(No Model.)

G. H. REYNOLDS.

DYNAMITE GUN AND APPLIANCE FOR OPERATING.

No. 421,310. Patented Feb. 11, 1890.

Fig. 1.

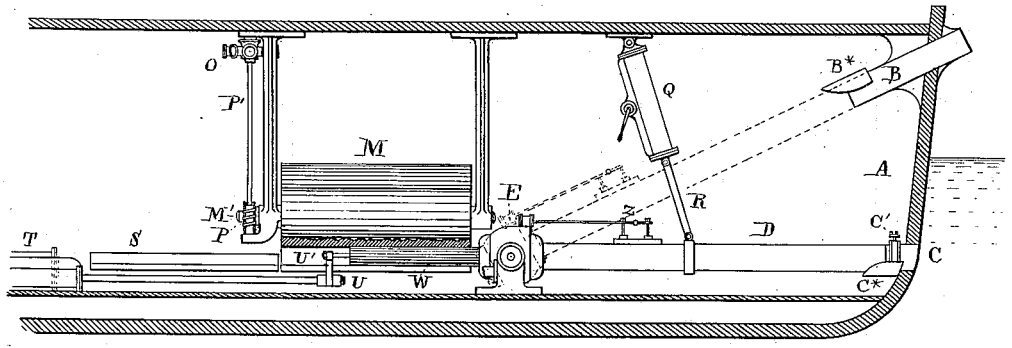


Fig. 2.

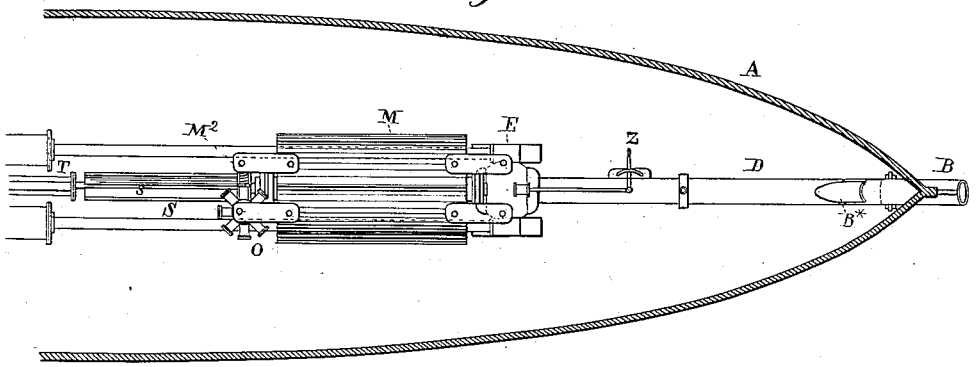
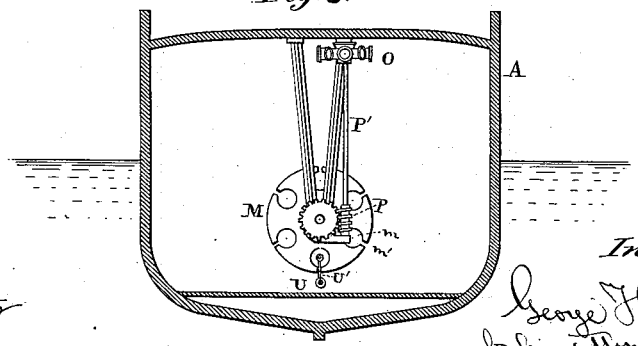


Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGE H. REYNOLDS, OF NEW YORK, N. Y.

DYNAMITE-GUN AND APPLIANCE FOR OPERATING.

SPECIFICATION forming part of Letters Patent No. 421,310, dated February 11, 1890.

Application filed April 6, 1889. Serial No. 306,176. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, of the city and county of New York, in the State of New York, have invented certain new and useful Improvements in Pneumatic Cannon and Means for Operating the Same, of which the following is a specification.

The invention is intended more especially for cannon operated by compressed air under high pressure and adapted for use on shipboard to throw large projectiles containing high explosives; but it may be carried out with a wide range of sizes and of various proportions, and may serve with other gases than atmospheric air, and the gas may be produced by other means than mechanical compression.

The objects sought are simplicity and economy of construction, and convenience, certainty, safety, and effectiveness of operation.

I do not confine myself to the exact form and arrangement of parts shown in the drawings, as I may arrange the various parts in a different way to suit their situations. I have here shown the gun as placed in the bow of the vessel and arranged to fire below water, as well as above water, and have shown the magazine for containing the projectiles in the rear of the gun; but I may omit the firing of the gun under water and remove it sufficiently back from the bow to put the magazine in front of the gun and load from toward the muzzle. Indeed, this is the arrangement which I have carried out in the United States cruiser *Vesuvius*.

One part of my invention relates to the peculiar arrangement of barrel, the breech portion being hinged near the breech end in such a way as to be capable, when in its lowest position, to receive the projectiles from the magazine, and may in that position be discharged point-blank through a muzzle which projects through the bow of the vessel at this point; or I may at will raise this movable part of the barrel by turning it upward, so as to be in line with another muzzle portion which is above water.

Another part of the invention relates to the peculiar form of magazine which I here employ. In guns of this character the projectiles are of great length and weight—say a projectile of sufficient capacity to carry six hundred pounds of dynamite will be about twelve feet long and fifteen inches diameter, and will weigh, when loaded, about one thousand pounds. It is impracticable to store and handle such projectiles by hand on board ships in any considerable heavy sea. That I may handle such projectiles with perfect safety, no matter how much the ship may be rolling, I have invented this magazine.

Another part of this invention relates to the means for turning the magazine into such exact position and holding it there as shall bring the projectile to be loaded in an exact line with the barrel.

What I consider the best means of carrying out the invention are fully described below and are shown in the accompanying drawings, forming part of this specification.

There is one sheet of drawings.

Figure 1 is a longitudinal section of the vessel. It represents in strong lines the gun in its horizontal and also in dotted lines in its elevated position, together with its two fixed muzzles, also the magazine for containing the projectiles, the hydraulic motor for turning the magazine, also the loading-ram and receiver for the projectiles, all shown in side elevation. Fig. 2 is a horizontal section of the vessel, showing plan view of the same parts; and Fig. 3 is a cross-section of the vessel with an end view of magazine.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

The barrel and muzzle may be made of any suitable material having sufficient strength to resist the pressure of air to be used, preferably of such material and in the manner described in my application for patent, Serial No. 302,216, filed March 6, 1889. I also show a hydraulic cylinder and piston for the purpose of raising and lowering the movable barrel. I also show the magazine in position ready for the loading-ram to force a projectile into the barrel and the water-motor ready to turn the magazine so as to allow of the projectiles entering the barrel.

I employ a hydraulic motor for training the gun. While in training any gun it is quite important to be able to place it in exact position, it is a necessity in this invention. The revolving magazine must be moved with great precision and steadiness and must

start and stop without shock. I employ a motor having many cylinders and connected to the magazine by means of a worm-wheel and worm and use liquid pressure to actuate the motor. By this combination thus worked I am enabled to attain the ends sought. On account of the great weight of the projectiles to be thrown I use motive power both for placing them in the magazine and for transferring them from the magazine successively into the gun-barrel. I arrange in the rear of the magazine a receiving-trough, into which the projectiles are first placed. The trough has a slot in the bottom dividing its front end completely in two, through which an arm from the ram can pass while pushing the projectiles into the magazine. Each chamber of the magazine is also provided with a slot or division extending the entire length of the magazine, through which the same arm can move in loading the projectile into the barrel.

Referring to the drawings and to the letters of reference marked thereon, A is the hull of the ship; B, a fixed muzzle for the cannon set in the ship in a fixed position, and C a fixed muzzle set in the ship in another position, the latter, as shown, being below the water-line and equipped with ordinary or any suitable provisions C′ for excluding the water and allowing the discharge of the projectile. I prefer for this latter the means set forth in the patent to John Ericsson, dated May 7, 1878, No. 203,435. It will be understood that the valve and the perforable water-tight fabric of Ericsson are in this invention simply applied to the inner end of the lower muzzle C, instead of to the forward or outer end of the gun, as in Ericsson's patent. Such a substitution will involve no difficulty and will require no further description.

D is my barrel. It is hinged on trunnions at the breech E.

B* is a stop fixed on the muzzle B in the position to arrest the elevation of the gun in line with the muzzle B, and C* is a stop fixed on the muzzle C, adapted to arrest the depression and hold the gun exactly in line with the lower muzzle.

M is a magazine mounted with liberty to revolve on an axle M′ and having a series of chambers *m*, each provided with a longitudinal slot *m′*. This magazine may be in practice a skeleton frame having sufficient strength to receive, hold, and present in proper succession a series of the long and heavy projectiles required to operate effectively with high explosives.

O O, &c., are a set of cylinders and pistons constituting a multiple-cylinder hydraulic motor, controlled by the attendant by means of any suitable valve connected to an elevated tank of water or to a supply of water under pressure in any convenient part of the ship. (Not shown.) This motor O gives motion at will to a shaft P′, carrying a worm P, which engages a worm-wheel M² on the shaft M′. The arrangement renders it practicable to revolve the magazine and arrest it exactly in line with the barrel D when the latter is depressed.

Q is a ram operated at will by water acting in the long cylinder controlled by the attendant and serving to draw up the rod R or allow its depression with the corresponding elevation and depression of the barrel D, turning on its trunnions E.

T is a ram, operated also at will by the attendant forcing out and drawing in the rod U, carrying an arm U′, which is adapted to traverse at will any slot *m′* in the magazine M, which is brought in line with its motion, and also to similarly traverse at will a slot *s* in the bottom of a trough S, arranged in rear of the magazine. To change the magazine, the projectiles W are placed one by one in the trough S, and the magazine being partially rotated between each operation the projectiles are by the reciprocations of the ram U T acted on by the arm U′ and forced endwise into the proper chambers *m* of the magazine. To charge the barrel from the magazine, the latter is brought into position with one of the chambers *m* in line with the barrel D, the latter being in the depressed position shown in strong lines in Fig. 1, and the breech of the cannon being opened the projectile is forced into the barrel D by a further movement than before of the arm U′. Then, the breech of the barrel being closed, the gun is ready for firing, either in the same position in which it has been loaded, thus firing through the lower fixed muzzle C and sending out the projectile under water, or in the elevated position to which it may be raised by the ram Q R bringing it into line with the upper muzzle B, in which case the projectile will be discharged higher and with a correspondingly-elevated inclination. The system of reservoirs for compressed air and the provisions for bringing a high pressure to bear with great force on the projectile or on a separate piston introduced behind it may be of any ordinary or suitable character. Z shows a handle to be operated by the attendant for effecting such operation.

Modifications can be made without departing from the principle or sacrificing the advantages of the invention. I can use a greater or less number of chambers *m* and slots *m′*. I can use any approved type of breech-block for opening and closing the rear end of the movable barrel D. I can use any type of firing-valve, and can operate the latter by any arrangement of auxiliary valve or valves. I can use means analogous to C′ for excluding water from the upper muzzle B when working in a heavy sea.

I claim as my invention—

1. In a pneumatic gun, the barrel D, turning on hollow trunnions E near the breech, having provisions for receiving compressed air therethrough, in combination with two

muzzles B and C, fixed at different elevations and arranged in divergent lines registering with such barrel, all substantially as herein specified.

2. The two fixed muzzles B and C and stops B* C*, arranged as shown, in combination with each other and with the barrel D, mounted on trunnions E, with provision for receiving compressed air through the latter, adapted to allow the barrel to be forcibly elevated and held by the stop B* in line with the muzzle B, and to be afterward depressed and held by the stop C* in line with the muzzle C, the barrel registering with the muzzle in such position, all substantially as herein specified.

3. The barrel D, turning on trunnions E, through which compressed air is received, in combination with the ram Q R, arranged to control such turning motion, and with two fixed muzzles B and C, arranged in divergent lines, adapted for joint operation, substantially as herein specified.

4. The magazine M, having chambers *m* and slots *m'*, mounted with liberty to be revolved, in combination with the barrel D, turning on hollow trunnions E, having connections for supplying compressed air to impel the projectile, and with two fixed muzzles arranged in divergent lines, all as herein specified.

5. The cartridge-holding trough S, in combination with the revolving magazine M, having chambers *m*, and with the barrel D, turning on hollow trunnions E, with connections for receiving compressed air, and with two fixed muzzles B and C set in divergent lines, all substantially as herein specified.

6. The ram T U, having an arm U', in combination with the magazine M, having chambers *m* and slots *m'*, and with the trough S, having a slot *s*, and with the barrel D, turning on trunnions E, through which compressed air is received, arranged to allow the projectile to be forced by the ram from the trough into the magazine, and afterward by a further movement of the ram into the barrel, all substantially as herein specified.

7. The multiple-cylinder motor O, with provisions for supplying water thereto, in combination with the revolving magazine M, having chambers *m*, the charging-trough S, the movable barrel D, turning on trunnions E, and the two fixed muzzles B and C, arranged divergent, adapted to register with the barrel in two divergent positions, all adapted for joint operation, as herein specified.

8. In a ship A, the two fixed muzzles B and C, arranged in the hull in divergent lines, one below the water-line, provisions C' for temporarily excluding water and allowing the passage of a projectile through the lower muzzle, and a movable barrel D, adapted to register with either muzzle, the barrel turning on trunnions E, with provisions for supplying compressed air therethrough, arranged to allow the projectile to be discharged through either muzzle at will, as herein specified.

9. The barrel D, turning on hollow trunnions E near the breech, with provisions for supplying compressed air through such trunnions to actuate the firing mechanism at will and impel the projectile, in combination with an elevating mechanism Q R for effecting the turning movement, two fixed muzzles B C, with their stops B* C*, either of which may be used at will, a charging-ram T U, and suitable provisions, as the trough S and revolving magazine M *m*, for holding and guiding the projectiles in being charged successively into the barrel to be discharged through one of the muzzles, as herein specified.

In testimony whereof I have hereunto set my hand, at New York city aforesaid, this 2d day of April, 1889, in the presence of two subscribing witnesses.

GEO. H. REYNOLDS.

Witnesses:
CHAS. F. BARTER,
CHARLES R. SEARLE.