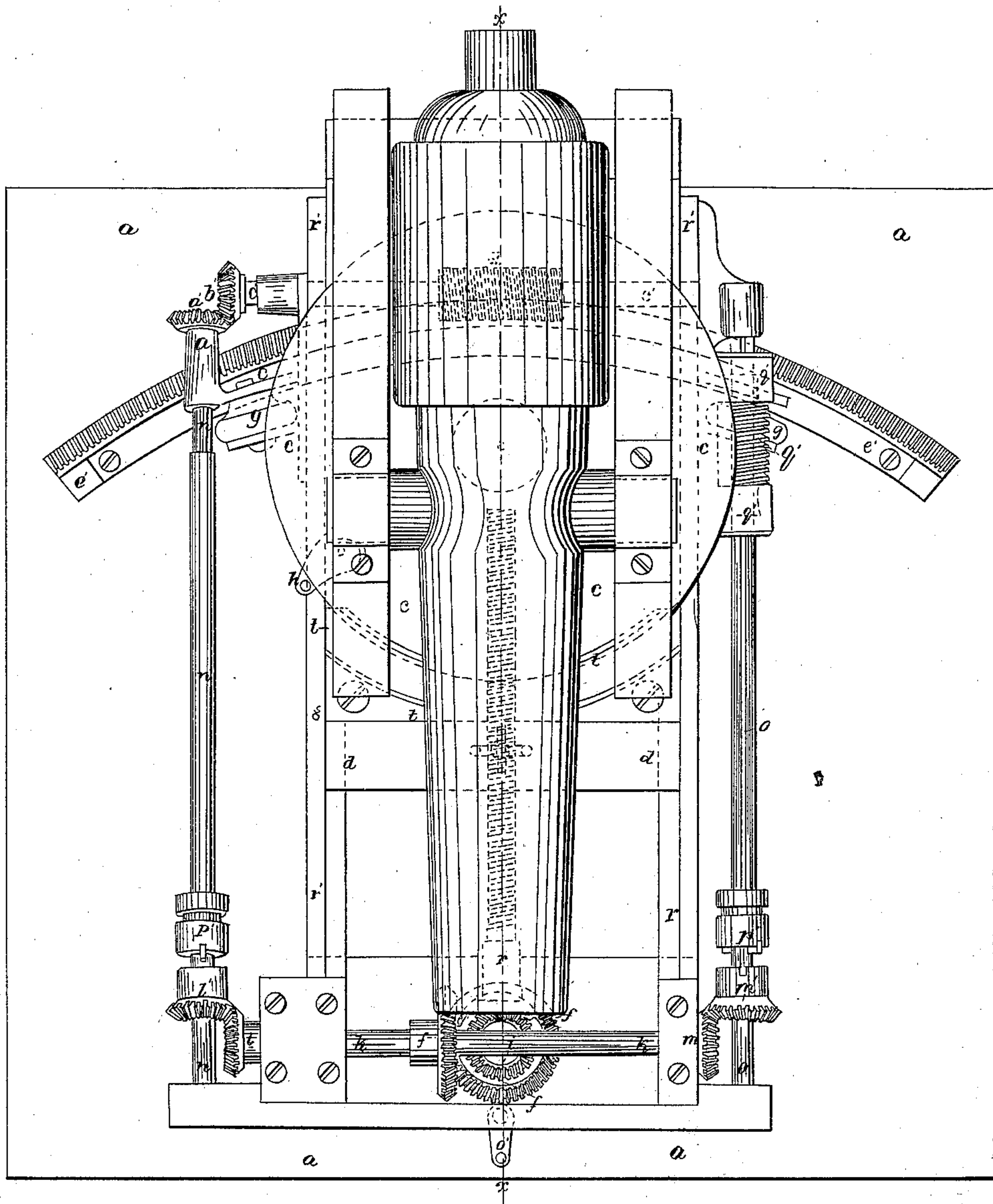


O. TUFTS.

Ordinance.

No. 37,250.

Patented Dec. 23, 1862.



John H. Melloway
W. B. Crosby Witnesses.

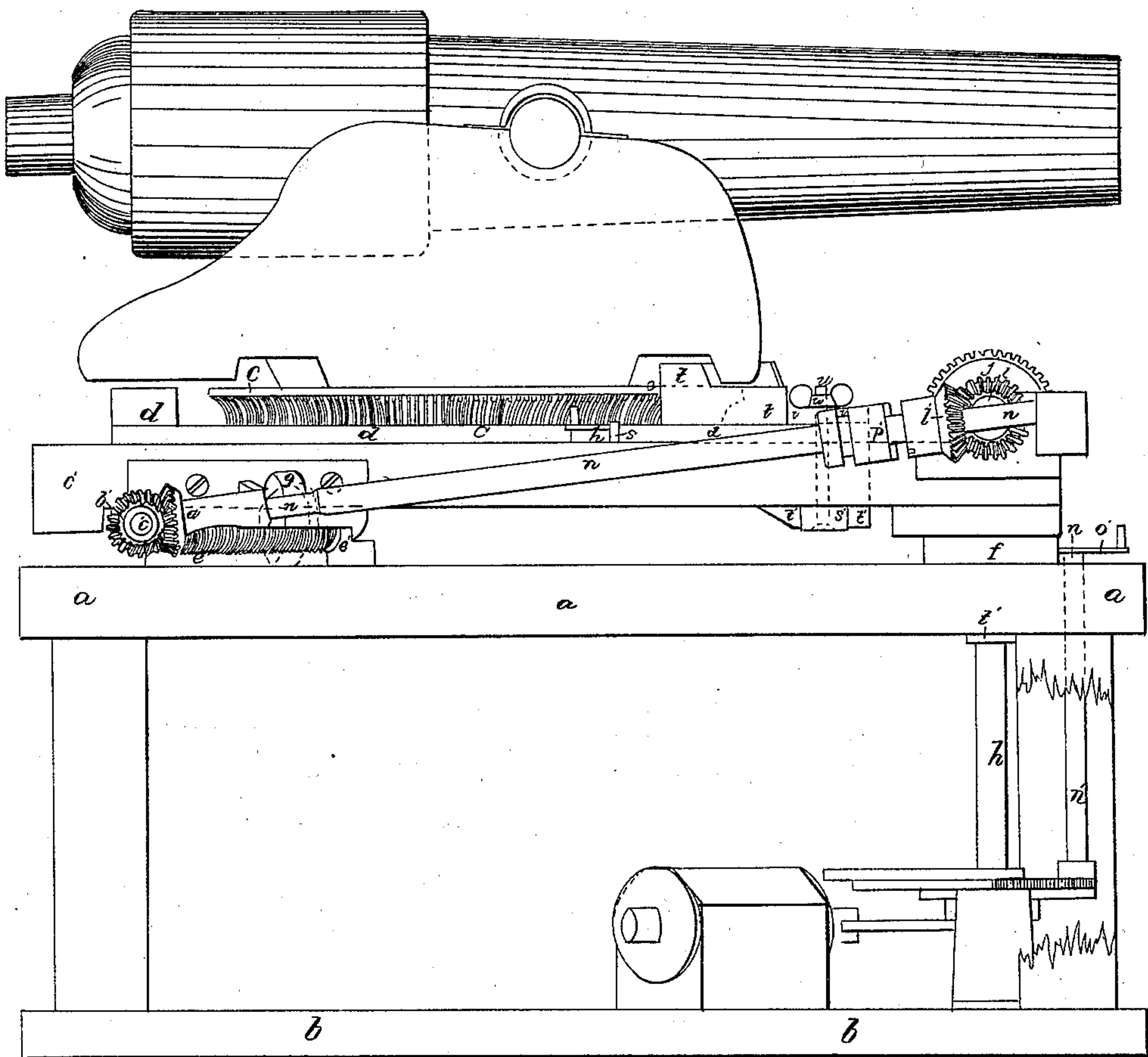
Otis Tufts Inventor.

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Witnesses

Jno E. Mulvaney
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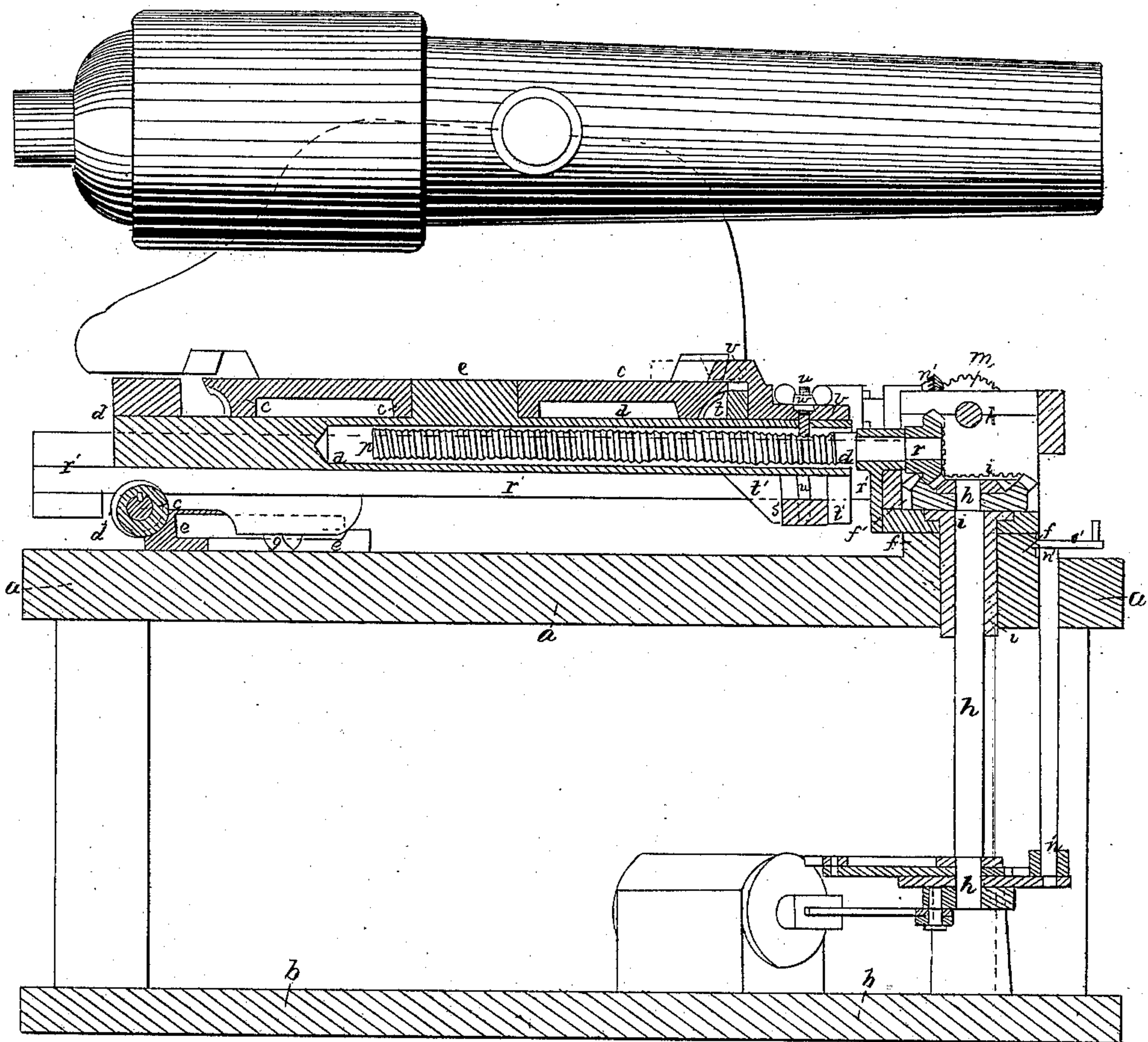
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4 Sheets—Sheet 3.

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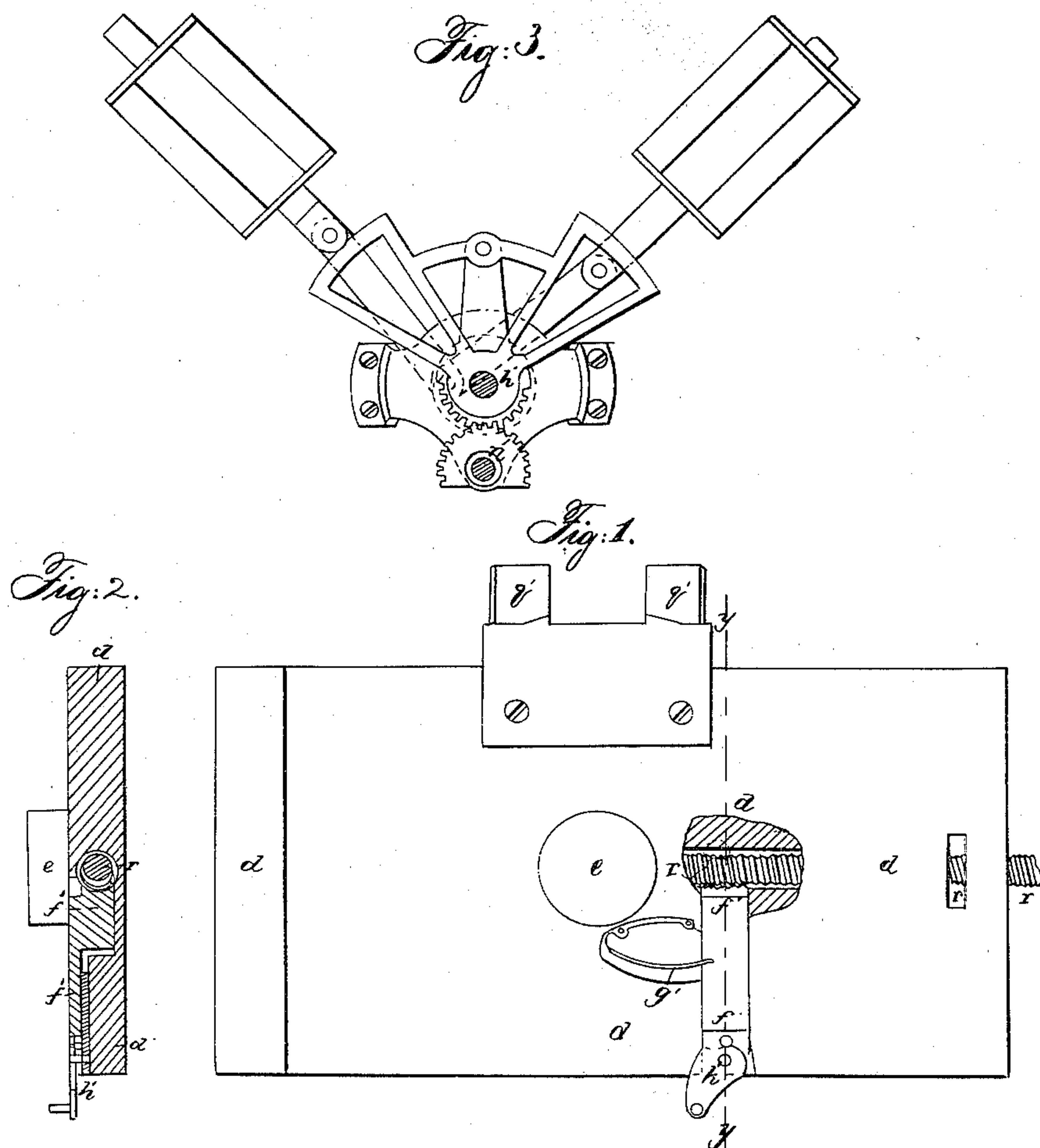
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UNITED STATES PATENT OFFICE.

OTIS TUFTS, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN OPERATING ORDNANCE.

Specification forming part of Letters Patent No. 37,250, dated December 23, 1862.

To all whom it may concern:

Be it known that I, OTIS TUFTS, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Operating Ordnance; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My invention relates to improvements in operating ordnance, which are illustrated in the drawings which accompany and form part of this specification. These improvements are shown in plan on Sheet 1, in side elevation Sheet 2, (this elevation being taken from the side at the right hand of the gunner as he stands to sight the piece,) and in sectional elevation on Sheet 3, the section being taken in a vertical plane passing through line *x x*, Sheet 1. On Sheet 4 are represented details, to be referred to hereinafter.

To enable others skilled in the art to practice my invention, I will now describe the construction, arrangement, and method of operation thereof, referring to the accompanying drawings, wherein similar letters refer to similar parts throughout.

My invention is particularly applicable in most of its parts to such heavy ordnance as are generally known as pivot-guns, though one of its features is applicable wherever a cannon is mounted upon one carriage which recoils upon another or sub carriage or way.

The invention is designed to be used in fortifications, particularly in such as are of a permanent character, and also, perhaps, more particularly on ship-board. It is in casemates, whether afloat or ashore, that the full benefits resultant from my invention are most applicable, though the invention may be applied to ordnance used *en barbette*, or on an open gun-deck. In my invention the gun is run into battery, and when not sent back by recoil may be drawn back by "power;" is trained upon the object to be fired at by power, and by power the muzzle of the gun is turned inward, or even completely around, to facilitate cleansing and loading without exposing men at or in range of the "port," all of which reduces the number of men needed to be employed in serving the gun to that number re-

quired to handle the ammunition effectively, directed by a captain, gunner, or engineer. The elevation and depression of the gun are not embraced within the scope of my invention, and are effected by the artillerists by aid of a screw or other well-known appliances, as heretofore.

In the drawings, *a* represents a gun-deck or gun-platform, and *b* a deck or platform immediately beneath. A gun is shown, which may be of any of the known kinds, supported in the usual way by trunnions on an upper carriage. This is made up of two cheeks or side pieces, *d*, which are fixed to a disk or turn-table, *c*, which has a worm-gear formed on its periphery, there being a pivot-hole formed in its center to receive the pivot *e*, fixed in the middle carriage, which is a somewhat plain piece, *d*, resting directly upon the ways of the "pivot" sub-carriage. *d* is otherwise fashioned and supplied, as shown in the drawings, and as will be explained hereinafter. The pivot or sub carriage is a rectangular frame capable of being vibrated on and about a pivot, *i*, which is secured in *a*, and which is directly beneath the muzzle end of the gun when run into battery, and at that end is supported, at a little distance above *a*, upon a collar, *f*, round the pivot, while the other end vibrates and is supported upon trucks *g*, which traverse on *a*, or on a curved rail upon or sunken into it. The pivot on which the lower or pivot carriage vibrates may be the shaft *h*, through which power is applied to work the gun; or else it must be a bushing, *i*, concentric with *h*, which in such case would pass through the bushing. *h* is provided with two bevel-gears, *i* and *j*, the latter of which rotates a corresponding gear, *j'*, which is on a shaft, *k*, which crosses the top of the pivot-carriage and rotates in suitable bearings thereon.

On each overhanging end of shaft *k* are fixed bevel-gears *l* and *m*, which rotate their corresponding gears, *l'* and *m'*, these latter revolving loosely around on the shafts *n* and *o*, which are mounted in suitable bearings fixed to the sides of the pivot-carriage, so that said shafts are about parallel with said sides. There are couplings *p* and *p'*, arranged so as to lock with and unlock from *m'* and *l'* by sliding along the shafts *o* and *n*, which, by the usual device of pin or feather and splineway, the couplings

are free to do, though, when rotated, they must rotate their respective shafts. The shaft o has a splineway formed along its length, and the worm q , which rotates c , surrounds o and is connected therewith by a feather, so as to be rotated by o while free to be slid along its length. q is mounted in and between bearings q' , which are fastened to d , so it will be plain that whenever the position of the slide or middle carriage is changed upon the pivoted or lower carriage that q will be borne along with d , and that in said change of position and at all times the worm q always remains fully in gear with the worm-wheel c . The overhanging end of n is provided with a bevel-gear, a' , which rotates its corresponding gear, b' , which is fixed upon the overhanging end of a shaft, c' , mounted in bearings fixed to and passing across that end of the pivot-carriage which is beneath the breech of the gun. On this shaft is fixed a worm, d' . (Shown in plan in dotted lines, Sheet 1, and in section in Sheet 3.) Beneath, and so that this worm will mesh therein, is fixed to a the toothed worm-rack e' , which is the segment of a circle struck from the center on which the pivot-carriage vibrates. The purpose of rotating worm q is to revolve the gun upon pivot e , so as to bring the muzzle somewhere inward out of exposure to fire through the port, and to some convenient location for loading. By thus revolving the gun many of the advantages claimed for a breech-loader are obtained without any of the disadvantages attendant upon their use. The purpose of rotating the worm d' is to vibrate the pivot-carriage on the bushing g , which is the pivot shown herein, for the purpose of training the gun or bringing it to bear upon an object. These rotatory or pivoting or vibrating movements might be obtained by other mechanisms than those described; but those I think to be the best of any, because, on ship-board particularly, the gun is always left locked in position by the worms and the parts into which they mesh, and also by the screw shaft and nut, to be described beyond. That this is the case will be so readily seen as to need no further comments. The gear i on shaft h rotates its corresponding gear, which is fixed on a screw-shaft, r . This shaft enters into d along its central line, and may be supported along its length on surfaces therein, so that d can slide back and forth freely over r . The object of this rotating screw-shaft is to draw the gun forward after it has recoiled consequent upon a discharge; but it may also be used to run the gun backward from, as well as forward into battery. Connection of the screw r with sliding piece d is made by means of a portion of a nut, (shown in detail in Figs. 1 and 2 of Sheet 4,) these being respectively, first; a plan of d , with a portion broken away, showing the screw r contained within; second, a section through Fig. 1, on line $y y$. These show the nut which is formed on one end of a slide-bar, f' , together with the means for moving the nut into and out of engagement with

the screw. A spring, g' , is shown, which operates to withdraw the nut from the screw-threads, and the vibratory cam-shaped piece h' is so arranged that the nut can be thrust by it into engagement with the screw against the resistance of spring g' . In actual practice it will be best to have portions of a nut operated on the screw from both sides, and to have them moved back as well as forward by a positive instead of by a spring motor. Some one of well-known devices—such as permitting slight sidewise movement to the nut—must also be introduced to insure that nut f' will move laterally so as to engage with the screw-threads when thrust forward, and not rest thereupon, as might otherwise be the case, especially if square threads were used. In Sheets 1 and 2 a stop-pin, s , is fixed in the lower or pivot carriage, against which h' impinges in the forward movement of the gun, so that h' is thereby moved and permits g' to throw the nut out of engagement with the screw, thus checking forward motion of the gun automatically at the right point, and preventing accident from forgetfulness or excitement. The best power for operating the devices described is that derivable from a small pair of engines arranged, with reference to shaft h , substantially in the manner shown in Fig. 3, Sheet 4, and also in Sheets 2 and 3. There is nothing novel in the engines, and so I do not propose to describe them, but dismiss the subject, saying that they are best arranged with the "Stephenson link movement," so that thereby they can be started, stopped, and reversed. The engines operate best placed on an angle of nearly ninety degrees, and should not have a fly-wheel, as it is extremely desirable in moving bodies, so heavy as are the gun and its carriages that their inertia should be gradually overcome.

Any suitable device may be employed to work the links. That which I show consists of a shaft, n' , coming up through a near h , and provided with an arm, o' , the position of which, by suitable connections, may be controlled by the gunner as he stands at his post to sight the gun, the means for doing this being so connected with the pivot-carriage that the instrumentality through which the gunner operates, however the gun may be trained, is always at the same place relative to him, as he stands at his post at the breech of the gun. So, also, by suitable devices, the couplings p and p' may be thrown into and out of gear, and the position of the nut may be controlled with scarcely any muscular effort.

To prevent the discharge and recoil of the gun from displacing c from its seat, a check or jaw, t , is secured to d , and projects for some distance round the periphery over the surface of c , front of the trunnion of the gun; but any tendency to displace c is still further checked by a device, which I shall now describe, in conjunction with the device which I employ to create friction to lessen the recoil of the gun. In the pivot-gun carriages in use this recoil

has been checked by the employment of two clamps or compresses, one on each side of the carriage, each requiring its own adjustment.

Passing across and beneath the longitudinal bars r' of the lower or pivot carriage is a bar, s' , which is kept from turning by jaws t' , projecting downward on each side of d . This clamp-bar is drawn upward against the lower edges of r' , thereby producing an increase of friction between slide d and the pivot-carriage by means of a screw-bolt, u , which is centrally located between r' , and is forked or assumes the form of a "staple" to clear the screw-shaft r . This screw-bolt passes through a large washer, v , which, like t , projects over the upper surface of c , so that it will be seen that, turning down the nut w , the turn-table c is firmly clamped, and the friction-resisting recoil is increased very simply and equally on both sides of the carriage. By this clamping the upper or turn-table carriage and the middle or sliding carriage are for the time united, so as to operate as if immovably joined.

In practice I propose to operate nut w by a ratchet-wrench in the manner well known to machinists.

It is on ship-board that the advantages obtained by my invention become most apparent. There, by the great saving in the number of men required to work the guns, the number of personal casualties in engagements is greatly lessened, and the space and displacement required for extra men and stores may be appropriated for coal and increased engine-power. As fewer men are required, the space formerly allowed between the guns for room for the artillerists to work in may be lessened, and the guns may be arranged more closely together, so that a casemate of given size will protect and cover more guns than heretofore. The ratio of the number of guns and the weight of metal which they can throw in proportion to the weight of armor carried are becoming of great importance.

I will now describe the general operation of the gun, premising that "steam is up," but shut off from the engine by the position of the links, their blocks being in their centers; that the couplings p and p' and nut f' are out of gear; that the clamp s is loosened; that the gun is fully "inboard" or run back as far as the ways of the pivot-carriage will admit; that it is loaded, and that the gun is trained to its central position. It is first necessary to run the gun forward into battery, which the gunner does by working h' so as to engage the nut in the screw-shaft. As this is done, he works the links so as to run the engine forward, when the gun begins to advance and moves rapidly toward and through the port till automatically stopped by the disengagement of the nut f' with the screw-shaft r . Stop-pins may be placed anywhere along the length of the carriage, if it is desired to automatically check the gun from moving forward its extreme distance; or the gunner can at any time pull the nut out of gear. When the gun

has moved forward far as desired, one of the artillerists tightens up the clamps r and s' by turning nut w . If the engine has not been stopped, and it is desired to train the gun to the right as the gunner stands, all that is necessary is to throw the coupling p' into gear; but if it is desired to train the fire to the left the gunner must reverse the engine by working the links, either before or after throwing the coupling into gear. The moment the gun is brought to bear upon the object, the gunner throws coupling p' out of gear, or stops the engine by moving the links; or he may do both. The piece on being fired recoils to the extent which is permitted by the degree of clamping, when one of the artillerists loosens the clamps. The gunner throws coupling p into gear, first being sure that p' is out of gear, and then causes the engine to move either one way or the other, according as he desires to rotate the gun on pivot e from right to left, or vice versa, in bringing the muzzle into the place where it is most convenient to cleanse and load the piece. This rotation is stopped for this purpose by throwing p out of gear, or by stopping the engine; and when the gun is charged the rotation on pivot e is continued or reversed by the gunner by moving p , or the links, as the case may demand. When the gun is swung round into line with the pivot-frame, motion on e is checked, and the nut f' thrown into gear, as before described, when the gun will advance, as previously set forth, and the operations of clamping, training, &c., are repeated. If it ever becomes desirable, the gun may receive all three of its motions at the same time, or any two of them—viz., the training motion on pivot i' , the turning for loading on pivot e , and the movement forward toward the "port." The ease and accuracy of movement thus imparted to the gun greatly increase the correctness of aim and the rapidity of fire to an extent which I consider in the crisis of an engagement equal to at least doubling the number of guns. As the gun is trained on a pivot directly beneath the muzzle end, it will be seen that I can obtain the maximum training-range with the minimum width of port.

To provide for the contingency of working the gun by hand, the usual and necessary eye-bolts, blocks, &c., may be affixed to the carriages, and trucks or rolls may be introduced into d and brought into operation when the gun is to be run forward, as in the ordinary hand-worked pivot-gun carriages, which, so far as operation is concerned, this herein described becomes when the worms q and q' are removed, and when the nut f' is thrown out of gear with the screw-shaft.

I claim—

1. The gun-carriage with its attached turn-table, in combination with the sliding or recoil carriage on which the table turns and the training carriage or slide that supports them, substantially as described.

2. Operating a pivot-gun carriage and the

gun thereon, substantially in the manner set forth—viz., by locating the shaft through which the power is transmitted so that it will be concentric with the training pivot or axis.

3. The training pin or pivot *i'*, when formed to admit the passage of a shaft concentrically through it, and combined with the training-carriage of a gun.

4. So arranging and combining a friction-producing clamp with the slide and ways of a gun-carriage that it may be operated at one central point, substantially in the manner de-

scribed, in the place of two separate clamps each requiring its own adjustment, as heretofore employed.

5. So combining the clamps *s'* and the clamp *v* that they are operated by one device in common, substantially in the manner set forth.

Executed this 22d day of November, A. D. 1862.

OTIS TUFTS.

Witnesses:

JNO. E. MULLONEY.

J. B. CROSBY.