(No Model.)

G. H. REYNOLDS.

PROJECTILE.

No. 421,313. Patented Feb. 11, 1890.

Fig. 1.

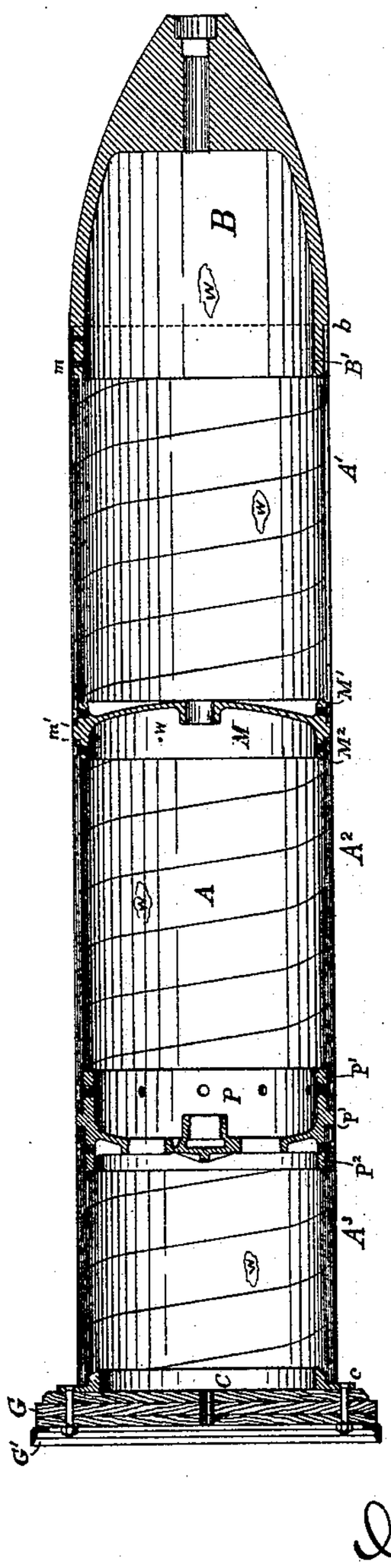
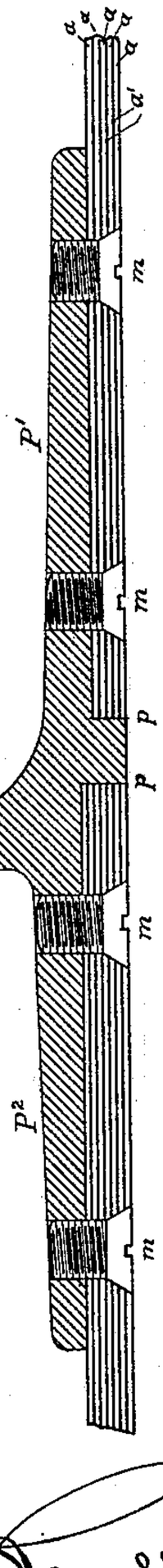


Fig. 2.



Witnesses
Henry Eichbaum
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UNITED STATES PATENT OFFICE.

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

PROJECTILE.

SPECIFICATION forming part of Letters Patent No. 421,313, dated February 11, 1890.

Application filed March 6, 1889. Renewed January 10, 1890. Serial No. 336,492. (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 a certain new and useful Improvement in Projectiles, of which the following is a specification.

My improvement relates to the construction of hollow elongated projectiles, and is more especially intended for large projectiles to be charged with dynamite or other powerful explosive and impelled by compressed air admitted by a proper mechanism to act behind it in a gun-barrel.

I have discovered that the mode of construction by winding thin metallic ribbons spirally in several layers soldered together, which has been long employed in the manufacture of light machinery, eminently the cylinders of carding-engines in the cotton and woolen manufacture, may be successfully used for the main cylindrical parts or bodies of such projectiles. I have based my invention thereon, and have worked it out in detail. I may make the cylindrical portion in three separate lengths of different thicknesses, the portion to go foremost being thinnest, the mid-length portion of intermediate thickness, and the rear portion of the greatest thickness. The ends of each are cut off or otherwise evenly finished, and abut fairly against corresponding surfaces at the extreme front and rear and at the intermediate junctions. At the points where the several lengths join I make transverse partitions through the projectile, each with surfaces abutting squarely against the correspondingly-formed portions in front and rear, and with flanges which are strongly secured to the cylindrical parts. The inner and outermost layers of ribbons may be of brass or other non-corroding material. The projectile is rotated rapidly during its flight, and it is important that it shall be balanced not only in its length, but around its axis. In the manufacture of the projectile I balance each of the several portions separately, adding solder on the inside, or otherwise modifying one end, or both ends, or the middle of each part, so that each of the projectiles is perfectly balanced by itself. Then, after properly uniting the parts, I test the entire projectile, and add further, if necessary, to verify the accuracy of the individual balancing of each piece. The projectile has now what is known in mechanics as a "running" balance, each part being balanced independently of the other parts.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a central longitudinal section through the entire projectile. Fig. 2 is a corresponding section of a portion on a larger scale.

Similar letters of reference indicate corresponding parts in both the figures.

A is the thin cylindrical shell, shown formed in three separate lengths, distinguished by supernumerals A' A^2 A^3. The thinnest A' is foremost, a thicker length A^2 comes next, and the thickest A^3 is in the rear. Each is in several layers. The outermost and innermost may be of brass. The intermediate layers may be of steel. All the layers are in the form of flat ribbons *a*, wound spirally and joined by solder *a'*. It will be seen that the body is in three separately-formed lengths. The end of each length is evenly finished and abuts fairly against an offset in the partitions M and P. The forward edge of the front section A' abuts against an offset *b* on the front piece B. A lip B' extends rearward sufficiently on the inner face of the section, and is strongly secured thereto by screws *m*, having countersunk heads. The back edge of the rearmost section A^3 abuts against an annular face *c* in a metal ring C. At proper distances forward of the breech-piece are two transverse partitions or rigid diaphragms extending across the projectile. The foremost M provides two annular abutting surfaces *m'*, looking in opposite directions, against one of which the rear edge of the length A' abuts, and is secured by screws *m*, tapped into a lip M'. The forward edge of the mid-length section A^2 is secured by screws *m*, tapped into a lip M^2. Further rearward is another rigid diaphragm or transverse partition P, which has two annular abutting surfaces *p* presented, the one forward to receive the rear edge of the section A^2, which is secured by screws *m*,

tapped into a lip P′, the other rearward to receive the front edge of the section A^3, which is secured by screws *m*, tapped into a lip P^2. These diaphragms or transverse partitions M and P separate the interior of the projectile into compartments and allow other members, (not shown,) as fuses, to traverse them. These details will be made the subjects of separate applications for patent, and need not be here further described.

G is a strong backing of wood in three layers, with the grain of one crossing that of the next. In the rear of the whole is a packing-lip G′, of stout leather, brass, or other material, adapted to be spread by a strong pressure of air or gas applied in rear of the projectile.

The ring C and the wood back G, which I term a "gas-check," and is not attached to the projectile, are of a greater diameter than the body A. The space around the latter is maintained by the introduction of suitable blocks or other efficient centering-pieces which hold the body in the center line of the gun while the projectile is lying still or is moving violently forward in the gun at the time of discharge. I propose to make these blocks also the subject of a separate application for patent.

A small quantity of solder W is applied on the interior of the front piece B in such position as to counteract any slight excess of weight on one side and bring the axis of motion coincident with the center line of the form. The interior of the several sections A′ A^2 A^3, and also the partitions M and P, may all carry small quantities of solder W, firmly attached on their interiors to effect the balancing. These pieces W perform the important functions of balancing the projectile not only as a whole, but also balancing each end and every intermediate part independently. They are applied before the parts A′ A^2 A^3 and the partitions M and P and the front piece B and back piece or gas-check G are put together. To effect this balancing, any given part, as the forward section A′, is mounted on a shaft and balanced on parallel bars in the usual manner. So soon as this is ascertained solder is applied on the proper side and at the proper distance from the mid-length toward either end, as may be required to make this piece when tested alone perfectly balanced. Each of the other two sections A^2 A^3 and the front piece B, and also the transverse partitions or diaphragms M and P, are each thus separately balanced. After this is done all the several parts are fastened together by the screws *m*, or equivalent rivets. The transverse partitions perform their usual functions of holding the contents in their proper position under the severe strain induced by the inertia or setback of the contents at the moment of the discharge. I attach importance to the fact that the thin material of the body abuts squarely against corresponding joints in the several partitions M and P, and also against offsets on the back piece G and on the front piece B. The junction of the parts, with the aid of these offsets, enables the construction to endure the great endwise strain to which the parts are subjected by the setback of the projectile and its contents at the moment of the discharge. I attach importance also to the difference in thickness in the different portions of the body. The portion A^3 between the partition P and the back piece G is subjected to the longitudinal crushing force due to the inertia of nearly the entire projectile. The portion forward of this A^2, extending between the transverse partitions P and M, is subject to the inertia or backward crushing force of a smaller portion (that in front of this section) and is of less thickness, and the forward portion A′ of the main body (that between the partition M and the front B) is made still thinner, because it has only the inertia of the front piece B to overcome.

I claim as my invention—

1. A projectile having a pointed front piece B and a suitable back piece C G, in combination with each other, and with countersunk fastenings *m*, securing them to a body or cylindrical shell of spirally-wound metallic ribbons *a*, secured by solder *a′*, as herein specified.

2. In a projectile, a main body composed of separate lengths of spirally-wound metallic ribbons *a*, joined by solder *a′*, the transverse partitions M and P, having offsets *m′* and *p*, and countersunk fastenings *m*, securing them together, as herein specified.

3. An elongated projectile having a front piece B, a rear piece C G, and an intermediate cylindrical body composed of spirally-wound metallic ribbons *a*, joined by solder *a′*, the body being made in separate lengths A′ A^2 A^3, arranged in line abutting against annular surfaces *b c m′ p* in the peripheries of the parts B, M, P, and C, and secured by the aid of lips B′ M′ M^2 P′ P^2 on such peripheries, as herein specified.

4. The projectile described, having a front piece B, rear piece G, and intermediate sections A′ A^2 A^3, all independently formed and separately balanced, constituting a body of spirally-wound metallic ribbons *a*, soldered, as indicated by *a′*, in combination with fastenings *m*, securing such sections to internal lips, as herein specified.

5. The projectile described, having a front piece B, rear piece C G, and intermediate cylindrical body formed of spirally-wound metallic ribbons *a*, joined by solder *a′*, the parts being balanced by small weights W, firmly attached in the interior of the several parts, substantially in the manner and for the purposes herein specified.

6. The body of a projectile, formed of thin cylindrical walls of metallic ribbon abutting upon transverse partitions, serving both to separate the interior into distinct compartments and to relieve the fastenings from strains due to the setback of the parts of the

projectile and of the charge, as herein specified.

7. The body of the projectile, formed in several sections or lengths of different thicknesses, the thickest being rearward, as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, New York, this 4th day of March, 1889, in the presence of two subscribing witnesses.

GEO. H. REYNOLDS.

Witnesses:

CHARLES R. SEARLE,

CHAS. F. BARTER.