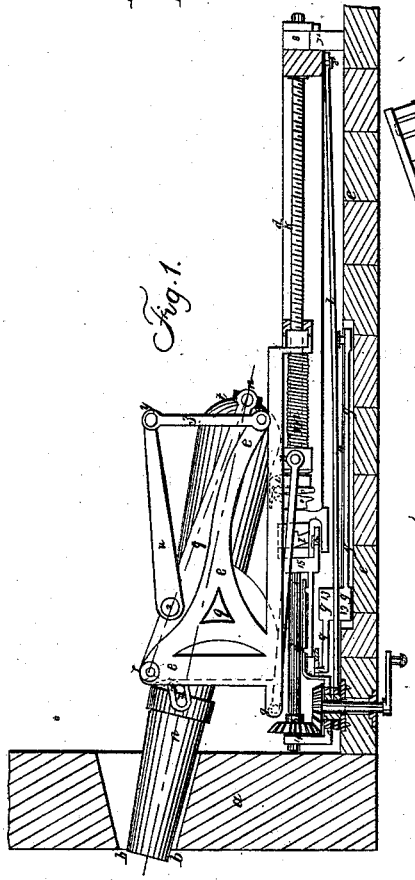

Fig. 1.

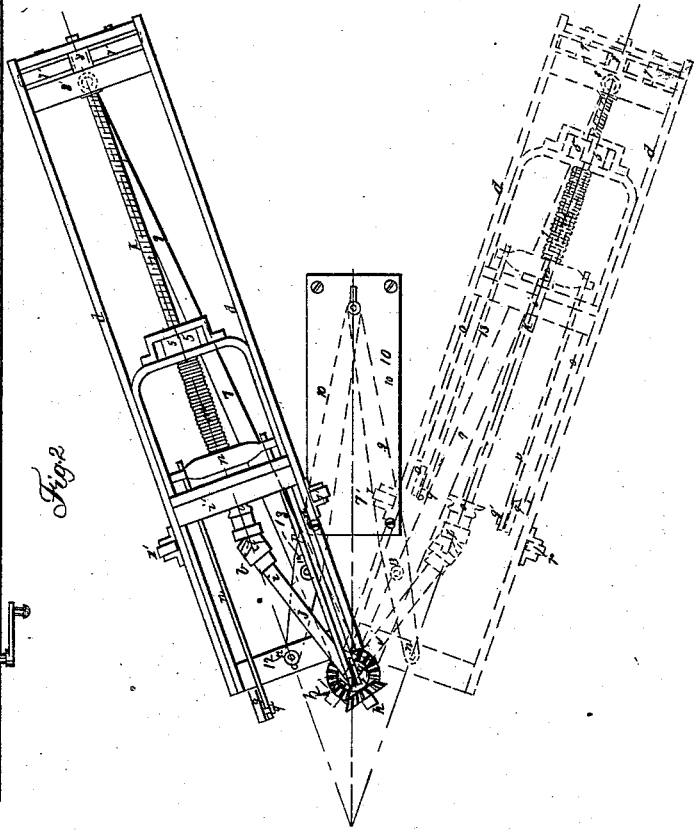

Fig. 2

Witnesses:
O. D. Munn
James P. Hall

Inventor
James B. Eads

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JAMES B. EADS, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN OPERATING ORDNANCE.

Specification forming part of Letters Patent No. **46,342**, dated February 14, 1865.

To all whom it may concern:

Be it known that I, JAMES B. EADS, of St. Louis, State of Missouri, United States of America, have invented an improved method of working guns in fortifications and in floating batteries; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed sheet of drawings, making a part of the same.

This invention relates to a better method of working guns on land and water; and it consists in working the gun in such manner as to admit of the use of a port-hole just large enough to receive the muzzle of the gun, and yet permitting the necessary elevation, depression, and lateral training of the gun with the utmost facility, all the movements of the gun being effected in such a manner that the muzzle forms the central point thereof.

The advantages of the said invention consist in greater security for the operators, who are thus enabled to work behind the fortifications, casemates, or turning turrets, always secured against the dangers which are involved in the use of large port-holes. Besides, by the use of small port-holes the armor or wall which protects the men is not weakened in the same measure as with larger port-holes, all the directing movements of the gun being imparted thereto at a point entirely inside of the inner line of the wall, and at some distance back from the muzzle or pivoting point of the gun, so that the integrity of the defense may be preserved.

I have represented my invention in the annexed drawings, where Figure 1 is a partly sectional elevation of the apparatus, showing the truck or lower carriage upon which is mounted the gun-carriage, and also the different parts which actuate the said truck; first, the screw-shaft; secondly, the levers by which said truck is controlled in its movements; thirdly, the vertical shaft which imparts the movement through the beveled wheels to the screw-shaft. Fig. 2 is a plan showing the truck and the levers controlling the movements thereof, and also the screw-shaft and the universal joint therein, with some other parts of the machinery, which will be better understood by means of the explanations which will be given hereinafter. Fig. 3 is a side elevation of the gun-carriage mounted on its truck. Fig. 4 is a top view of the gun and the levers which raise the same with a portion of the sides of the gun-carriage under them. Fig. 5 is a section through the line 1 2 of Fig. 3. Fig. 6 is another vertical section through the line 4 5 of same figure.

In all these figures the same letters of reference stand for the like parts in each.

This invention, as I have said, consists in the possibility of giving the gun all desired directions, either vertical or horizontal, without displacing sensibly the muzzle for the purpose of having as small a port-hole as possible, which result I attain by devices which impart to the gun its movements, the center of rotation of which is the muzzle of the gun itself. The movements to be imparted to the gun are of different sorts. The gun must be enabled to assume, first, all possible inclinations in the vertical plane; secondly, all possible inclinations in the horizontal plane; thirdly, a rectilinear to-and-fro movement for entering or being driven from the port-hole. I will successively describe these different movements, which, as I have before said, have all of them the muzzle of the gun as center of oscillation. *a*, section of wall showing the port-hole *b*; *c*, platform or floor upon which the truck *d* rotates; *d*, truck or lower carriage upon which is placed the gun-carriage *e*. Now, to give the gun different inclinations in the vertical direction, I first impart a rotary motion to the crank *f*, which imparts its motion to a wheel, *g*, gearing with wheel *h*, which slides upon the shaft *i*, which is made to slide into wheel *h*, so as to permit the necessary elongation when the shaft is bent in the universal joint. The shaft *i* is formed of two parts, *j* and *k*, connected together by a universal joint, *l*, the construction of which may be varied, as desirable.

Round the part *k* of the shaft *i* is a hollow threaded shaft, *m*, bearing a nut, *n*. The two shafts *m* and *k* are set in connection by means of a clutch, *o*, the hollow shaft *m* being loose upon the shaft *k*. The clutch *o* is so arranged as to slide upon the shaft *k*, but in such manner as to turn constantly therewith by means of a feather formed within the clutch, which slides in a longitudinal groove formed upon the shaft *k*. By causing the clutch *o* to move against the end of the hollow shaft, said clutch is made to adhere thereto, either by a frictional or any other known device, so as to make the hollow shaft turn. When the connection exists, if to the crank *f* is imparted a rotary motion, then

the nut n will receive, through this movement in one or other direction, a rectilinear motion on the shaft m, which shaft is held in a cross-piece, i', fixed to each side of the gun-carriage; but as the rods p are connected to nut n they will follow its movements, and will cause the segments and the levers q, to which they are attached at q', to oscillate round the fulcrum r, when the ends s s of said levers will be raised or depressed according to the direction given to the crank f, and the breech of the gun will follow the movements of the end of said levers q and as it is attached to the ends of the latter by means of the cross-piece t, which itself is attached to the end of the gun. At the same time the levers q q are elevated the levers u will be set in motion. These levers support the gun v at one of their ends x by means of two pins placed on the opposite sides of a collar surrounding the gun at this point. These pins enter slots formed on the ends x of the levers u u, which slots are to be long enough to permit horizontal motion of the gun produced by the vibrations of the levers q q. The other ends, y y, of levers u u are held at the same point of elevation by means of two rods, z z, jointed at 1 to the gun-carriage e, and by their upper ends to the levers u u, which upper ends constitute the center of oscillation of the levers u u. At the same time the rods z z permit of the necessary longitudinal movement of the levers u u caused by the vibrations of the levers q q. The levers u u are pivoted at 2 2 to the levers q q, by which means they are elevated or depressed according to the direction given to levers q q. The axes 2 2 of the levers u u traverse the levers q q, one arm of the levers u u being on one side of the levers q q and the other arm on the other side. By this arrangement of levers the ends y y of q q move more rapidly, but always in the same direction that the ends x x of the levers u u move in, and impart to the breech of the gun, and to that part supported at x x, the proper velocity required to rotate them in a vertical plane, the central point of which will be at the muzzle of the gun.

The means of giving the gun the various inclined positions in the vertical plane being understood, I will describe the means by which the gun-carriage is made to assume a longitudinal motion upon the truck or lower carriage.

The gun-carriage e being mounted on the truck d, as shown, its movements are guided thereon by means of four guides, 3 3 3 3, screwed on the sides of the carriage. The lower ends of these guides slide in grooves 4 4, Figs. 3 and 5, formed in the sides of the truck to receive them. By this means the carriage is not liable to any derangement in its position. In order to reduce friction, rollers may be placed between the gun-carriage and the lower carriage. The screw-shaft k is of a size to admit of an independent movement in the hollow shaft m. On this inner shaft, k, there is a nut, 5, formed of two equal parts, so that when these two parts are separated the shaft is allowed to rotate freely between them without actuating the nut 5; but when the two said parts are brought together, then the rotation of shaft k will impart to the nut 5 a rectilinear motion in one or the other directions, according to the direction imparted to the crank f. Now, as the nut 5 is attached to the end of the carriage e, the latter will follow the rectilinear movements thereof. The two parts of the nut will move in grooves transverse to the axis of the shaft k, and be set apart or brought together at will by means of any suitable devices operated by a hand-lever. They may also be made to open automatically when the nut has reached either end of its course by such or similar devices as are used in reversing the motion of the bed or table of a planing-machine, and thus all danger of straining the machinery if the nut be kept closed too long on the revolving shaft will be avoided; but these are only details of so plain a nature that they will be readily understood by any one skillful in the art without further explanation. All that is requisite is the opening of the nut sufficiently apart for liberating the shaft and closing the same firmly enough to permit of its seizing upon the thread.

This rectilinear movement of the gun-carriage upon the lower carriage or truck being understood, I will describe the means whereby I give the gun different directions in the horizontal plane. These means are the same as those already described for giving the gun variable vertical inclinations, except that but one set or pair of levers is required, and these move in a horizontal manner and control the movements of the truck in such a way as to cause its motions to have for their center a point in a vertical line drawn through the center of the exterior of the port-hole.

To allow of an easy oscillation of the truck or lower carriage, I provide its two ends with four rollers, $7^{\times}$ $7^{\times}$ and 7′ 7′. The screw-shaft k has on its end a friction-roller, 8, or a pinion gearing with the two wheels $7^{\times}$ $7^{\times}$, so that when the friction-roller and the shaft k are engaged the wheels $7^{\times}$ $7^{\times}$ will turn and cause the truck to pivot. A lever, 7, jointed to the end of the truck at $8^{\times}$, and free to oscillate round the axis 6, corresponds to the levers q q on the gun-carriage. Another lever, 9, jointed on one part to a stationary plate, 10, by means of a pin, 11, and a slot, and on the other part to the lower carriage, likewise by means of a pin, 12, and a slot, corresponds to the levers u u on the gun-carriage. This connection of the lever 9 by means of pins and slots, as said, is intended to permit the necessary longitudinal movement of 9, caused by the vibration of the long lever 7. The lever 9 is attached in the same manner as the levers u u on the lever 7, by means of a pivot or axis, 13, fixed through the said lever 7. The bearings 14 and 15, which support the shaft j, are joined together under the shaft in such a manner as to allow the bearings to move apart to accommodate the elongation of the shaft, caused by the deflections of the universal joint. The two parts forming

these bearings are pivoted around the axis 6 and at the point 16. Now, it will be easily understood that if the great lever 7 is displaced by causing the rollers $7^{\times}$ $7^{\times}$ to rotate, which rollers set the end of the lever 7 into motion, the conditions will be exactly the same as those described with regard to the vertical inclinations to be given to the gun, only in this case the gun is replaced by the truck. Now, the truck being displaced, the lever 7 will oscillate round the stationary point 6. During this oscillating motion the lever 9, in pivoting at the point 11 will be displaced, for in the oscillating movement of lever 7 the point 13, where the two levers are jointed together, has been displaced. Now, the end 12 of the lever 9 being connected to one end of the truck, the latter will follow the movement of the end 12 of the lever 19, while the other end of the same truck will follow the same movement as the end 8 of the great lever 7, and all these movements are arranged and combined (like those heretofore described in alluding to the movements of the gun) in such a manner as to have for their center of oscillation the horizontal projection of the gun-muzzle.

Fig. 2 represents a plan view of the lower carriage, and I have drawn different positions in order to better show the working of the various pieces and parts in the movement of the truck round the point 17. To avoid confusion one of said positions is shown in black and the other in red. I likewise have represented the gun-carriage sliding on the truck in two various positions.

From what has been said it is plain that the gun thus placed on the two carriages, as described and shown, may first assume all the desired inclinations in both vertical and horizontal planes, still preserving as center of its movements the muzzle, and consequently the latter, not moving sensibly, will require but very small port-holes, and in the second place it may assume movements to and fro on the lower carriage.

The use of a shaft with a universal joint is not absolutely necessary, as one stiff shaft may be used having its axis always parallel to the long lever under the truck, while the nuts and hollow shaft may be arranged to slide from side to side of the gun-carriage, according as the truck is trained, and as may be required by the changing position of the shaft.

I claim—

1. Supporting a gun at two different points in its length by a combination of devices on a gun-carriage acting in connection with each other in such a manner as to rigidly compel the gun, whenever it is moved in a vertical plane, to rotate about a point in advance of said devices, and at or near its muzzle.

2. Controlling the horizontal movements of the chassis or lower carriage which supports the gun-carriage by a combination of devices acting in connection with each other upon the chassis at two different points in the length of the latter in such a manner as to rigidly compel its longitudinal axis to rotate about a point in advance of the chassis, and the devices which control its movements, so that the center of rotation may be on the exterior of a defense-wall, while the devices are on the inner side of it at some considerable distance from the center of rotation.

3. The use of the axis 6, Fig. 1, at a point not the center of rotation of the chassis, when used in combination with other devices, for the purpose of producing a center of rotation for the chassis at a different point from said axis.

4. The use of axis 6, Fig. 1, at a point not the center of rotation of the chassis, when used as a channel for the conveyance of power to operate the gun.

JAMES B. EADS.

Witnesses:
SAVIALLY,
E. SHERMAN GOULD.