

Feb. 13, 1923.

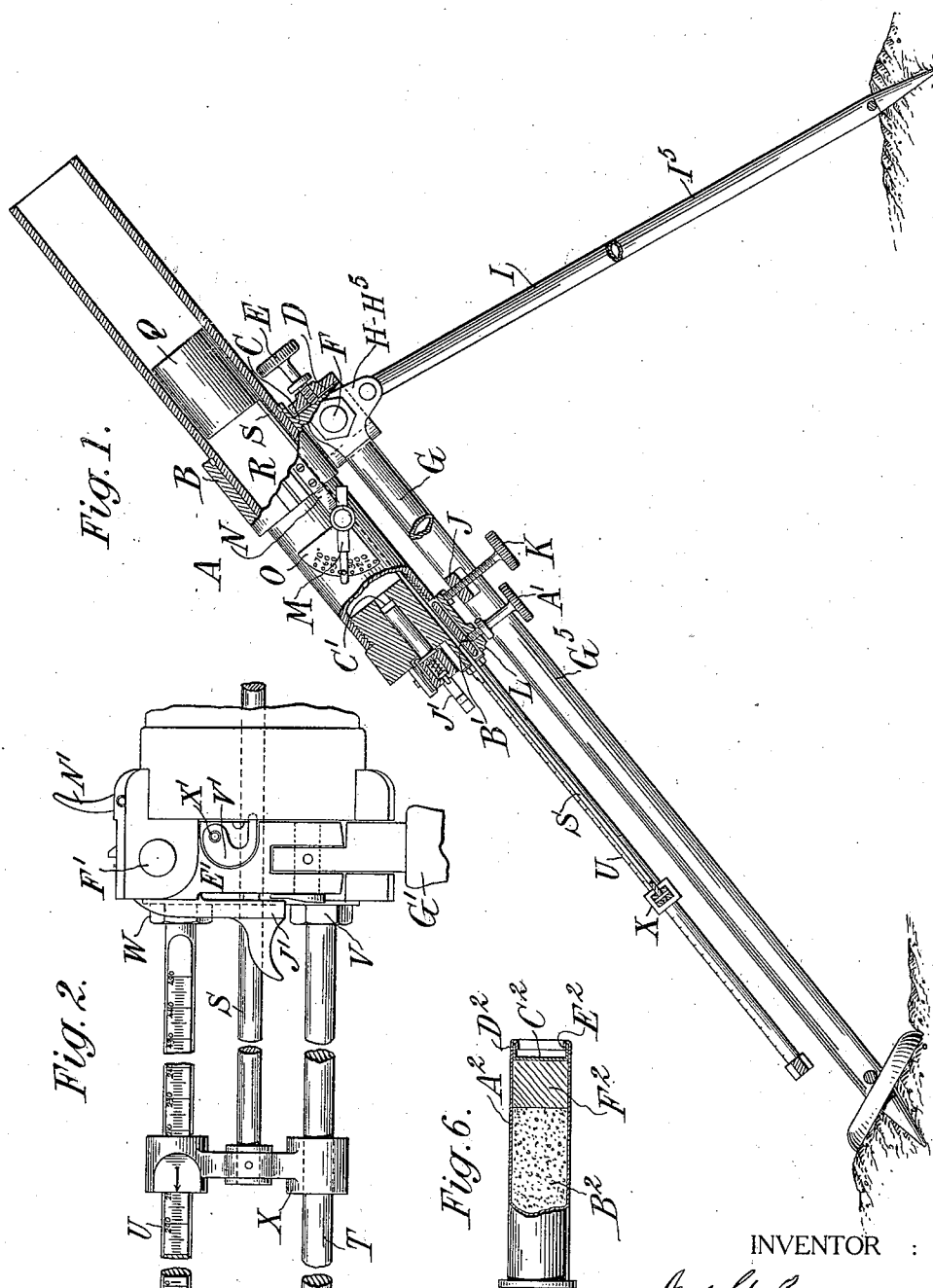
A. G. BERGMAN

GRENADE GUN

Filed June 8, 1916

1,445,126

2 sheets-sheet 1



WITNESSES:
Rene Maine
J. B. Hallard

INVENTOR :
Axel G. Bergman
 By Attorneys,
Frank J. Turk & Sons

Feb. 13, 1923.

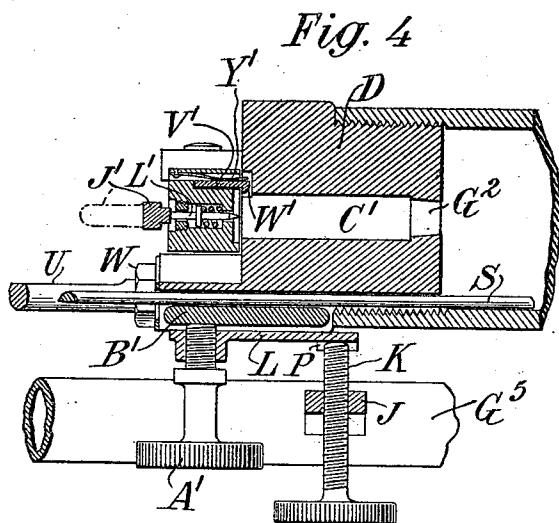
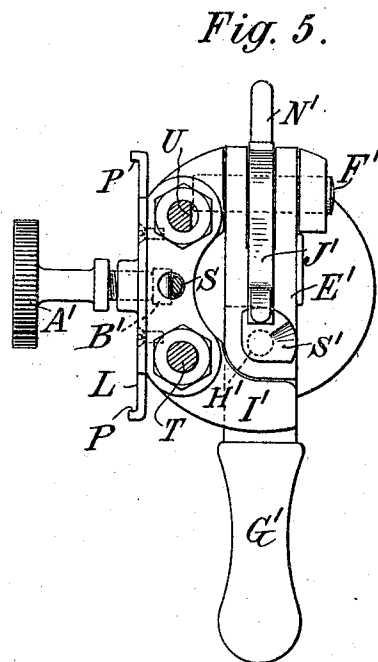
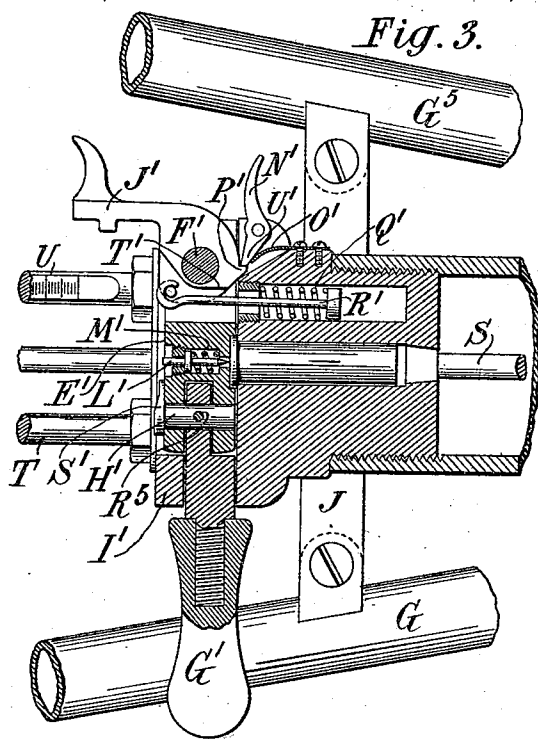
A. G. BERGMAN

GRENADE GUN

Filed June 8, 1916

1,445,126

2 sheets-sheet 2



INVENTOR

Axel G. Bergman

By Attorneys,

Fraser, Turk & Mullen

WITNESSES:

René Gruine
J. J. Wallace

UNITED STATES PATENT OFFICE.

AXEL G. BERGMAN, OF NEW YORK, N. Y., ASSIGNOR TO ELMER ORDNANCE CORPORATION, OF EAST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

GRENADE GUN.

Application filed June 8, 1916. Serial No. 102,494.

To all whom it may concern:

Be it known that I, AXEL G. BERGMAN, a subject of the King of Sweden, residing in borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Grenade Guns, of which the following is a specification.

This invention relates to trench guns, and aims to provide certain improvements therein.

In my Patent No. 1,317,419, dated September 30, 1919, I have described and claimed a trench gun intended primarily for throwing bombs, grenades, or other similar devices in which a substantially constant propelling charge is used, and the angle of the gun is preferably fixed, the range being altered by varying the size of the explosive chamber at the rear of the projectile. In the specific construction shown the explosive chamber is varied in capacity by altering the point at which the projectile is held in the barrel of the gun at the time of explosion.

The present invention aims to provide a more accurate and effective weapon of this type.

It is highly desirable that the explosive charge used in this type of gun shall be composed of smokeless powder, since this explosive not only gives the best results in practice, but also conforms to usual service conditions. It is also desirable that the explosive shall be contained in a cartridge case of some standard caliber, and that the cartridge shall conform as nearly to ordinary service cartridges as possible. For this purpose I have employed service ammunition from which the balls or bullets have been removed, or, in other words, what may be said to be blank cartridges.

In experimentation, however, I have found that such cartridges are subject to several disadvantages. A thorough ignition of the smokeless charge cannot take place in the ordinary blank cartridge because of the fact that smokeless powder requires a very considerable back-pressure to properly ignite it. This back-pressure in the ordinary ball cartridge is supplied by the bullet itself which

is crimped into the cartridge case and which is retarded to a great extent in its passage through the ordinary gun by the rifling of the barrel. Where the bullet is omitted, however, no such resistance is present, with the result that the charge does not build up a pressure sufficient to cause thorough ignition. The effect of this in a trench gun, particularly of the type where the explosive chamber is varied in size, is that the explosive charge not only does not reach anywhere near its maximum efficiency, but also is uncertain in its operation, with the result that that nice degree of accuracy in the range which is so desirable is not attained.

One of the principal features of my invention is the provision of a means, particularly in connection with a gun of this type, for building up a pressure which will insure a definite or standard explosive effect, which is preferably the maximum which a given charge of smokeless powder will produce.

The invention also includes certain features of the gun itself with which the cartridge is to be combined in practice, which features of construction will be hereinafter more fully described.

Referring to the drawings which illustrate one form of the invention,—

Fig. 1 is a side elevation, partly in section of the gun.

Fig. 2 is a plan of the breech and rear of the gun.

Fig. 3 is a horizontal section, showing the firing hammer in cocked condition.

Fig. 4 is a vertical section, showing the hammer in firing position.

Fig. 5 is a rear elevation of the breech, certain parts being shown in section.

Fig. 6 is an elevation, partly in section of the preferred form of cartridge.

Referring first to Figs. 1 to 6, let A indicate the gun as a whole which is best provided with a split sleeve B clamped to the barrel by suitable bolts. The sleeve has a pivot C at its under side which is held in a recess formed in a head D being removably retained therein by a bolt or thumb-screw E. The head D is formed or provided with lugs F which constitute pivots

for the rear legs $G\ G^5$ which are provided at their upper ends with brackets $H\ H^5$, the lower parts of which are pivoted to the front legs $I\ I^5$. By this construction the gun is in effect pivoted to the frame comprising the front and rear legs, while the latter may be adjusted at any relative angle to each other to secure a firm foundation for the gun.

The gun is capable of elevation and depression to a certain degree through its pivotal connection with the frame, means being provided for accurate adjustment and for holding it in its adjusted positions. Across the rear legs $G\ G^5$ is fixed a bar J through the middle portion of which is tapped a thumb-screw K , the inner end of which is adapted to engage a plate L screwed to the under side of the barrel, as shown in Figure 4. The approximate elevation having been obtained by adjustment of the frame, the thumb-nut K is manipulated until the precise degree of elevation is attained.

I prefer to provide a spirit level M or other means for ascertaining the horizontal and in the construction shown the level M is pivoted to an arm N carried on the sleeve B , a thumb-screw being provided for adjusting it in its horizontal position. A graduated sector O is shown as fixed to the barrel, the graduations indicating the degree of variance from the horizontal.

If it is desired to adjust the gun as to horizontal direction, the latter may be swung around the pivot C and the thumb-screw K will engage the plate L at varying parts of its length, while at the same time serving as a means for vertical angular adjustment. It is preferred to provide the plate with flanges $P\ P$ in order to limit the horizontal adjustment by engagement with the end of the screw K .

While means are provided for minor vertical adjustments for range, the principal means for varying the range is the positioning of the projectile at such points in the barrel as will allow of a smaller or greater explosion chamber behind it. In Fig. 1 of the drawing the projectile Q is shown as held about midway in the barrel, the explosion chamber R comprising principally that part of the barrel which lies between the projectile and the breech. In order to accurately adjust the position of the projectile, I provide an adjusting rod S which extends longitudinally of the gun and passes through the breech, as best shown in Figs. 1 and 2. In order to secure a scale and guide for the adjusting rod S , I provide two guide rods T and U which are screwed into the breech and fixed thereto by means of nuts $V\ W$. Moving on the rods T and U is a slide yoke X , to the middle of which the lower end of the adjusting rod S is fixed. One of the guide rods (shown as U) is provided with a

graduated scale indicating the position of the adjusting rod, and consequently the position of the projectile in the barrel. In order to fix the adjusting rod firmly in its adjusted positions, I provide a thumb-nut A' which screws through the plate L and either engages the rod S directly, or preferably through the medium of a key or clamping plate B' held loosely above the plate L , which when pressed against the rod secures a greater frictional surface than would the end of the thumb-screw A' alone.

The cartridge is preferably contained in a cartridge chamber C' formed in the breech D' which chamber may be of ordinary proportions, or may be modified, as hereinafter pointed out.

Any suitable form of breech mechanism may be employed, but I prefer that shown in the drawings which is best seen in Figs. 2, to 5. In these figures the construction includes a breech block E' mounted to swing horizontally on a vertical pivot F' . In the drawings the breech block is shown closed and locked by locking lever G' pivoted to swing vertically around a horizontal pivot H' , as best seen in Fig. 3. Fixed to the breech is a locking lug I' in front of which the locking lever G' swings, and by means of which the breech block is held in its closed position against back pressure during firing.

The firing mechanism shown comprises a hammer J' which is pivoted on the pivot F' , and which is adapted to strike the firing pin L' contained in a recess in the breech block, as best seen in Fig. 3. The firing pin is held retracted by a spring M' in the usual manner.

The hammer J' is normally held in its retracted position by the trigger N' , which is pivoted to a fixed portion of the breech, controlled by a spring O' and which engages a nose P' formed on the rear of the hammer. When the trigger is released the hammer is impelled forwardly by a spring Q' acting through a link R' connected to a pin on the hammer, as best shown in Fig. 3.

In order to prevent any possibility of firing unless the breech block is closed and locked, the pivot H' is fixed by a pin R^5 to the locking lever G' , so that the pivot oscillates when the lever is manipulated. At the outer end of the pivot is fixed a cam sector S' which when the breech is closed and locked, as shown in Fig. 3, is of insufficient thickness to prevent the hammer J' from impacting against the firing pin. In any other position, however, the thickened edge of the cam is interposed between the hammer and the pin.

The result of this construction is that after each firing operation the locking lever G' is tilted to unlock the breech whereupon the breech block may be swung back-

wardly a sufficient distance to permit the removal of the cartridge. The result of this movement is that the inner face T' of the hammer moves around the nose U' of the trigger until the lug P' of the hammer passes the nose U' and becomes engaged therewith. When the breech is again closed, the hammer is retained in its cocked position shown in Fig. 3.

I prefer to provide an extractor for the cartridge case which is best seen in Figs. 2 and 4. It comprises a curved member V' pivoted to the breech block and having a nose W' adapted to slip over the cartridge rim on the inward movement of the breech block. For this purpose the extractor V' is pivoted loosely at X' as shown, so that it may tilt sufficiently to pass over the rim. A spring Y' tends to hold it in its downward position. As the breech block is opened the nose W' pulls the cartridge case out of the cartridge chamber and in so doing it swings around its pivot sufficiently to produce a more or less straight pull on the cartridge case sufficient to draw the latter out of its chamber.

As before stated, in a gun of this type accuracy of range is secured principally by variation of the explosion chamber behind the projectile. It is essential to successful firing, however, that the explosive force of the cartridge shall be uniform; otherwise a variable factor is introduced which interferes with accuracy of firing. Ordinary black powder is not suitable for the explosive charge in the cartridge for a number of reasons principally due to the fact that the barrel is rapidly fouled and requires too frequent swabbing. On the other hand, smokeless powder while avoiding the disadvantages of black powder has not been found to be satisfactory due to the fact that with the ordinary blank cartridge there is nothing to build up the pressure within the cartridge to a point where thorough combustion of the cartridge charge is secured. One of the principal features of the present invention is hence the provision of means whereby a uniform explosive force is obtained with a given charge. Preferably this force is the maximum which the quantity of charge will afford.

The invention includes various methods of accomplishing this result, but the simplest is in the construction of the cartridge itself. In Fig. 6 I have illustrated the preferred form. The cartridge casing A² may be of any usual construction. I have indicated a charge of smokeless powder B², which charge may be varied but which best conforms to service conditions. The invention includes a means for building up a pressure on the charge after ignition, or what may be said to be the production of a back pressure, which is preferably the minimum

required by the charge for thorough ignition. In the form illustrated I provide a metal or other stiff disk C² which is preferably formed with an out-turned flange D² and the end of the cartridge casing is bent inwardly over the flange D², as shown at E². The thickness of the disk and the cartridge casing will determine the pressure which is necessary to disrupt the flange and the length of time which is required for this purpose. They should be so proportioned that they will not disrupt until about the minimum pressure required is reached. In the ordinary service cartridge casing, however, where the gauge of metal is small I have found it very effective to introduce a plug F² into the cartridge casing which best lies immediately back of the disk C² and is conveniently formed of wood. When the cartridge is fired I have found in practice that the construction shown not only provides sufficient back-pressure for thorough ignition, but also produces a great uniformity in explosive effect, so that with care in loading a succession of cartridges will fire a succession of projectiles with great accuracy, and where the maximum explosive force is provided for, the possible range of the projectile is greatly increased.

Practically, the means for introducing the back pressure should be such that when forced out of the cartridge they will not pierce the projectile, and thereby cause explosion of the projectile in the barrel, or otherwise injure the projectile. It is to be noted that this type of gun is adapted for use when constructed with a barrel which in diameter is in excess of that of the cartridge. This introduces a condition which does not permit of the back-pressure required being obtained by driving a bullet along the rifling as in the case of ordinary guns.

The building-up of the pressure required may be obtained in other ways than by the construction shown, as for instance by constructing the diameter of the exit passage G² of the cartridge chamber as shown in Fig. 4 to a point where the gases escape with difficulty. Or the exit passage G² may be so formed as to engage a plug (such as C² or F²) of the cartridge in such manner as to retard the passage of the latter into the explosion chamber. Other ways of producing the result will suggest themselves.

While I have shown and described one form of the invention, it will be understood that I do not wish to be limited thereto, since various changes may be made therein without departing from the spirit of the invention.

What I claim is:—

1. In a trench gun, the combination of a breech, a barrel secured thereto, an adjusting rod passing through said breech into

said barrel, guide rods at the end of said breech, a guide on said rods connected to said adjusting rod, and means for holding said adjusting rod in varying positions.

- 5 2. In a trench gun, the combination of a breech, a barrel secured thereto, an adjusting rod passing through said breech into

said barrel, guide rods at the end of said breech and a guide on said rods connected to said adjusting rod.

In witness whereof, I have hereunto signed my name.

10

AXEL G. BERGMAN.