

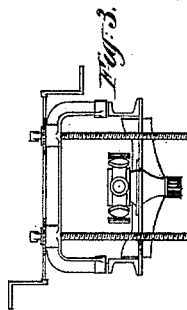
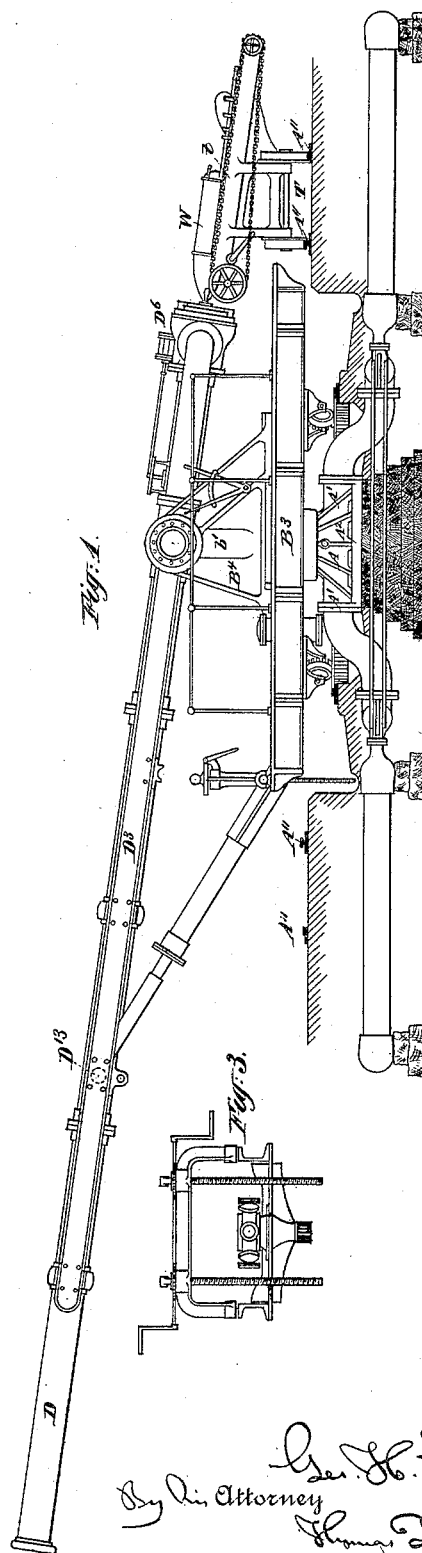
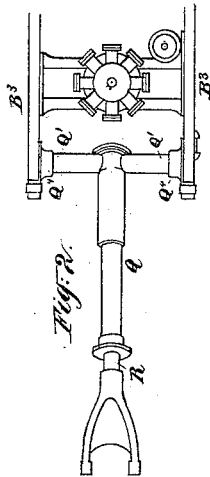
(No Model.)

5 Sheets—Sheet 1.

G. H. REYNOLDS.
PNEUMATIC GUN.

No. 421,312.

Patented Feb. 11, 1890.



Witnesses
Charles R. Searle
Charles F. Bart

Inventor
G. H. Reynolds
By his Attorney
Thomas D. Smith

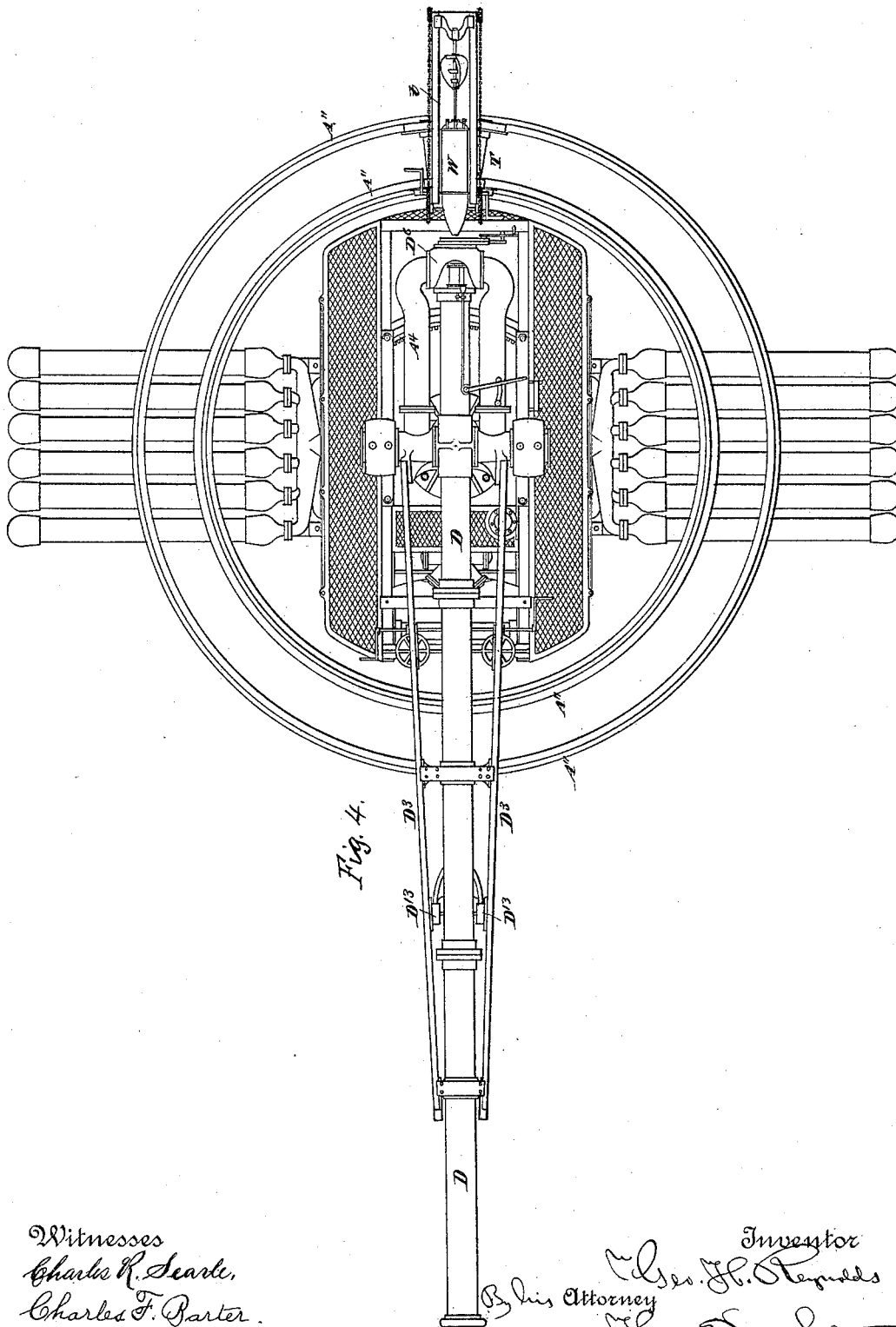
(No Model.)

5 Sheets—Sheet 2.

G. H. REYNOLDS.
PNEUMATIC GUN.

No. 421,312.

Patented Feb. 11, 1890.



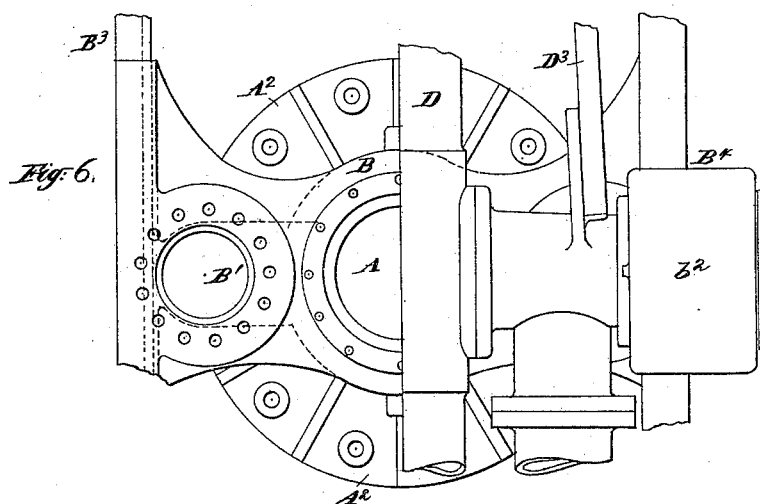
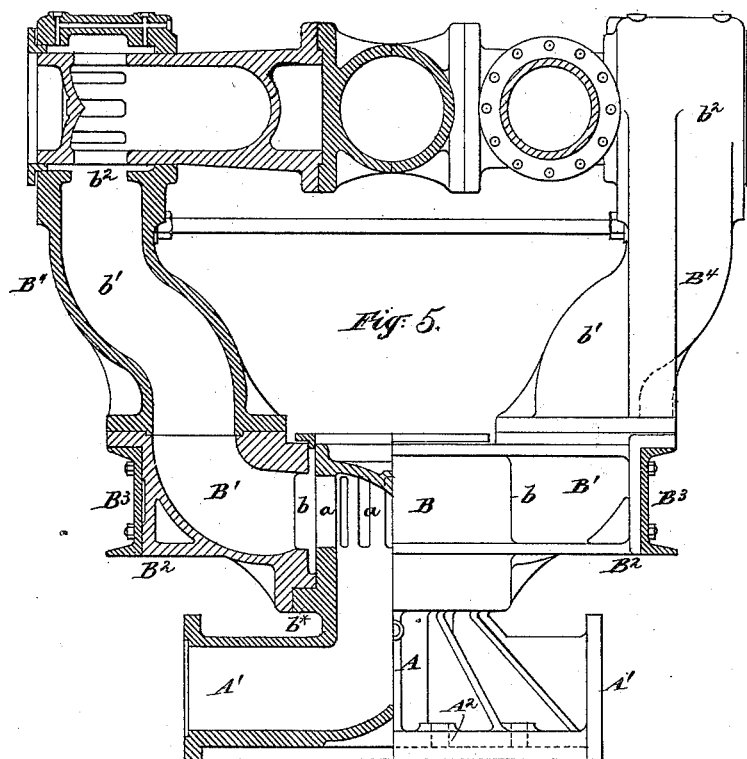
(No Model.)

5 Sheets—Sheet 3.

G. H. REYNOLDS.
PNEUMATIC GUN.

No. 421,312.

Patented Feb. 11, 1890.



Witnesses
Charles R. Searle,
Charles F. Barter.

Inventor
Geo. H. Reynolds
By his Attorney
James D. Preston

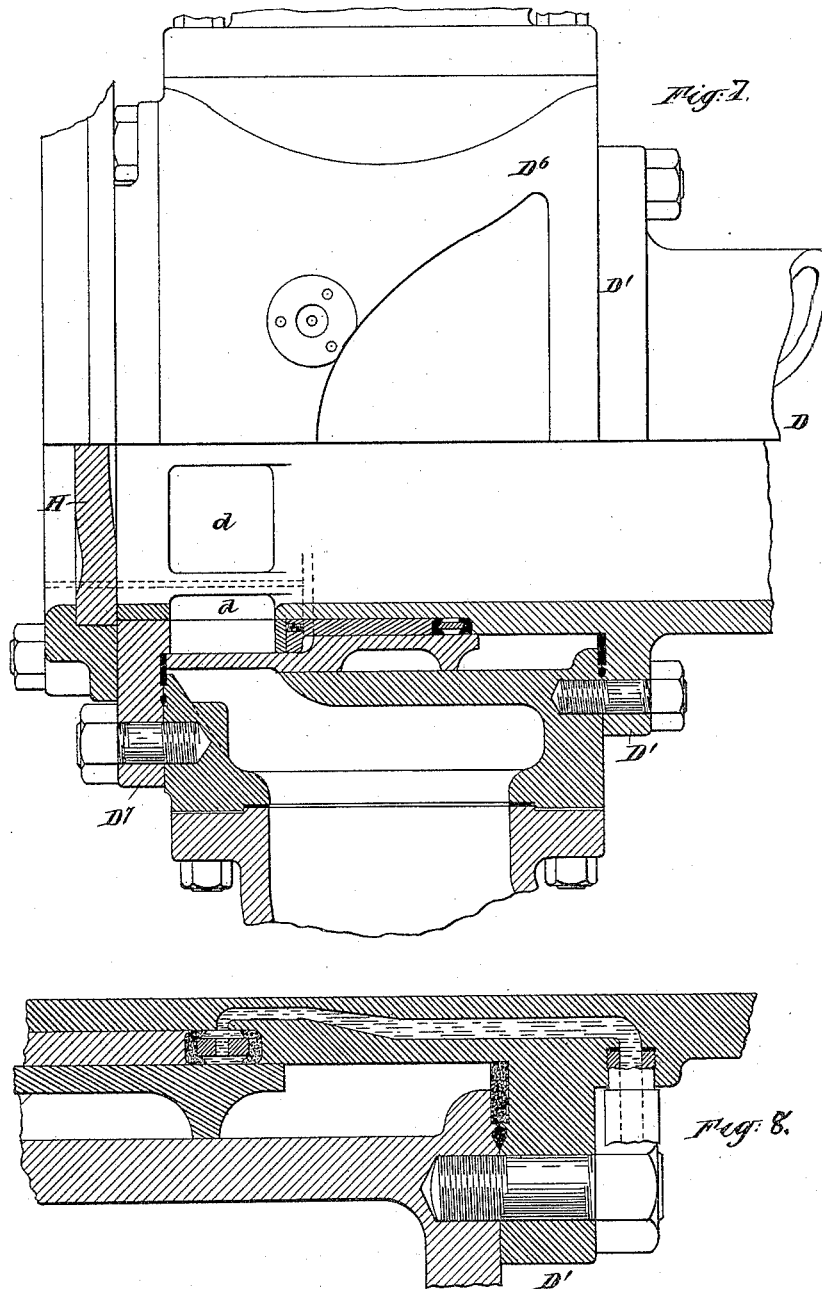
(No Model.)

5 Sheets—Sheet 4.

G. H. REYNOLDS.
PNEUMATIC GUN.

No. 421,312.

Patented Feb. 11, 1890.



Witnesses
Charles R. Searle
Charles F. Barter.

Inventor
G. H. Reynolds
By his Attorney
James D. Searle

(No Model.)

5 Sheets—Sheet 5.

G. H. REYNOLDS.
PNEUMATIC GUN.

No. 421,312.

Patented Feb. 11, 1890.

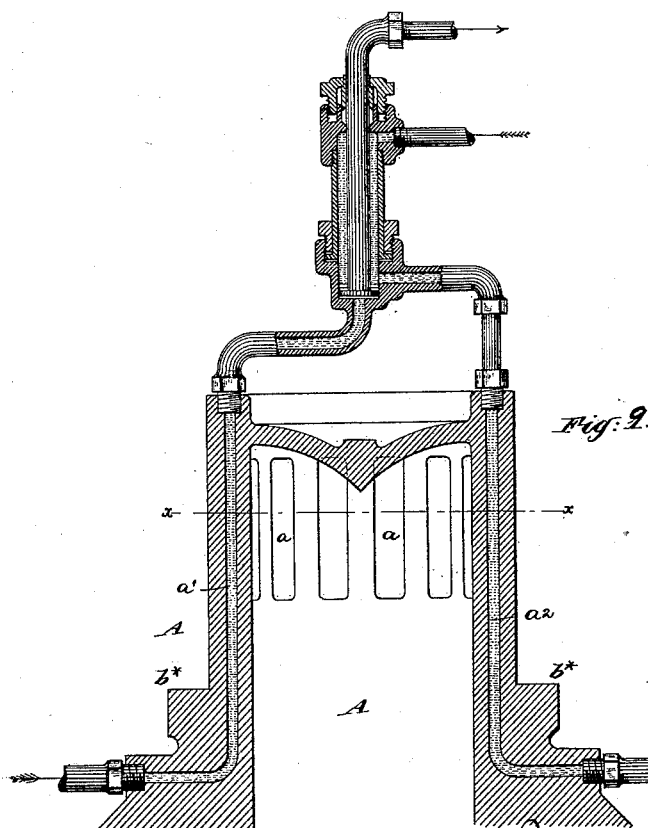
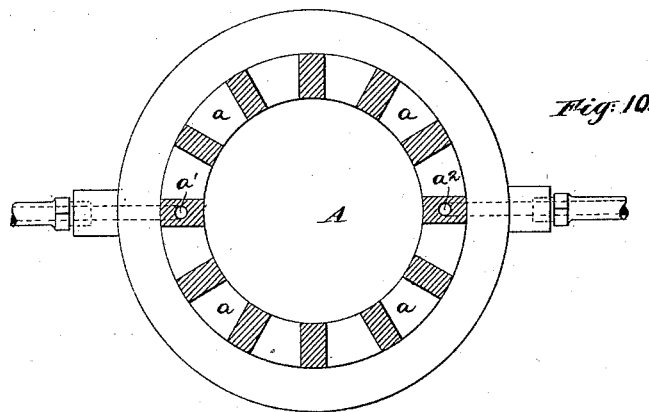
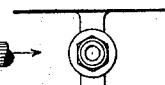


Fig. 11.



Witnesses:
Charles R. Searles
Charles F. Barter.

Inventor:
Geo. H. Reynolds
By his attorney
James D. Sisson

UNITED STATES PATENT OFFICE.

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

PNEUMATIC GUN.

SPECIFICATION forming part of Letters Patent No. 421,312, dated February 11, 1890.

Application filed July 29, 1889. Serial No. 319,025. (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 relating to Pneumatic Guns, of which the following is a specification.

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

The objects sought are simplicity and economy of construction and convenience, certainty, and effectiveness of operation. I have been guided to this by years of experience and practical application of the principles on which such ordnance should be constructed.

I will use the word "firing" in its technical sense as used by military men to define the act of discharging the gun. There is no ignition of powder or other combustible.

I will use the word "air" to designate the large volumes of gas under pressure employed to impel the projectile, and the word "oil" to designate the liquid employed in small quantities, with an excess of pressure in the packings, although various other liquids, as water with glycerine, may in practice be substituted.

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

Figure 1 represents the gun and the mechanism for operating it, in side elevation, with the loading-carriage in position to introduce a projectile. In this figure the gun is in a plane parallel reservoir. Fig. 2 is a plan view of one end of the gun-carriage, the hydraulic motor for training the gun, and the ram for elevating it; and Fig. 3 is an end view of the mechanism provided to elevate the gun by hand, showing also the motor for training. Fig. 4 is a plan view of the gun,

with its carriage and the loading-carriage. In this figure the gun has been trained in a plane across the firing-reservoirs. Fig. 5 is an end elevation of the gun-carriage frame, with the trunnion-blocks centered on the pintle, one-half of this view being shown in section. Fig. 6 is a plan view of the above parts, half of the upper parts being taken away. Fig. 7 is a plan view of the breech of the gun, partly in section. Fig. 8 is a corresponding section through a portion in a different plane. This figure is on a larger scale. Fig. 9 is a central vertical section of the pintle, showing the two ducts for conveying hydraulic pressure from the stationary parts of the system to operate the machinery for training and elevating the gun, the other allowing the return of the oil or other liquid after having performed this service. Fig. 10 is a cross-section on the line X X. Fig. 11 is a front view of one of the nozzles on the pintle.

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

Referring to the drawings, A designates the central pintle, which is securely fastened by bolts to a substantial foundation. It consists of a hollow casting with liberal apertures, combining the following features: first, as a sufficient and firm center around which the gun trains, receiving the recoil of the gun; secondly, as a passage for the air under heavy pressure from the firing-reservoirs to the gun, and in this respect it is so constructed that the strains resulting from this pressure are self-contained, it being closed at the top and bottom, and, thirdly, serving also for the passage to and from the motive fluid from the stationary to the movable parts of the apparatus. The air enters from the firing-reservoirs by the two nozzles A' and issues from it through a number of openings a' which being made around the circumference of the pintle, the pressure is balanced in all directions. To receive the recoil of the gun, the pintle is provided with a heavy flange A², re-enforced by ribs around it. The pintle is also constructed with ducts a' a² for the passage to and from the gun of the oil or other fluids under pressure, by which the gun is trained and elevated. Encircling the up-

per portion of the pintle and resting on the annular flange b^* thereof is a casting I call the "yoke" B, carrying the gun and carriage. The center of the yoke is bored to a working fit upon the pintle. It is provided with a belt b , into which the air passes from the pintle through the openings a , and from this belt the air passes by two nozzles B' on opposite sides of the yoke, thus relieving the parts from any unbalanced strain. The yoke is provided with flanges B^2 for attachment to the longitudinal framing of the gun-carriage, which consists of two heavy channel-bars B^3 . The yoke, with its load, is capable of turning in a complete circle around the pintle, and the flow of air is not obstructed by this movement, the openings in the pintle being at all times in full communication with the belt. Securely bolted to this yoke are the trunnion-blocks B^4 . Each trunnion-block consists, mainly, of a pipe b' , of suitable diameter, rising from the yoke to the gun-trunnion, supported by ribs and flanges sufficient to resist the recoil when the gun is fired. To receive the trunnions of the gun, the pipes swell into and terminate in chambers b^2 , bored to fit them.

At the breech of the gun the barrel is embraced within the firing-valve casing D^6 , which, with the breech-block H, is bolted to a heavy flange D' , cast upon the barrel a little forward from the breech.

D is the barrel.

D' is the flange, to which valve-casing D^6 is bolted, and D^7 is a piece which I call the "breech-ring," surrounding the barrel and flush with its end, and to which breech-block H is secured. Near the end of the barrel are openings d , through which air is admitted for the purpose of propelling the projectile W.

To elevate the gun to the required angle for attaining the range desired for the projectile, I use a hydraulic ram, marked Q R in Sheet 1, Fig. 1, and in the plan view, Fig. 2, of same sheet. It consists of a barrel Q, trunnioned at the lower end, where it is carried by two trunnions Q' in bearings Q^4 , bolted to the channel-bars B^3 . Within this barrel is a ram R, having one end formed into a fork, each end of which fits into a bearing D^{13} , securely bolted to the channel-bars D^3 , which constitute the truss for the barrel. The lower end of the ram R is formed into a piston working in the barrel Q, and provided with cup-leather packing. The liquid pressure for actuating this ram is introduced through one of the trunnions Q' . As it is desirable to be able to load the gun at any point of the circle to which it may be trained, I have provided a circular track at such a distance from the training center as will bring the projectile, mounted on a suitable carriage, into the proper position for introduction into the gun-

barrel. This track is shown in plan on Sheet 2, its rails being there marked A'', and in sectional elevation, marked by the like letters, on Sheet 1. The projectile-carriage T is made with wheels of proper diameters to roll easily and naturally on this circular track, and is provided with a trough t for safely holding the projectile, and with a ram T' , running on slides and worked by chains running over sprocket-wheels, for pushing the projectile steadily and without shock into the barrel of the gun. The sprocket-wheels are attached to or cast with gear-wheels, the latter being operated from a pinion-shaft extending from side to side of the carriage and turned by cranks in the hands of the men engaged in loading the gun.

In the drawings I have shown the projectile-carriage arranged for loading the gun at an angle of eight degrees. This enables the carriage to be lower than it would be if the gun were brought to a level for loading.

The several devices set forth for training are not dedicated to the free use of the public, but are made the subject-matter of my application filed July 29, 1889, Serial No. 319,024, and the hollow pintle in Serial No. 303,218, filed March 14, 1889.

I claim as my invention—

1. The combination, with a rotatable pneumatic gun and the circular track concentric with the pivot thereof and independent of the track upon which the gun travels, of the loading-car traveling on said track, as set forth.

2. The combination, with a rotatable pneumatic gun, of the circular track concentric with the pivot of the gun, the loading-car traveling on said track, the sprocket-wheels on said car, the chains running over said sprocket-wheels, and a ram carried by said chains and adapted to push the projectile into the barrel of the gun without shock, substantially as set forth.

3. The combination, with a pneumatic gun, of the circular track concentric with the pivot thereof, the loading-car traveling on said track, the sprocket-wheels on said car, the chains running over said wheels, a ram carried by said chains and adapted to push the projectile into the barrel of the gun without shock, the said sprocket-wheels carrying gear-wheels operated by a pinion-shaft extending from side to side of the loading-car, and provided with suitable crank, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand, at the city of New York, this 24th day of July, 1889, in the presence of two subscribing witnesses.

GEO. H. REYNOLDS.

Witnesses:

JAMES M. TULLY,
CHARLES R. SEARLE.