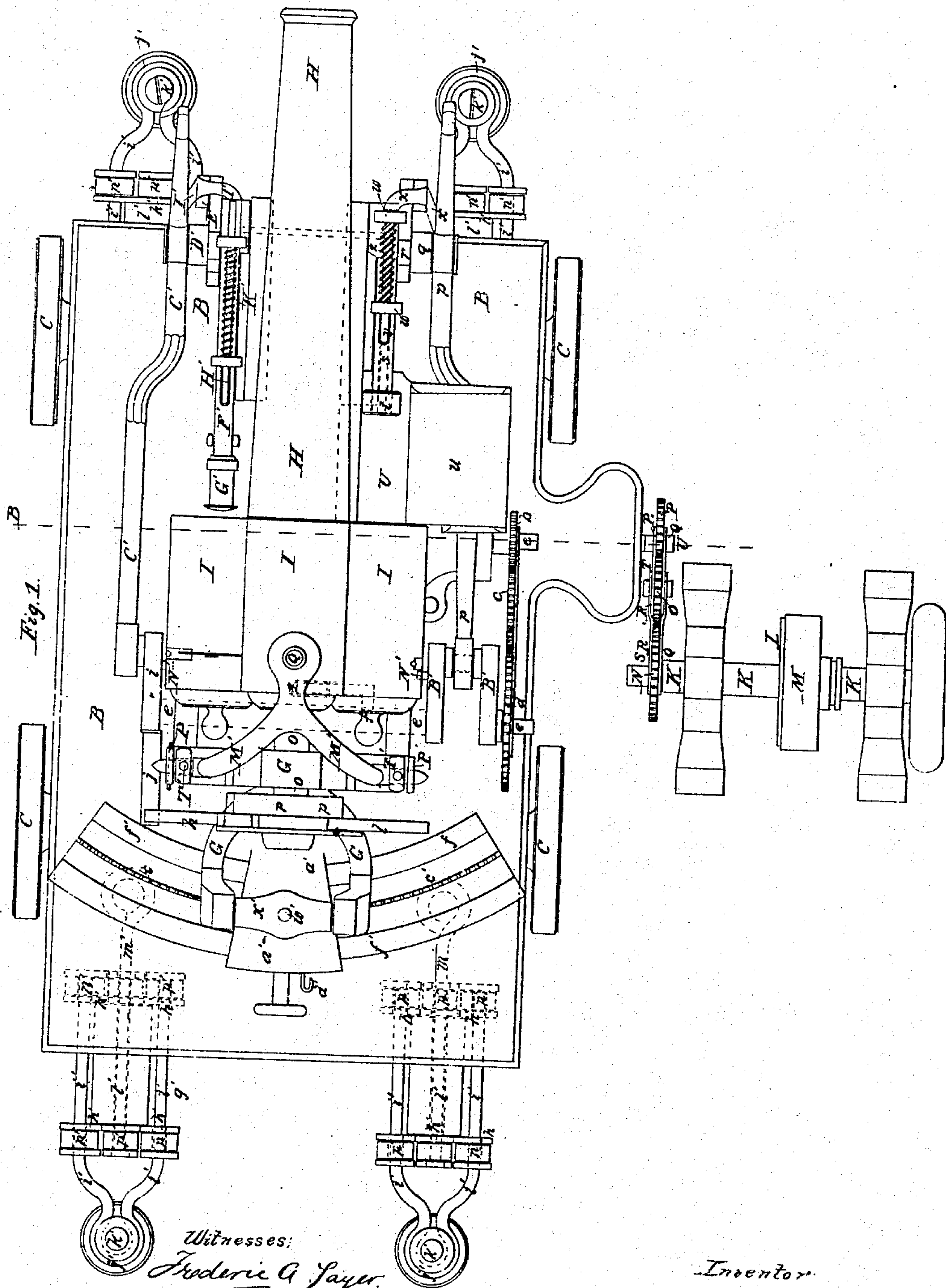


T. J. MAYALL
FIELD ORDNANCE, &c.

No. 32,376.

Patented May 21, 1861.



Witnesses:

Frederic A. Jager.

Albert W. Brown.

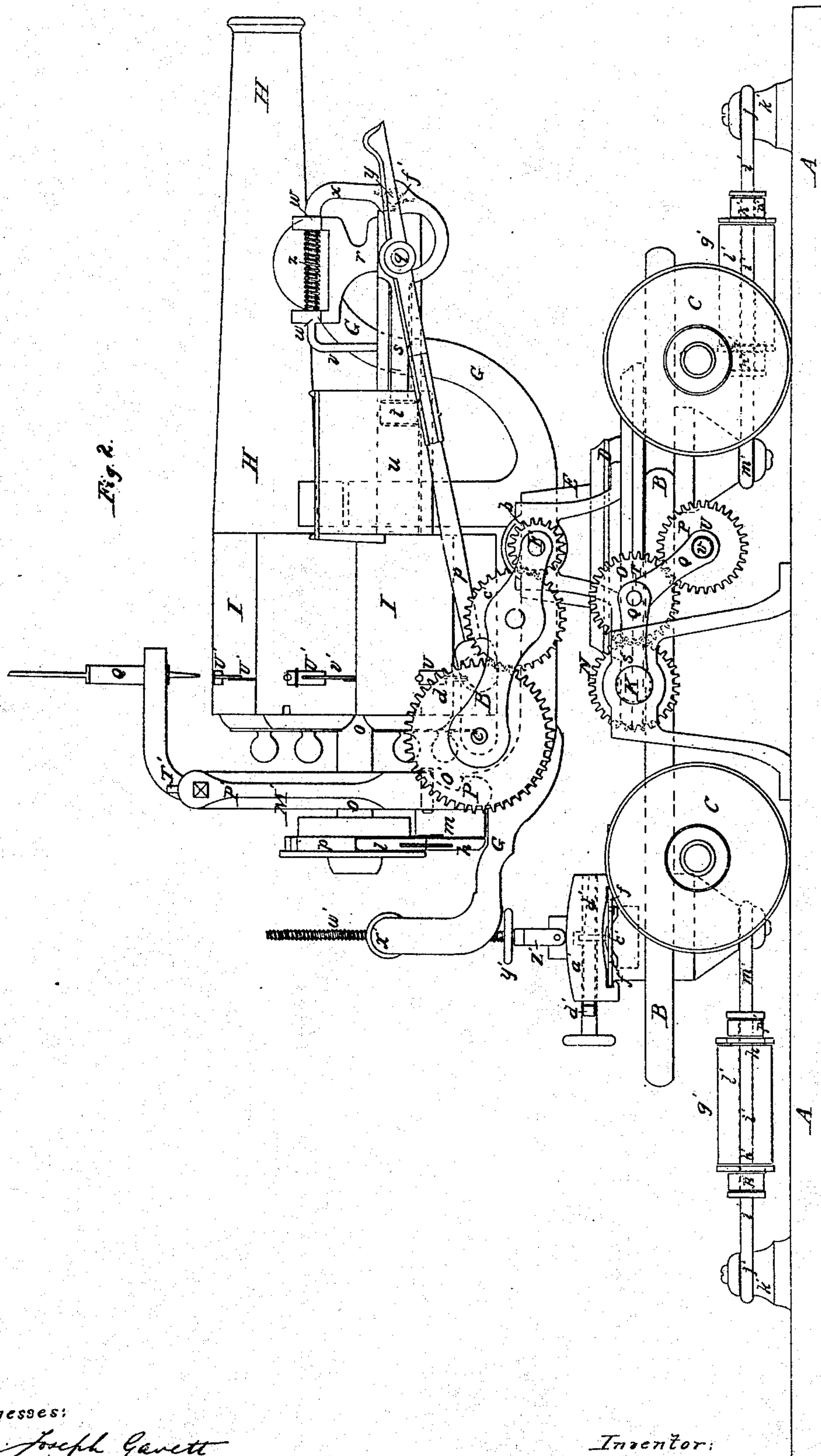
Inventor.

Thos. Mayall.

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FIELD ORDNANCE, &c.

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Witnesses:

Joseph Garrett
Albert W. Brown

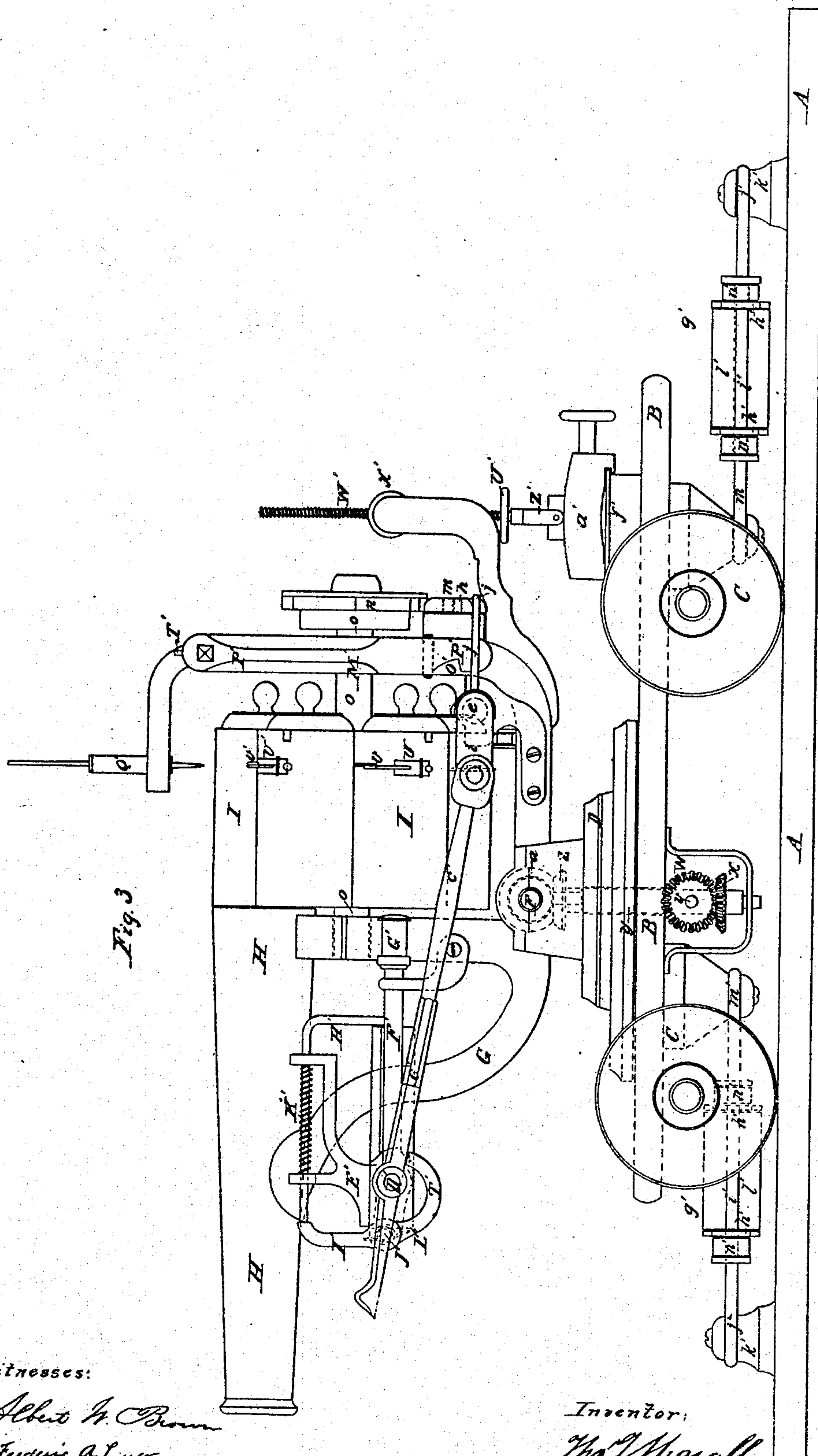
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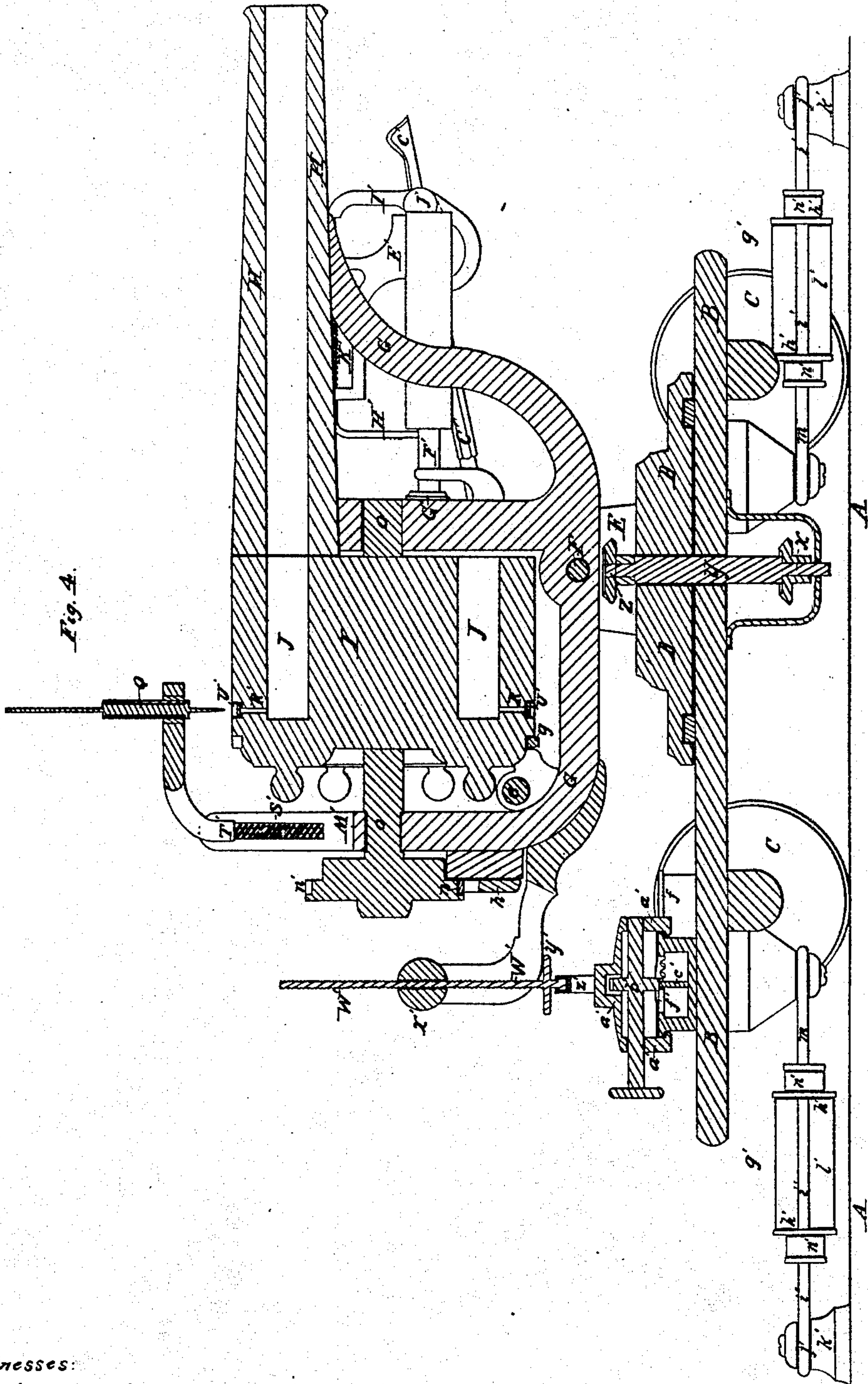
Witnesses:
Albert H. Brown
Frederic A. Jager

Inventor:
Thos J Mayall

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FIELD ORDNANCE, &c.

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Witnesses:

Albert W. Brown
Frederic A. Loyer

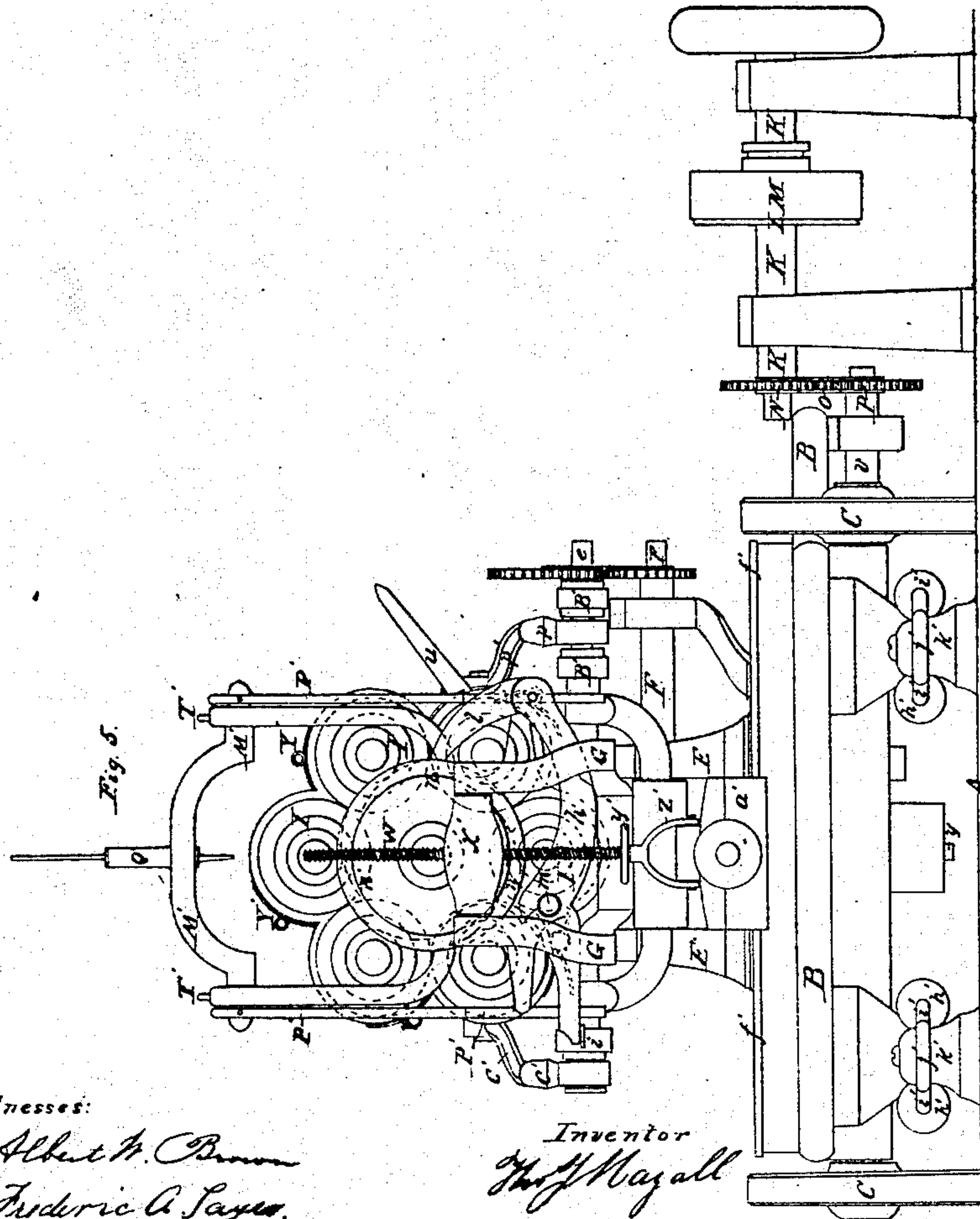
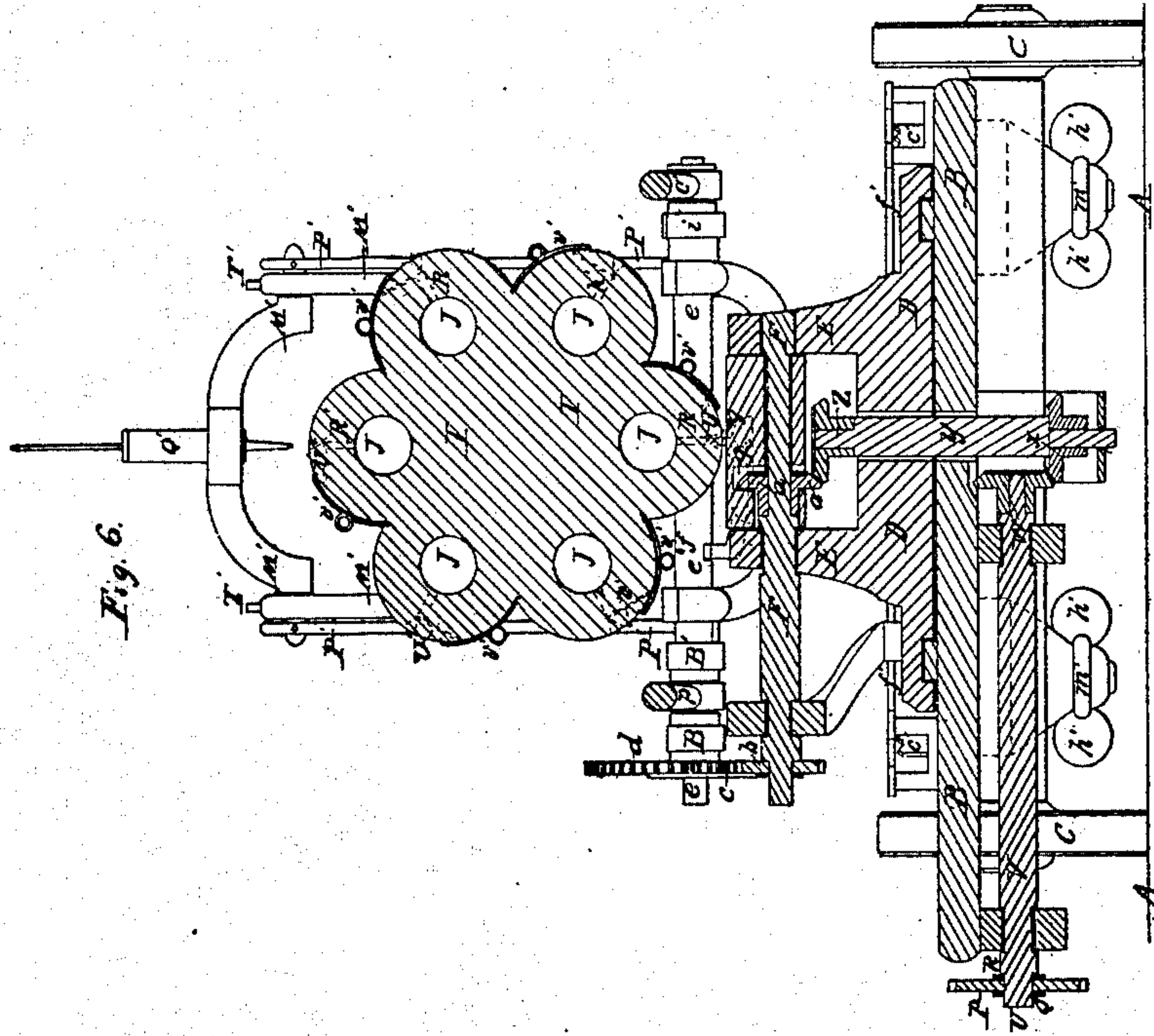
Inventor

T. J. Mayall.

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FIELD ORDNANCE, &c.

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Witnesses:
Albert H. Brown
Frederic A. Lyster.

Inventor
Thos. J. Mayall

UNITED STATES PATENT OFFICE.

THOMAS J. MAYALL, OF ROXBURY, MASSACHUSETTS.

IMPROVEMENT IN ORDNANCE.

Specification forming part of Letters Patent No. 32,376, dated May 21, 1861.

To all whom it may concern:

Be it known that I, THOMAS J. MAYALL, of Roxbury, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Ordnance for Field-Pieces, Vessels, Batteries, Fortifications, &c.; and I do hereby declare that the following description, taken in connection with the accompanying drawings, hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvements, by which my invention may be distinguished from all others of a similar class, together with such parts as I claim and desire to have secured to me by Letters Patent.

The figures of the accompanying plates of drawings represent my improvements. Plate 1, Figure 1, is a plan or top view. Plate 2, Fig. 2, and Plate 3, Fig. 3, are side elevations. Fig. 4, Plate 4, is a central longitudinal vertical section. Fig. 5, Plate 5, is a view of one end. Fig. 6, Plate 5, is a transverse vertical section taken in plane of the line A B, Fig. 1, Plate 1.

The present invention relates to certain improvements in ordnance for field-pieces, &c., for which I have made other applications for separate Letters Patent, in which the various necessary operations required in loading and firing cannon, &c., are performed automatically by machinery. The particular arrangement of devices for accomplishing these objects will constitute the subject of the present application for Letters Patent.

A A in the drawings represent a base—such as the deck of a vessel, &c.; B B, a platform or carriage supported on four wheels, C C C C, having elastic tires of india-rubber or other suitable elastic material.

It has been found, particularly on board of ships, to be a source of inaccuracy in firing, and as greatly interfering with the taking aim, when, in consequence of a succession of discharges of the guns, the jars or vibrations imparted to the ship are so great as to cause it heavily to roll from one side to the other. To obviate, or at least to reduce or decrease, the vibrations thus imparted to the ship I interpose between the deck and the wheels an elastic or yielding substance by providing said

wheels with an india-rubber or gutta-percha tire, as shown.

Upon the carriage B B is placed, so as to swing round upon the same upon suitable friction-rollers, a circular plate, D D, the standards E E of which serve as bearings to the axles F F of a frame, G G, which serves to support the gun-barrel H H and its revolving cylinder I I, and is susceptible of being raised and depressed and set at any desired angle with the horizon (turning loosely on the axles F F) by means of devices the operation of which will be hereinafter described. The cylinder I I has formed in it a series of chambers, J J, &c., and has an intermittent rotary motion in a vertical plane imparted to it, so as to bring each of the chambers J J, &c., in apposition with the gun-barrel H H, as follows:

K K in the drawings represent a driving-shaft having a conical-shaped pulley, L, and laterally-sliding friction-clutch M, operating together so as to produce any desired amount of speed. A band or belt moving by steam or horse power can be applied to the clutch M, or the main shaft may be driven by hand-power. On the end of the driving-shaft K is a gear-wheel, N, which, by means of an intermediate gear, O, communicates motion to a gear-wheel, P, the cluster of gears N, O, and P being connected by toggle or swinging arms Q Q R R, turning loosely upon bearings at S, T, and U. By thus connecting and supporting the gears N, O, and P it will be seen that the two gears O and P can be brought nearer to the gear N or travel away from the same, as the case may be, without disengaging any one of them with the others. The importance of this arrangement of gearing will be manifest, as it permits the main carriage to travel freely in a longitudinal direction when the recoil and resetting of the gun takes place without disconnecting the devices which communicate motion from the driving-shaft. The gear P is on one end of a horizontal shaft, V, extending under the carriage, on the other end of which is a bevel-gear, W, that engages with a similar gear, X, on the lower end of a short vertical shaft, Y, that passes upward loosely through the carriage B B and circular plate D D, and has on its upper end a bevel-gear, Z, that engages with a similar gear, a, placed

on a horizontal shaft, F F, turning loosely in proper bearings formed in the standards E E of the circular plate D.

Fixed to one end of the shaft F is a gear-wheel, *b*, which, by means of gears *c* and *d*, imparts a rotary motion to the shaft *e*, upon which the gear *d* is placed.

On the shaft *e* is a projection, *f*, the office of which is to disengage at proper intervals of time a spring-clutch, *g*, from a series of holes in the chambered cylinder or magazine, the said spring-clutch, when not thus disengaged by the action of the projection *f*, serving to firmly hold the cylinder in position while being loaded, &c.

On one end of the shaft *e* is a crank, *i*, having attached to it, or forming a part thereof, a suitable projection or stud, *j*, which as the said shaft *e* revolves abuts against and moves a lever-pawl, *h l*, swinging upon a fulcrum at *m*. The spring-pawl *h l* is thus made to engage at intervals with a ratchet-wheel, *n*, placed on the same shaft *e* with the magazine I, which will thus receive an intermittent rotary motion.

I will next proceed to describe the manner in which the several sections or chambers J J, &c., of the cylinder I are loaded or charged with suitable cartridges, it being premised that the same movement which causes the several chambers or chamber J to be brought in apposition to the gun-barrel also causes one of the several sections or chambers J J, &c., to be brought in succession in proper position for the insertion of cartridges.

To the crank B' of the shaft *e*, above referred to, is attached, so as to swing loosely thereon, a connecting-rod, *p*. The connecting-rod *p* engages at or near one end with a short shaft, *q*, of the traveling carriage *r*, which thereby receives a reciprocating rectilinear motion.

Attached to the traveling carriage *r*, or forming a part thereof, is the stock *s* of a rammer, *t*, which rammer *t* consequently receives the same motion as the traveling carriage, so that the charges or cartridges being fed into a suitable hopper, *u*, will at the proper intervals of time be driven into the several sections or chambers of the magazine.

In case from any accident the contents of any one chamber of the magazine should fail to be discharged the rammer is prevented from driving in another cartridge by its being connected with a bent rod, *v*, which, playing in suitable bearings of standards *w w*, abuts against an arm, *x*, turning upon a center at *y*, and so actuates it as to disengage the connecting-rod from the short shaft of the sliding carriage *r*, above referred to, the rammer *t* and arm *x* being retracted by means of springs *z* and A', one of which is coiled around the rod *v* and the other around the center or shaft of the arm *x*. Simultaneously with the loading or charging of one of the chambers J J, &c., one of the said chambers is being sponged or

swabbed out by means of devices which I will now proceed to describe.

The swabbing out is accomplished by somewhat substantially similar means as was described for the loading, *i* being a crank-shaft, before referred to, to which is attached, so as to swing loosely thereon, a connecting-rod, C'. This connecting-rod C' is attached at its other end to a short shaft, D', of the traveling carriage E', which carriage has consequently imparted to it a reciprocating rectilinear motion. F' is the stock of the swabber G', the stock F' being attached to or forming a part of the traveling carriage. The swabber, in consequence of the reciprocating rectilinear motion imparted to the carriage E', as above described, will travel in and out of the several sections or chambers of the magazine successively, thereby completely cleansing and sponging the same during the entire revolution of the magazine.

H' is a bent rod connected with the swabber, which, in case of the non-discharge of any of the several sections, will, by reason of the swabber abutting against the charge in the section, abut against the arm I', which arm I', turning upon a center at J', will disconnect the connecting-rod C' and traveling carriage E'. The rod H' and arm I' are retracted by means of springs K' and L'—one coiled around the rod H' and the other around the center of the arm I'.

The discharge of each chamber or section successively is provided for by the following means:

M' is a vertical sliding frame, which has a vertical motion imparted to it by means of two studs or projections, N', one on the interior surface of the crank-shaft *i* and the other on the same surface of the crank-shaft B', which studs N', upon the revolution of the cranks *i* and B', interlock or engage with suitable notches, O', of vertical sliding pieces P' P' of the sliding frame M'.

To the vertical sliding frame M' is attached a suitable rod, Q', which, upon the successive chambers or sections being brought in proper position, will, by means of the downward motion imparted to the frame M', as described, enter into suitable touch-holes, R' R', &c., formed in the several sections or chambers. At the moment that the rod Q' enters one of the touch-holes a spark of electricity may be sent through the same, the said rod being connected at one end with a suitable battery. The sliding vertical frame is retracted after the rod has entered the touch-holes by means of springs S' S', coiled around suitable rods, T' T', upon which the frame slides.

The "thumbing" of the touch-holes after each discharge is effected by means of a sliding piece, U', which, upon the downward motion of the rod Q', is abutted against by the said rod on its beveled end, and also moved or slid away from the touch-hole, thereby allowing

the rod to descend freely into the same, the sliding piece, after the withdrawal of the rod, being retracted or pushed back by the spring V' , and thereby effectually thumb or stop all vent of air through the touch-hole.

Provision is made for the elevation and depression of the gun, and also for the setting of the gun at any desired horizontal angle with regard to the carriage B, whereby projectiles can be discharged in every desired direction, either parallel with or inclined to the horizon, as follows: W' is a vertical screw passing through a rocker-shaft, X' , of the rear portion of the swinging frame, so that upon turning a nut, Y' , to the right or left the swinging frame G G, and consequently the gun-barrel, magazine, &c., will be elevated or depressed. The screw-shaft W' terminates in a forked strap, Z' , attached by swinging joints to a carriage, a' , made to travel upon the arc of a circle by means of a gear-wheel, b' , that engages with the teeth of a toothed arc, c' , thereby slewing the gun to the right or left, as may be desired. The traveling carriage is set and held at any desired position upon the toothed arc by means of a wedge-shaped sliding rod, d' , which, upon a forward motion being imparted to it, causes a strap, e' , to bear upward against the shoulders f' of a grooved way upon which the carriage bears. The strap is disengaged from the shoulders by the pulling out of the wedge-shaped rod.

In the accompanying drawings the gun is represented as being susceptible of traveling horizontally upon a portion of the arc of a circle; but it will be obvious that by continuing the toothed arc so as to form a complete circle the gun can be made to travel around the entire circumference thereof.

From the foregoing description it will be seen that the guiding or steering of the gun, so as to discharge projectiles in every possible direction, can be readily effected during the time of and without interrupting the various operations of loading, discharging, &c.

To provide for the recoil of the gun, so as to reset it in the exact position which it occupied previous to a discharge, I attach to each end of the gun-carriage B powerful rubber or other springs, $g' g'$, &c., so arranged and operating that both their tension and compression will act equally upon the gun-carriage. These springs I prefer to construct as follows: $h' h'$ are cross-heads which slide freely upon side bars, $i' i'$. These bars are connected to an eye, j' , which is fitted over a suitable standard, k' . The heads

h' bear upon the ends of a hollow elastic cylinder of india-rubber, l' , or other suitable elastic spring. Through the center of the spring and through the cross-heads passes a rod, m' , terminating in a loop that is fastened to the gun-carriage B B. $n' n'$ are washers of india-rubber. It will be seen by this arrangement that the gun in recoiling will be acted upon so as to completely and accurately reset it by a double force—viz., that of the expansive force of the compressed springs at each end of the gun-carriage.

Having thus described my invention, I shall state my claims as follows:

1. The arrangement herein described of supporting the gun-barrel and its revolving cylinder, so that the same may be swung round horizontally and be raised, depressed, and set at any desired angle with the horizon, by means of a brace or frame extending under said barrel and cylinder, and being pivoted or hung on a stationary axle in suitable brackets fast on a plate capable of horizontal rotation, substantially as shown and described.

2. The arrangement and application, substantially as described, with respect to the frame supporting the gun, and the mechanism for automatically performing its functions, of the devices for pointing the gun in any desired direction, so that the latter may be effected independently of, simultaneously and without interfering with, the operation of the former, substantially as shown and described.

3. Arranging the two shafts that receive and impart motion to the gun-operating mechanism in such a manner that they shall be located within the vertical plane passing transversely through the center of gravity of the gun and its appurtenances, or thereabout, whereby the gun may be operated with ease, substantially as shown and described.

4. Providing the rotary shaft e with a stud or projection, f , when so arranged as to actuate the spring-clutch with which it is combined at every revolution of said shaft and at proper intervals of time to release its hold on the breech, as herein set forth.

5. The rotary shaft e and the stud or projection j , when the same are combined with and arranged in relation to the breech-operating lever-pawl to actuate the same to perform its functions, as shown and described.

THOS. J. MAYALL.

Witnesses:

JOSEPH GAVETT,
A. W. BROWN.