6 Sheets—Sheet 1

# T. J. MAYALL.

## Machine Gun.

No. 30,742

Patented Nov. 27, 1860.

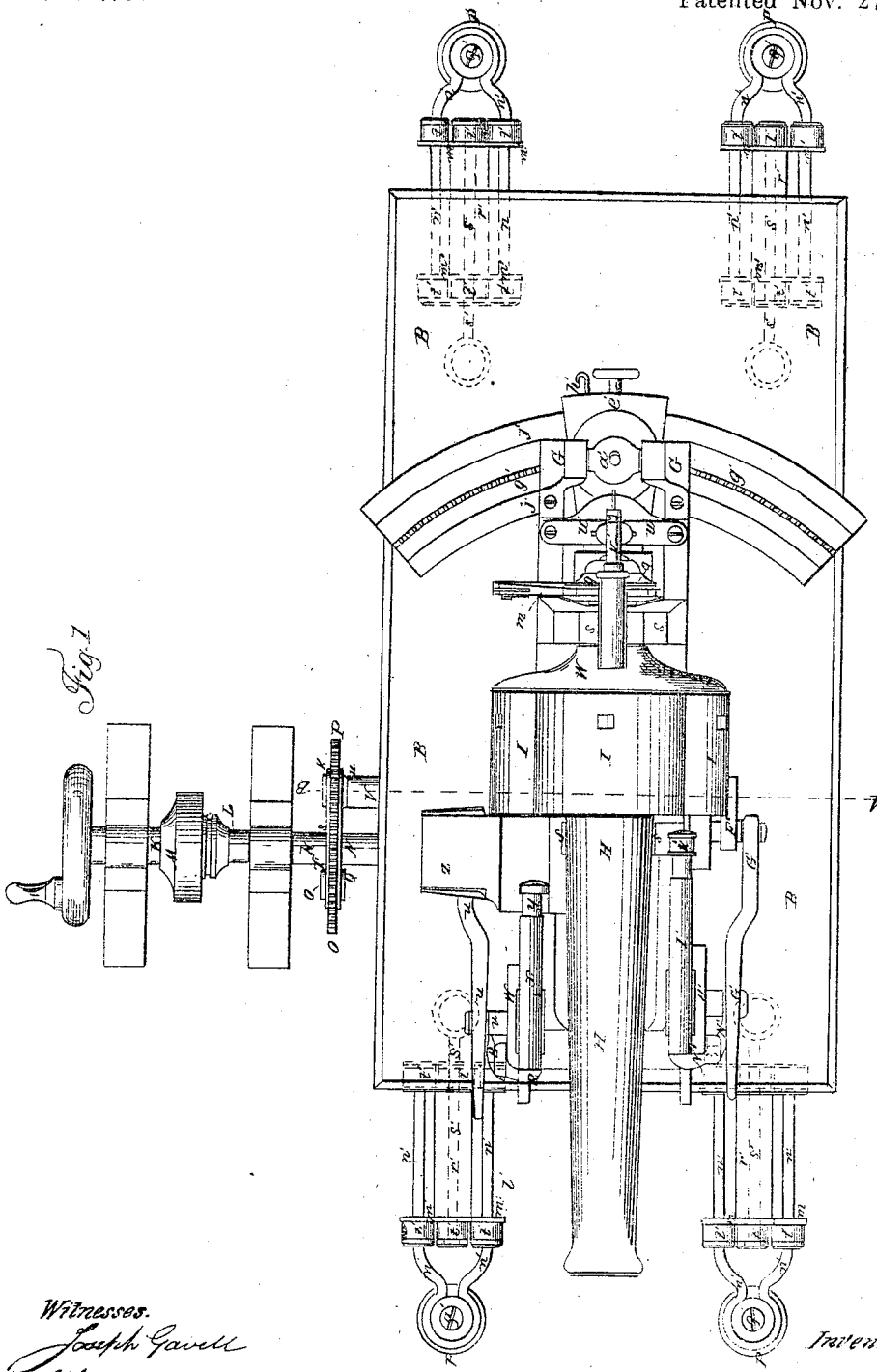


Fig. 1

Witnesses.
Joseph Gavell
Albert W Brown

Inventor.
Thos J Mayall

T. J. MAYALL.

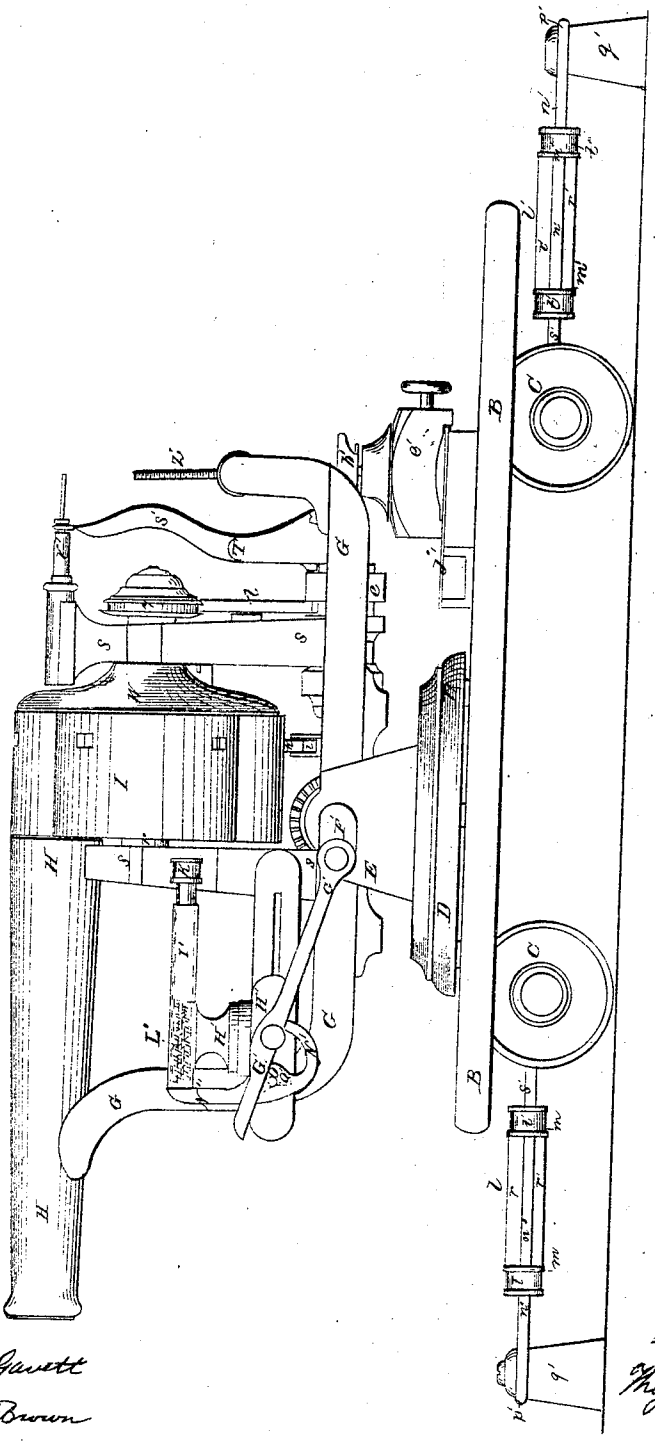
Machine Gun.

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No 30,742

Patented Nov. 27. 1860.

Fig. 2



Witnesses.

Joseph Gavett

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Machine Gun.

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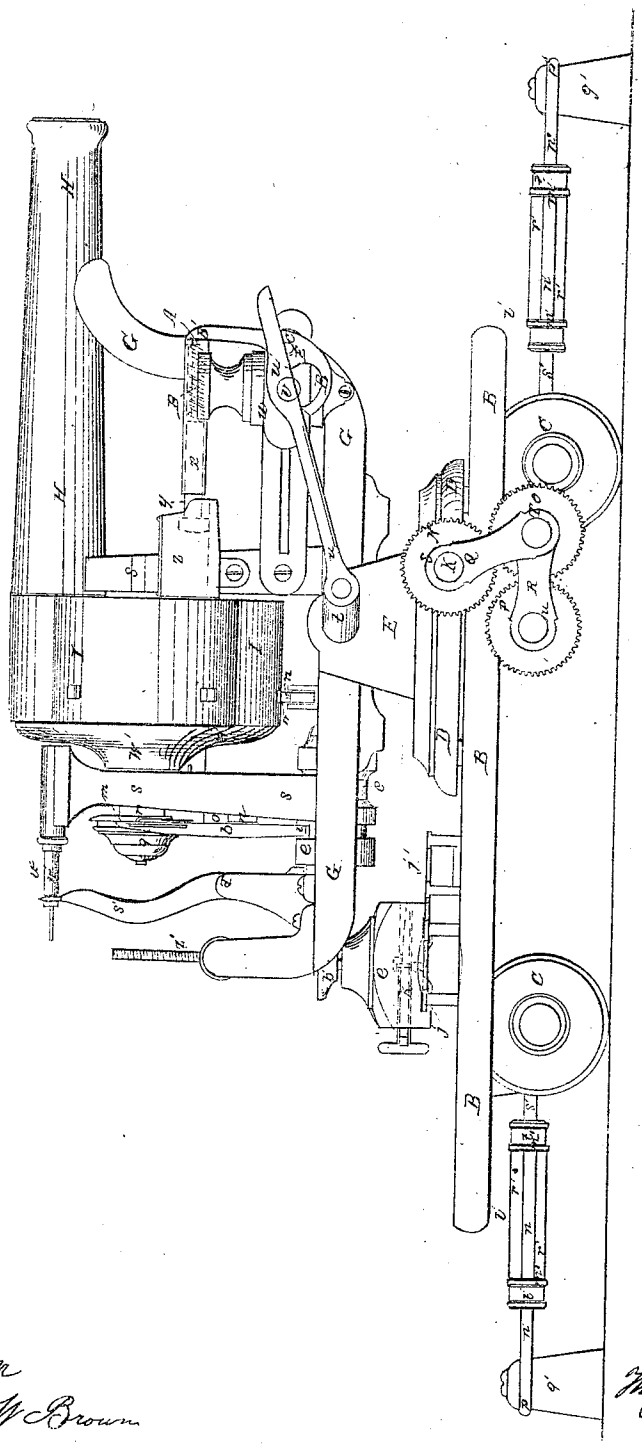


Fig 3

Witnesses.
F. A. Sayer
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Thos. J. Mayall

6 Sheets—Sheet 4

# T. J. MAYALL.

## Machine Gun.

No 30,742 Patented Nov. 27, 1860

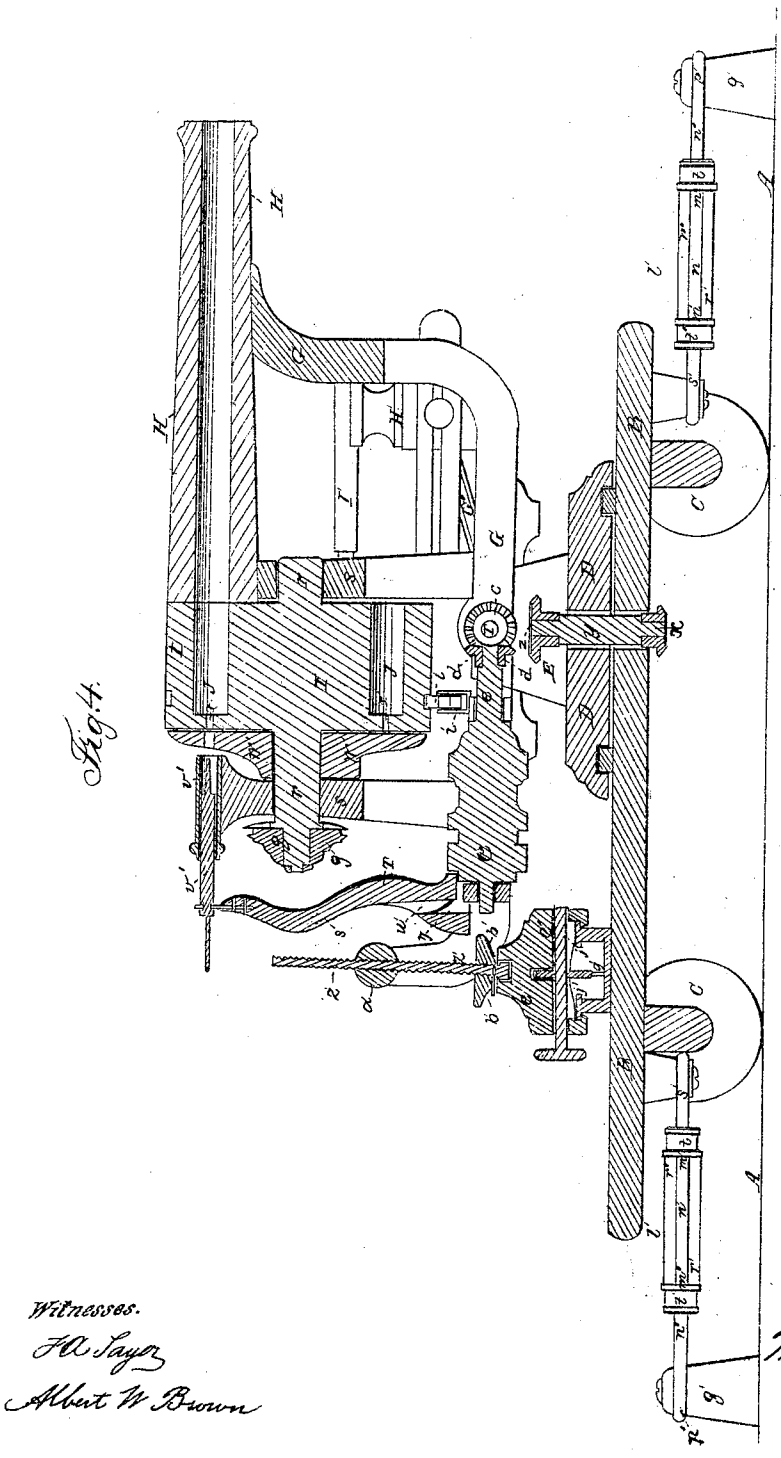


Fig. 4.

Witnesses.
H. A. Sayer
Albert W. Brown

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Thos. J. Mayall

T. J MAYALL.

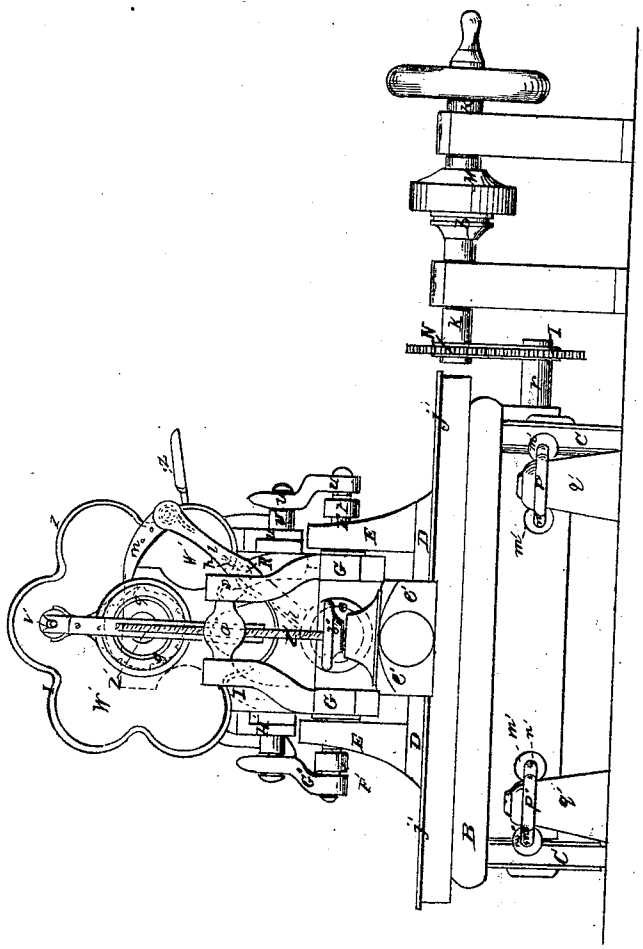
Machine Gun.

6 Sheets—Sheet. 5.

No. 30.742.

Patented Nov. 27. 1860.

Fig. 5.



Witnesses

Joseph Gavett

Albert N Brown

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Thos J Mayall

T. J. MAYALL.

Machine Gun.

6 Sheets—Sheet 6

No 30,742

Patented Nov. 27. 1860.

Fig. 7

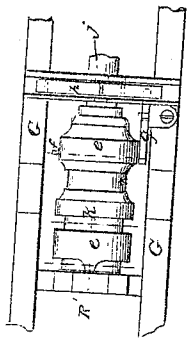


Fig. 8 Fig. 9 Fig. 10

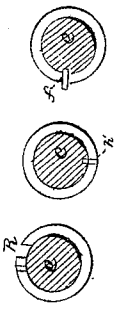
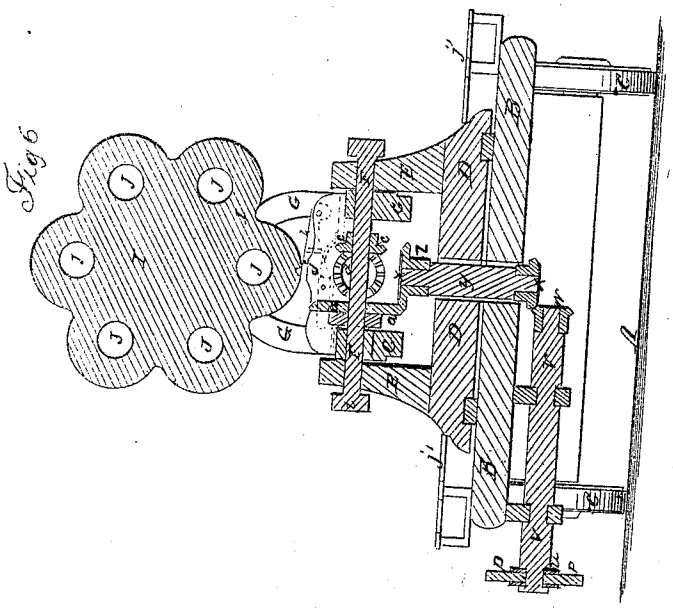


Fig 6



Witnesses.

Joseph Gavett

Albert W Brown

Inventor.

Thos J Mayall

# UNITED STATES PATENT OFFICE.

THOMAS J. MAYALL, OF ROXBURY, MASSACHUSETTS.

## IMPROVEMENT IN ORDNANCE.

Specification forming part of Letters Patent No. **30,742**, dated November 27, 1860.

*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 plate of drawings represent my improvements.

Figure 1, Plate 1, is a plan or top view of my improved ordnance used for field-pieces, batteries, fortifications, &c. Fig. 2 Plate 1, and Fig. 3, Plate 2, are side elevations of the same. Fig. 4, Plate 2, is a central longitudinal vertical section. Fig. 5, Plate 3, is an end view. Fig. 6, Plate 3, is a transverse vertical section taken in the plane of line A B, Fig. 1, Plate 1. Figs. 7, 8, 9, and 10, Plate 3, are detail views, to be hereinafter more particularly referred to.

I have heretofore made separate application for Letters Patent for certain new and useful improvements in ordnance used for field-pieces, batteries, fortifications, &c., which improvements consisted in performing all the functions necessary for the firing of cannon, &c., by any motor, such as steam, hand-power, &c., automatically.

The present invention consists in a different and peculiar arrangement of mechanical devices, whereby the same results can be accomplished—viz., the complete performance of every function necessary for the proper loading, firing, swabbing out, &c., of cannon used for field-pieces, batteries, and fortifications—by the aid of mechanical means.

A 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 rubber, gutta-percha, or other suitable material.

It has been found, particularly on board of ships, to be a source of inaccuracy in firing, and as greatly interferring 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 around upon the same upon suitable friction-rollers, a circular plate, D D, the standards E E of which serve as bearings to the stationary 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 opposition with the gun-barrel as follows:

K K in the drawings represent a driving-shaft having a conical-shaped pulley, L, and lateral sliding 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 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 on 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 from the others. The importance of this arrangement of gearing will be evident, as it permits the main carriage B B to travel freely in a longitudinal direction when the recoil and resetting take place without disconnecting the devices which communicate motion from the driving-shaft. The gear P is on one end of a horizontal shaft, U U, extending under the carriage B B, on the other end

f 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 center of the 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 transverse shaft, F, turning loosely in proper bearings in the standards E E of the swinging frame G G and circular plate D D. On this shaft F there is also another bevel-gear, *c*, that engages with a bevel-gear, *d*, placed on the horizontal and longitudinal shaft *e*, turning loosely in proper bearings formed in the swinging frame.

On the longitudinal shaft *e* is a stud, *f*, the office of which is to disengage at proper intervals of time, by means of a series of levers, *g h i*, against one of which, *g*, the said stud *f* abuts, a spring-clutch, *j*, from a series of holes in the many-chambered cylinder or magazine I I, the said spring-clutch *j*, when not thus disengaged, serving to firmly hold the cylinder I in position while being loaded, &c.

On the longitudinal shaft *e* is a projection, *k*, which, as the shaft revolves, abuts against and moves a lever-pawl, *l m*, swinging upon a fulcrum, *n*, having its length of motion regulated by a stop, *o*, and kept down to its bearing upon the shaft *e* by a spring, *p*. The spring-pawl, *m*, is thus made to engage at intervals with a ratchet-wheel, *q*, placed on the shaft *r*, having bearings in standards *s s* of the swinging frame G, with the magazine I 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 I are loaded or charged with suitable cartridges, it being premised that the same movements which cause the several chambers or sections J J, &c., to be brought in opposition to the gun-barrel also cause the several sections or chambers to be brought in succession in proper position for the insertion of cartridges.

To the crank-shaft *t t*, on the horizontal transverse-shaft F F, before referred to, is attached, so as to turn loosely thereon, a connecting-rod, *u u*. The connecting-rod *u* engages at or near one end with a short shaft, *v*, of the traveling carriage *w*, which thereby receives a reciprocating rectilinear motion. Attached to the traveling carriage, or forming a part thereof, is a hollow tube or shaft, *x*, within which plays the rammer *y*, that receives the same motion as the traveling carriage *w*, so that the charges or cartridges, being fed into a suitable hopper, *z*, will at the proper time be driven into the several 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 *y* is prevented from driving in another cartridge by the rear end of its shaft A′ abutting against an arm, B′, turning upon a center at C′, so as to disengage the connecting-rod *u u* from the short shaft *v* of the sliding carriage *w*, above referred to, the rammer *y* and arm B′ being retracted by means of springs D′ and E′, one of which is coiled around the shaft A′, inside of the hollow-tube or shaft *x*, and the other around the center or shaft C′ of the arm B′.

Simultaneously with the loading or charging of one of the chambers J another one of the said chambers J is being sponged or swabbed out by means of devices substantially similar to those which have been described for loading or charging the several chambers with cartridges.

F′ is the crank-shaft, attached to the horizontal shaft F, before referred to; G′, connecting-rod; H′, the sliding carriage; I′, hollow tube of the carriage H′, and in which plays a sponger or swabber, K′, having a reciprocating rectilinear motion imparted to it by the revolution of the shaft F, will travel in and out of the several chambers J J, &c., and thereby cleanse each chamber successively upon the revolution of the magazine.

L′ is a spring coiled upon the shaft M′; N′, an arm turning upon a center at O′, against which arm N′ the rear end of the shaft M′ of the sponger K′ abuts in case of the non-discharge of any one chamber J, which thereby lifts and disconnects the connecting-rod G′ from the short shaft P′ of the sliding carriage J′, the springs L′ and Q′, the latter coiled upon the center or turning fulcrum of the arm N′, serving to retract the sponger K′ and arm N′.

The discharge of each chamber successively is provided for by means of a cam-projection, R′, upon the shaft *e* before referred to, which upon the revolution of the shaft abuts against an arm, S′, turning on a pivot at T′ of a standard, U′, of the swinging frame G, thereby causing at proper intervals of time a rod, V′, to enter through a thumbing-plate, W′, the touch-holes X′ X′, &c., of each chamber or section, which are successively brought in opposition with the said rod by the previously-described revolution of the magazine or cylinder. The rod V′ is retracted after entering each touch-hole X′ by means of a bent spring, Y′ against which the lower part of the arm S′ bears. At the moment that the rod V′ enters the touch-hole of each chamber of the magazine a spark of electricity is sent through the said rod by the aid of a suitable battery attached to one end of the same. The thumbing of each touch-hole after every discharge is effected by a stationary thumbing-plate, W′, against which the cylinder or magazine, by means of a ground or other tight joint, has a close bearing during its revolution, so as to stop all vent of the same and prevent a premature discharge. The thumbing-plate can also be furnished with rubber or other elastic projections or packing, which upon the revolution of the cylinder or magazine will closely fit over the several touch-holes.

Provision is made for the elevation and depression of the gun, and also for the setting of the gun at any desired angle horizontally with regard to the carriage B B, whereby projectiles can be discharged in every desired direc-

tion, either parallel with or inclined to the horizon, as follows:

Z′ Z′ is a vertical screw passing through a rocker-shaft, $a'$, of the rear portion of the swinging frame G, so that upon turning a nut, $b'$, to the right or left, the swinging frame, and consequently the gun-barrel, magazine, &c., will be elevated or depressed. The screw-shaft Z′ Z′ is secured in such a manner as to freely move thereon to a carriage, $e'$, made to travel upon the arc of a circle by means of a gear-wheel, $f'$, which engages with the teeth of a toothed arc, $g'$, 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, $h'$, which, upon a forward motion being imparted to it, causes a strap, $i'$ to bear upward against the shoulders $j'$ $j'$ of a grooved way, $k'$, upon which the carriage bears. The strap $i'$ is disengaged from the shoulders $j'$ by the pulling out of the wedge-shaped rod $h'$.

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 B powerful rubber or other springs, $l'$ $l'$, &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: $m'$ $m'$, &c., are cross-heads, which slide freely upon side bars, $n'$ $n'$, &c. These bars are connected to an eye, $p'$ $p'$, which is fitted over a suitable standard, $q'$ $q'$. The heads $m'$ $m'$ bear upon the ends of a hollow elastic cylinder of india-rubber, $r'$, or other suitable material. Through the center of the spring $r'$ and through the cross-heads passes a rod, $s'$, terminating in a loop that is fastened to the gun-carriage B. $t'$ $t'$, &c., are washers of india-rubber. It will be seen that by this arrangement the gun in recoiling will be acted upon so as to 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 improvements in ordnance, I shall state my claims as follows:

1. In combination with the swinging frame supporting the cannon, as described, transverse braces provided with suitable bearings for so holding the shaft operating the automatic machinery herein referred to as that its proper relation to said machinery shall not be disturbed by any movement imparted to the cannon, substantially as set forth.

2. The arrangement of the three levers *g h i* relatively to each other, in combination with the studded shaft *e*, imparting to and the spring-clutch *f* receiving from said levers the requisite motions whereby at proper intervals of time the breech is firmly grasped and released, substantially as described, and for the purposes herein set forth.

3. Arranging upon one and the same crank-shaft, at either side of the barrel, connecting-rods for operating the devices for automatically loading and swabbing the chambers of the breech, essentially as set forth.

4. The arrangement and application of the several devices for automatically revolving and locking the breech, firing and thumbing its chambers with respect to one common cam-shaft, substantially as described, so that the said devices shall all be operated by said cam-shaft in perfect unison and with unfailing accuracy, as set forth.

5. The arrangement of springs of equal power and capable of compression and tension at either end of the platform, whereby the gun in recoiling will be acted upon equally and simultaneously at each extremity of the carriage and be accurately reset in position for the next discharge.

THOS. J. MAYALL.

Witnesses:
JOSEPH GAVETT,
A. W. BROWN.