(No Model.)

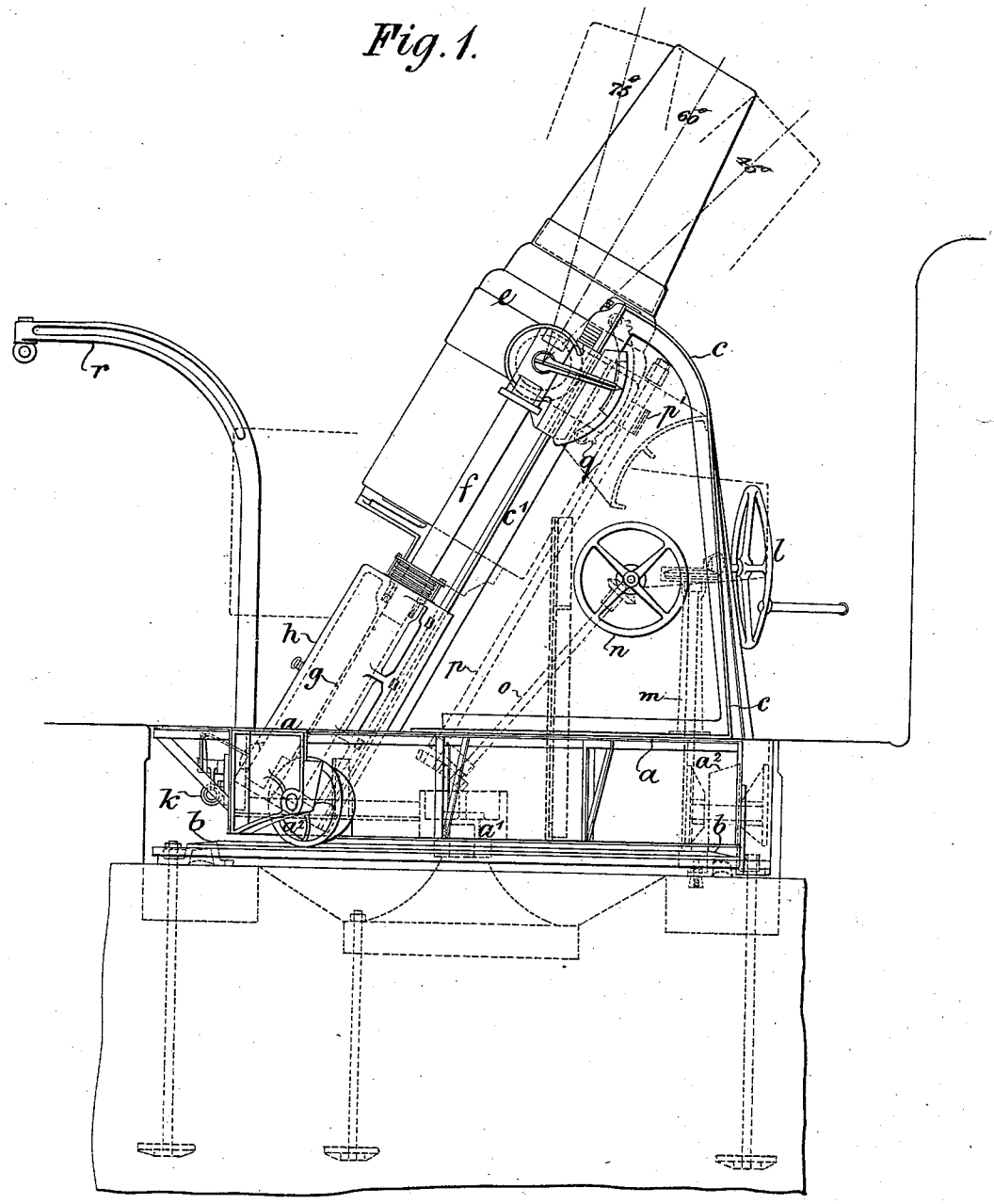
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OPERATING ORDNANCE.

No. 378,172. Patented Feb. 21, 1888.

Fig. 1.



Witnesses
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(No Model.)

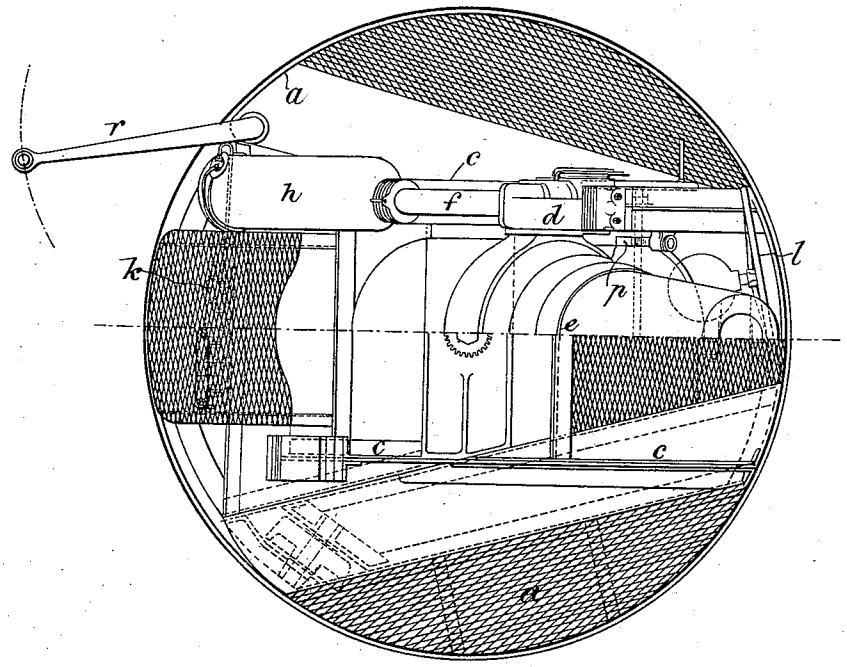
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Fig. 2.



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OPERATING ORDNANCE.

No. 378,172. Patented Feb. 21, 1888.

FIG. 5.

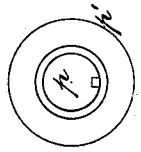


FIG. 3.

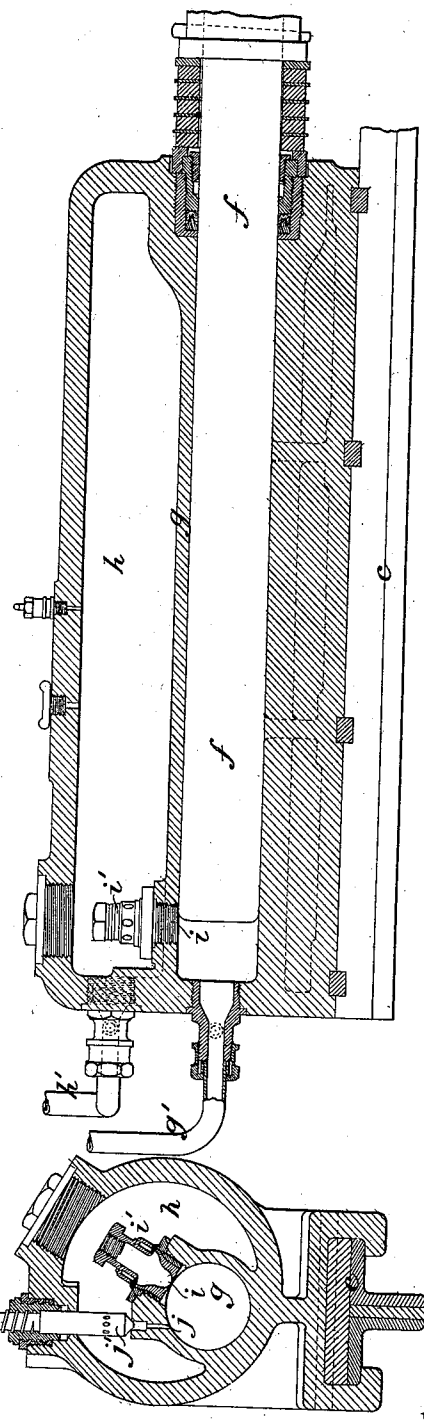


FIG. 4.

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UNITED STATES PATENT OFFICE.

ANDREW NOBLE, OF NEWCASTLE-UPON-TYNE, ENGLAND, ASSIGNOR TO W. G. ARMSTRONG, MITCHELL & CO., (LIMITED,) OF SAME PLACE.

OPERATING ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 378,172, dated February 21, 1888.

Application filed June 8, 1887. Serial No. 240,610. (No model.) Patented in England February 6, 1885, No. 1,674, and in Italy June 30, 1885, No. 18,191.

To all whom it may concern:

Be it known that I, ANDREW NOBLE, late captain in the Royal Artillery, a subject of the Queen of Great Britain, residing at Jesmond-dene House, Newcastle-upon-Tyne, England, manufacturing engineer, have invented a certain new and useful Improved Mounting for a Howitzer, (for which a patent has been granted to me in Great Britain, dated February 6, 1885, No. 1,674, and in Italy, dated June 30, 1885, No. 18,191,) of which the following is a specification.

This invention has for its object an improved mounting for a howitzer. This mounting consists of a turn-table capable of rotating about a central pivot and moved by means of a hand-wheel upon the turn-table, which by beveled gear turns a vertical axis, which at its lower end is geared with one of the supporting-wheels. The turn-table carries a slide inclined at an angle of about sixty degrees, and along this slide the gun-carriage is able to traverse. The gun is mounted by its trunnions on this carriage, and immediately in rear of each of the trunnions and parallel with the face of the slide a ram is attached to the carriage, and the ram at its lower end enters a hydraulic cylinder. In connection with the cylinder there is an air-vessel, in which air under pressure is contained. On the recoil taking place the rams are driven downward in the cylinders and a portion of the liquid therein passes out into the air-vessels through narrow passages or loaded valves. A further compression in the air-vessel is brought about by the entrance of the ram into the cylinder during the recoil, and in this way the recoil is expended and checked. The compressed air serves as an automatic arrangement to run the gun out again into the firing position, either immediately or as soon as the return of the liquid to the cylinder is permitted.

A pump is provided by means of which liquid can be transferred from the air-vessels to the cylinders, or vice versa, to raise or lower the gun independently of the recoil.

For the purpose of inclining the gun to the desired angle, a toothed arc is mounted concentrically with the trunnions, and this arc engages with a worm capable of sliding upon an axis carried upon the slide parallel with its face. This axis is geared by spur-wheels to another axis, and this, by beveled gear, receives motion from a hand-wheel. When the gun recoils, the worm in gear with the toothed arc slides longitudinally upon its axis, and the same takes place as the gun rises to the firing position.

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 elevation of a twenty-eight-centimeter howitzer mounted in accordance with my invention. Fig. 2 is a plan of the same, partly in section. Fig. 3 is a longitudinal section of the hydraulic cylinder and air-vessel. Fig. 4 is a transverse section of the same. Fig. 5 shows a detail of the elevating-gear.

a a is a turn-table, having its pivot at *a'*, and supported, also, by wheels a^2 a^2, which run on a circular rail, *b*. This rail *b*, with the pivot, is supported on a massive foundation. On the turn-table *a* there are two standards, *c c*, suitably connected, and upon them at *c' c'* are guide-surfaces which form the slide along which the carriage of the gun moves when the recoil takes place.

d is the carriage in which the gun *e* is held by its trunnions.

f f are rams supporting the carriage *d* immediately in rear of the trunnions. The rams *f* enter into the hydraulic cylinders *g g*, and around these cylinders and in the same piece with them are formed the air-vessels *h h*. The cylinders *g* and the air-vessels *h* communicate near the lower end by a small passage, *i*, and through this passage when the gun recoils the liquid in the cylinder *g* displaced by the ram *f* is forced to pass. This orifice may be made once for all of the dimensions found necessary by experiment, or means for adjustment may be provided. There is a stop-valve, *i'*, to prevent the return of the liquid by the same passage, and a by-pass, *j*, with a valve, *j'*, upon it, is provided, which is opened to permit the return of the liquid when desired; or in some cases the arrangement may be simplified, the liquid being allowed to return directly into

the ram-cylinder by the same passage by which it passed out of the cylinder, in which case the gun immediately after recoil rises again to the firing position.

k is a hand-pump which is employed for drawing the liquid out of the cylinder *g* by the suction-pipe *g'* and forcing it into the air-vessel *h* by the delivery-pipe *h'*. This is done for the purpose of bringing the gun down without firing. The same pump may be employed for forcing air into the air-vessel *h*.

l is a hand-wheel for rotating the turn-table *a* and for training the gun upon the object upon which it is required to be directed.

The axis of the hand-wheel has upon it a beveled pinion gearing with a corresponding wheel on the vertical shaft *m*, and this at its lower end is geared with one of the wheels on which the turn-table is supported.

n is another hand-wheel to be employed for varying the elevation of the gun. On its axis there is a beveled pinion gearing with a corresponding pinion on the inclined shaft *o*. This shaft at its lower end carries a toothed wheel engaging with a similar wheel on the shaft *p*, which is parallel with the slide-face *c' c'*. The shaft *p* is grooved from end to end, (see Fig. 5,) and a worm, *p'*, is able to slide along it. This worm, which is compelled to rotate with its shaft, engages with a toothed arc, *q*, fixed upon the trunnions of the gun; hence by turning the shaft *p* and the worm *p'* by means of the hand-wheel *n* the gun is caused to rock upon its trunnions and its elevation is varied. In the case of the gun represented by these drawings the elevation is intended to range between forty-five degrees and seventy-five degrees; but these angles may be varied. *r* is a crane fixed upon the turn-table *a*. It is used to lift the charge and to swing it into position to be inserted into the breech of the gun when this has been opened to receive it.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The combination, substantially as described, of the slide inclined downward from front to rear, the gun-carriage upon the slide, the hydraulic cylinder with its ram parallel to the slide and supporting the gun-carriage immediately in rear of the gun-trunnion bearing, the air-vessel adjacent to the cylinder, and the passage by which the cylinder communicates at or near its end with the air-vessel, and through which liquid passes from the cylinder to the air-vessel, for the purpose set forth.

2. The combination of the slide inclined downward from front to rear, the gun-carriage upon the slide, the hydraulic cylinder with its ram parallel to the slide and supporting the gun-carriage immediately in rear of the gun-trunnion bearing, the air-vessel adjacent to the cylinder, the passage by which the cylinder communicates at or near its end with the air-vessel, the non-return valve of this passage, the by-pass passage between the cylinder and the air-vessel, and the valve of the by-pass, substantially as and for the purpose set forth.

3. The combination of the slide inclined downward from front to rear, the gun-carriage upon the slide, the hydraulic cylinder with its ram parallel to the slide and supporting the gun-carriage immediately in rear of the gun-trunnion bearing, the air-vessel adjacent to the cylinder, the passage by which the cylinder communicates at or near its end with the air-vessel, the non-return valve of this passage, the by-pass passage between the cylinder and the air-vessel, the valve of the by-pass, the pump, the suction-pipe of the pump connected with the cylinder, and the delivery-pipe of the pump connected with the air-vessel, substantially as and for the purpose set forth.

A. NOBLE.

Witnesses:
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T. PURVIS.