

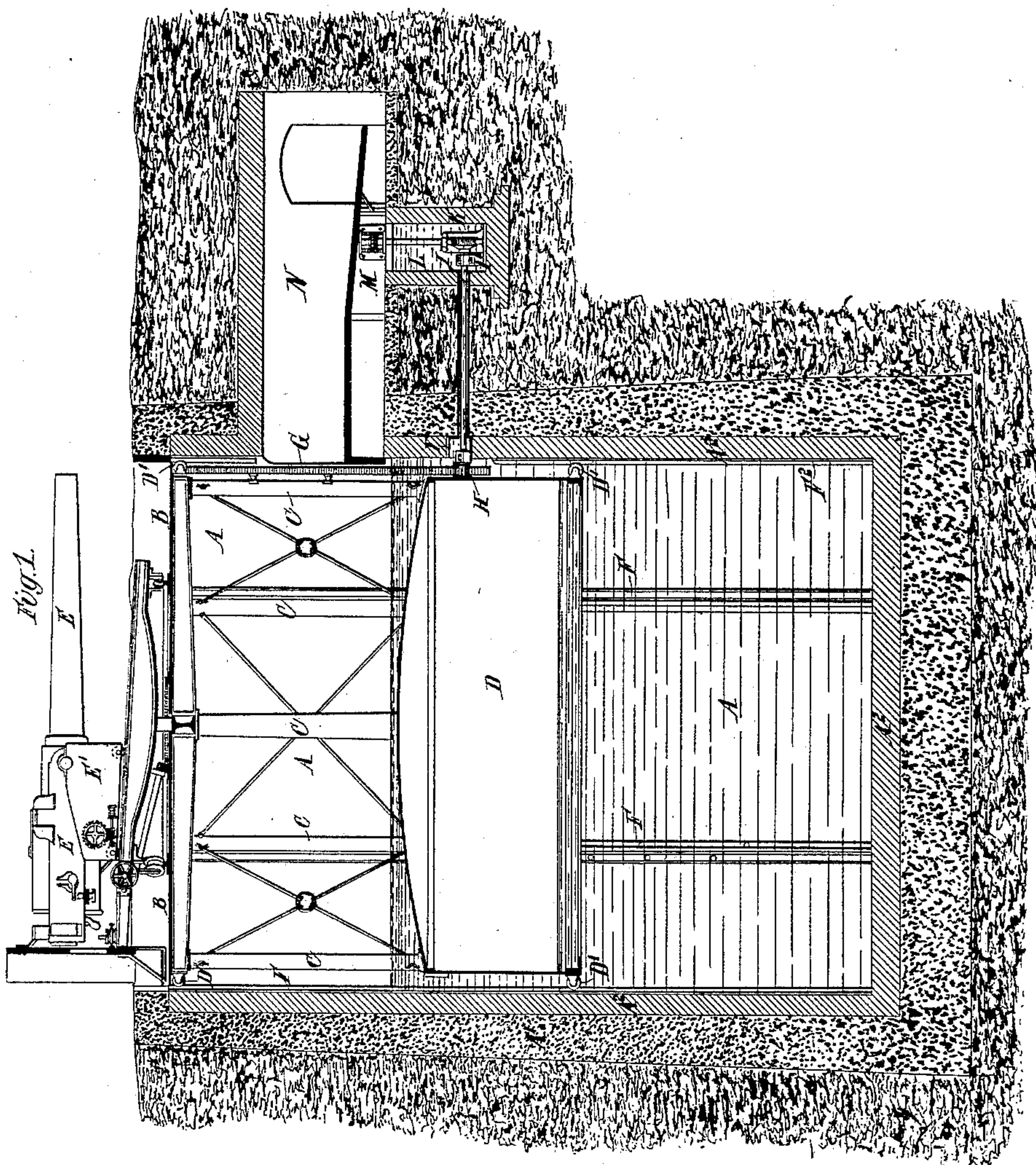
(No Model.)

2 Sheets—Sheet 1.

H. S. MAXIM.
APPARATUS FOR WORKING ORDNANCE.

No. 430,136.

Patented June 17, 1890.



Attest:
Robert F. Gaylord
Frank C. Hartley

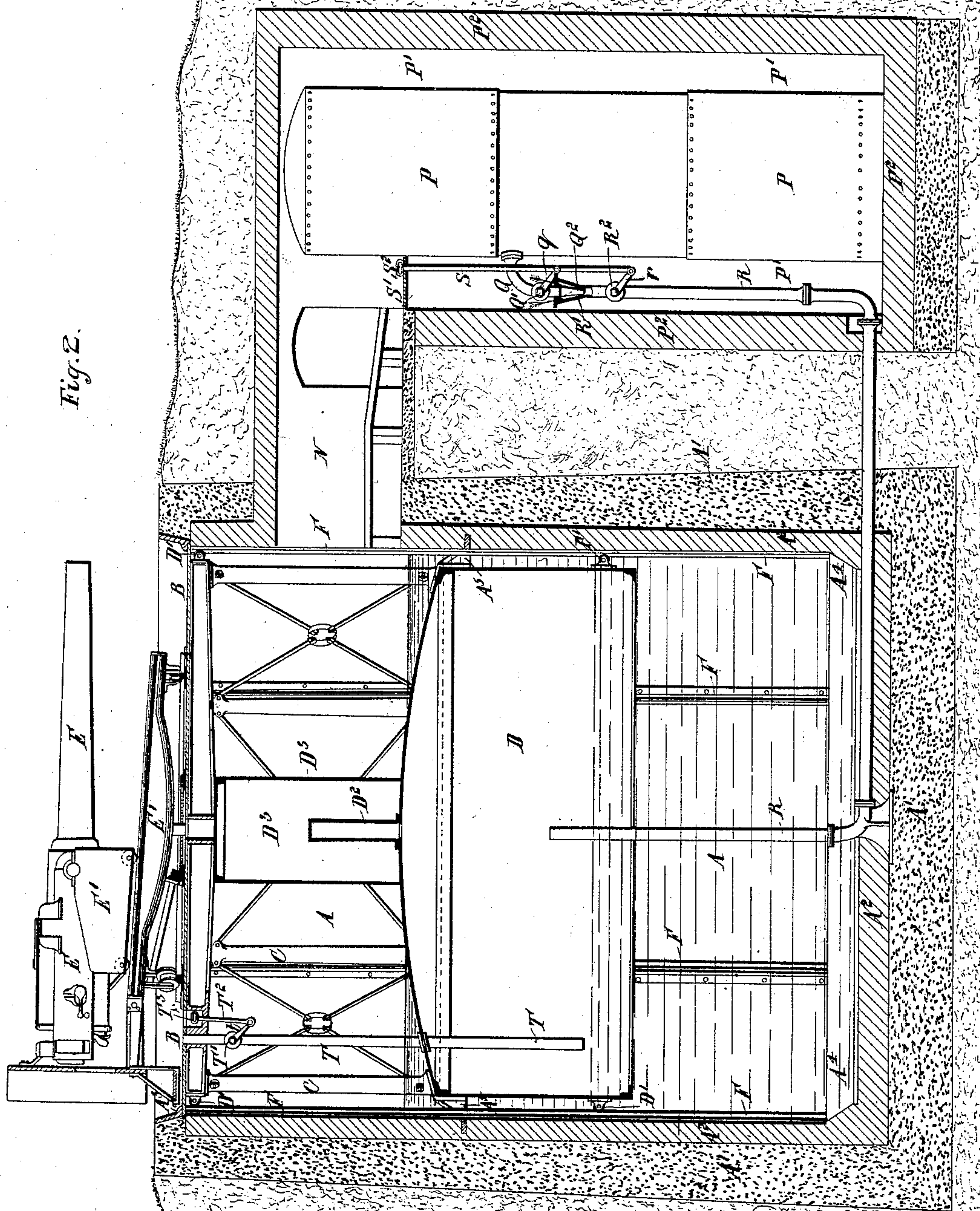
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UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF LONDON, ENGLAND.

APPARATUS FOR WORKING ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 430,136, dated June 17, 1890.

Application filed August 22, 1887. Serial No. 247,512. (No model.) Patented in England March 7, 1885, No. 3,019; in France April 10, 1885, No. 168,195; in Italy June 6, 1885, No. 18,466; in Belgium June 20, 1885, No. 69,347; in Sweden August 17, 1885, No. 882, and in Austria-Hungary August 19, 1885, No. 35 and No. 1,751.

To all whom it may concern:

Be it known that I, HIRAM STEVENS MAXIM, a citizen of the United States of America, and a resident of London, England, have invented
5 new and useful Improvements in and Relating to Apparatus for Working Ordnance, (for which I have obtained patents in the following countries: in Great Britain, No. 3,019, dated March 7, 1885; in France, No. 168,195, dated
10 April 10, 1885; in Belgium, No. 69,347, dated June 20, 1885; in Austria-Hungary, dated August 19, 1885, No. 35 and No. 1,751; in Italy, dated June 6, 1885, No. 18,466, and in Sweden, dated August 17, 1885, No. 882,) of which the
15 following is a specification, reference being had to the accompanying drawings.

My invention relates to apparatus for working cannon or heavy guns either on land or on a ship or vessel by the aid of electricity
20 or by hydraulic or other power.

My said invention is applicable to apparatus of that class wherein the gun is supported upon a platform designed to be lowered within an inclosed space, so that the
25 gun can be loaded without exposure of the gunner to an enemy's fire, and to be raised (after the gun is loaded) into position for firing *en barbette* or from a turret.

The main feature of my said invention is
30 the provision of means for counterbalancing the gun and its supports, so that a small force will suffice for raising or lowering the same.

My said invention, moreover, comprises various novel features of construction herein-
35 after set forth.

In the accompanying drawings I have shown how my said invention may be conveniently and advantageously carried into practice.

Figure 1 is a vertical central section showing my improved apparatus constructed and
40 arranged for use on land. Fig. 2 is a vertical central section illustrating a modification of my invention.

Like letters indicate corresponding parts
45 in these two figures.

A is a pit, which is formed in the ground, and the bottom and sides of which are lined with concrete, as at A', and with brick-work, as at A².

50 B is a platform supported by means of col-

umns or standards C upon an air-holder D, which is open at the bottom and is immersed in water or other liquid contained in the pit A. The standards C are firmly secured at their upper ends to the said platform and at
55 their lower ends to the air-holder D.

E is a gun, which is mounted upon a carriage E' upon the platform B and is provided with suitable means whereby it can be pointed and trained or traversed. The holder D and
60 platform B are provided with rollers D', which bear against and rotate in contact with vertical bars or rails F, secured to the sides or walls A² of the pit A. These bars or rails serve to guide the holder in its up-and-down
65 movement.

In the apparatus shown in Fig. 1 a rack G is secured to one of the columns C at one side of the holder D, and is geared with a pinion H, fixed on one end of a horizontal
70 shaft I, carried in suitable bearings I'. A worm-wheel K is fixed on the other end of the said shaft, and is geared with a worm or endless screw fixed or formed on the vertical
75 shaft L, which is arranged to be rotated in either direction by an electric motor at M. This motor is connected with any suitable generator of electricity, and a switch or contact making and breaking device is arranged
80 in the circuit to provide for starting and stopping or reversing the movement of the said motor. One or more passages N are
85 formed between the pit A and the magazine or other place where the ammunition is stored. Rails are laid in each of these passages, and upon these rails is placed a truck for carrying
ammunition from the magazine to the gun. The said passages are so arranged that
90 when the gun is lowered its muzzle will be in a suitable position to receive the charge and projectile.

The air-holder D is made of such capacity that it will, by reason of its buoyancy, support the whole or the greater portion of the weight of the gun and its carriage and of the
95 platform B. The depth of water in the pit A is such that the air-holder D will be completely submerged whatever position it may occupy in the said pit. Therefore, assuming
100 that when it is at about the center of its

movement its buoyancy is exactly counter-
balanced by its weight and that of the gun,
carriage, and platform, if the said holder is
raised above the central position, the mean
5 density or specific gravity of the mass in the
liquid will be diminished by reason of the
expansion of the air in the holder and the
consequent expulsion of some of the water
therefrom, and the said holder and parts car-
ried thereby will have a tendency to rise. If,
10 however, the holder is moved down below
this central position, the mean density or
specific gravity of the mass will be increased
by the compression of the air in the holder
15 and the entrance of water therein, and the
said holder and parts carried thereby will
have a tendency to descend. It is therefore
evident that the motor, in order to raise or
lower the gun, will only require to exert suf-
20 ficient force to overcome the friction of the
working parts and the slight resistance due
to variation in the density of the mass, as
above stated, and to lift the extra weight of
the charge and projectile in raising the gun
25 when loaded. It is obvious that instead of
using air in the said holder I can, if desired,
use any other suitable gas.

The pointing of the gun is, by preference,
effected by means of electricity, and for this
30 purpose I prefer to employ mechanism such
as that described in the specification accom-
panying my application for Letters Patent of
the United States filed August 22, 1887, Serial
No. 247,511.

35 In the modification of my invention shown
in Fig. 2 I provide for the introduction of
compressed air into the air-holder D for the
purpose of raising the gun and platform.
For this purpose I employ a closed chamber
40 or reservoir P for containing compressed air,
which chamber is placed in a pit P', lined
with brick-work, as at P². A pipe Q is con-
nected with the said chamber and is provided
with a stop-cock Q' and a nozzle Q². This
45 nozzle extends into the funnel-shaped end or
mouth R' of a pipe R, which is provided near
this end with a stop-cock R², and which has
its other end extended upward within the pit
A into the air-holder D and above the highest
50 level to which the water is permitted to rise
in the said holder.

D² is a cap or casing, which is secured to
the top of the holder D to provide an inclosed
space for the reception of the end of the pipe
55 R when the said holder is lowered. The stop-
cocks Q' R² are provided with levers q r,
which are coupled to a rod S, passed through
a hole in a supporting-plate S' and provided
with a handle S². By pulling up this rod the
60 said stop-cocks can be simultaneously opened
and by releasing or depressing the said rod
the stop-cocks can be simultaneously closed.
When the said stop-cocks are opened, a jet of
compressed air from the chamber P will be
65 forcibly directed through the nozzle Q² into
the pipe R and will induce a current of air
into the mouth R' of the said pipe, as indi-

cated by the arrows. The said nozzle and the
pipe R therefore constitute an injector where-
by air can be forced into the holder D under 70
a pressure sufficient to raise the same and
the parts carried thereby. If desired, the said
injector can be dispensed with and the cham-
ber P connected by a pipe directly with the
air-holder D; but by employing the said in- 75
jector I am enabled to effect considerable
economy in the use of the compressed air.
For instance, assuming that the pressure of
the air in the chamber P is one hundred and
forty pounds per square inch and that a press- 80
ure of seven pounds per square inch is re-
quired in the air-holder D to displace the wa-
ter in and raise the same, if air from the
chamber P were admitted into the air-holder
D at its full pressure, although it would ex- 85
pand to twenty times its volume, yet a con-
siderable quantity of the compressed air
would require to be used for raising the gun;
but when the dynamic force of the compressed
air issuing from the nozzle Q² is utilized, as 90
above described, for inducing a current of
external air through the mouth of the pipe
R a large quantity of air can be introduced
into the air-holder D under a pressure suffi-
95 cient to raise the gun with a small expendi-
ture of the compressed air contained in the
chamber P.

T is a pipe fixed in the top of the air-holder
D and extending to and through the plat-
form B. This pipe is provided with a stop- 100
cock T', furnished with a lever t, which is
coupled to a rod T². This rod extends to and
through the platform B, and has a handle T³,
whereby it can be raised or depressed to open
or close the stop-cock T'. The portion of 105
the pipe T within the holder D is of such
length that the lower end of the said pipe is
a short distance above the level of the water
in the said holder when the latter is in its
highest position. When the cock T' is opened, 110
a portion of the air in the holder D escapes
through the pipe T, and the said holder is
caused to descend by gravity. When the
said holder has descended a short distance,
the said pipe is closed by the water, and as 115
the said holder continues its descent the air
remaining therein is slightly compressed and
the mean density or specific gravity of the
mass in the liquid is compressed, so that the
said holder and parts carried thereby have a 120
tendency to descend; but to counteract this
tendency I provide a closed air chamber or
dome D³ on the top of the holder D. As the
said holder descends, this chamber or dome
gradually becomes submerged and increases 125
the buoyancy of the said holder. By employ-
ing this chamber or dome I also provide for di-
minishing the buoyancy of the holder as it
rises. The equilibrium or approximate equi-
librium of the parts is thus insured whatever 130
position the said holder may occupy in the
pit A. The lowering of the gun after the
pipe T is closed by the water is effected or
continued by the momentum imparted thereto

while the said pipe was open either with or without the aid of gravity, according to whether the parts are in absolute or approximate equilibrium.

5 To gradually arrest the movement of the said holder and prevent too violent impact thereof against the bottom of the pit A or against the stop A³ at the top thereof when the said holder is raised or lowered, I make
10 the said pit conical at its lower end, as at A⁴, and I attach to the sides of the said pit a ring or annular piece A⁵, which is conical in transverse section. During the latter part of the downward movement of the holder D the
15 space for the passage of water between its lower edge and the conical part A⁴ of the pit A is gradually contracted, thereby increasing the resistance to the downward movement of the said holder. In a similar manner, during the latter part of the upward movement
20 of the said holder, the space for the passage of water between its upper edge and the conical ring A⁵ is gradually contracted, thereby increasing the resistance to the upward movement of the said holder.
25

What I claim is—

1. The combination, with a cannon and its carriage or supports, of a vertically-movable counterbalancing air or gas holder submerged in a pit of water or other liquid, and upon which the cannon is mounted, and mechanism for moving the holder to different levels in the water, and thereby adjusting the level of the cannon, as set forth.
30

2. The combination, with a vertically-movable air or gas holder open at the bottom and immersed in a pit partially filled with water or other liquid and a cannon with its carriage or supports mounted on the said holder
40 so as to be always above the surface of the water, of a device for increasing or diminishing the air contained in the holder, as and for the purpose set forth.

3. The combination, with an air or gas
45 holder with an opening in the bottom and immersed in a pit or receptacle filled or partly filled with water or other fluid in which it may rise or descend and a gun or cannon

with its supports mounted on said holder so as to be above the level of the water when the
50 holder is in its lowest position, of an air chamber or reservoir containing air or gas under compression, a pipe or passage connecting the same with the holder, and means for controlling the admission of air into the holder
55 and its escape therefrom, as herein set forth.

4. The combination, with an air or gas holder open at the bottom and immersed in water or other liquid in which it can rise or descend and a gun and its carriage or supports
60 mounted on said holder so as to be above the surface of the water when the holder is in its lowest position in the water, of a compressed-air chamber or reservoir connected by a pipe or passage with said holder and an injector for
65 utilizing the compressed air to induce a current of external air and force the same into the said holder, all substantially as and for the purpose set forth.

5. The combination, with a gun and its carriage or supports, of a submerged and vertically-movable air-holder open at the bottom and supporting said gun above the surface of the water, the holder being formed with a smaller air chamber or dome on its top, which
75 in an elevated position of the holder projects above the level of the water or other liquid, as set forth.

6. The combination, with a submerged and vertically-movable air-holder open at the bottom and a gun and its carriage or supports mounted on the holder above the surface of the water, of a means for gradually arresting the vertical movement of the holder, consisting of a pit in which the holder is immersed,
80 having a conical lower end and provided with an annular piece attached to the sides of the pit near the upper limit of movement of the holder, as set forth.

In testimony whereof I have hereunto
90 signed my name in the presence of two subscribing witnesses.

HIRAM STEVENS MAXIM.

Witnesses:

ROBT. M. HOOPER,
DAVID T. S. FULLER.