June 5, 1945. L. R. JACKSON 2,377,425

EXPERIMENTAL GUN

Filed Oct. 23, 1942

Fig. 1.

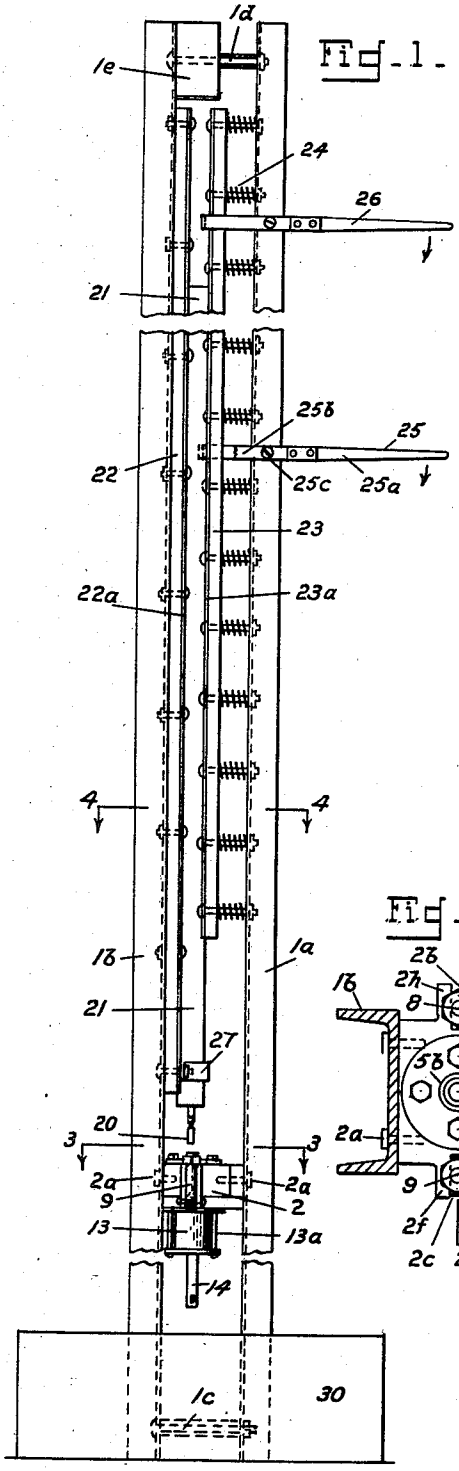


Fig. 2.

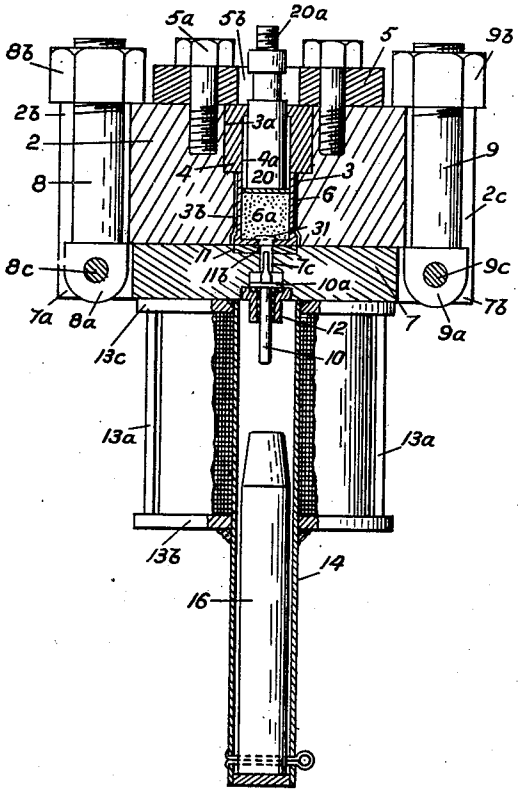


Fig. 3.

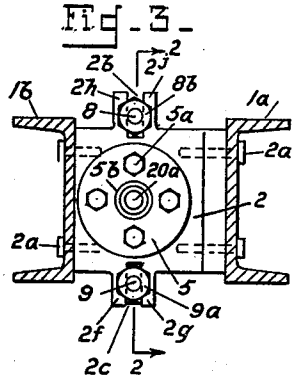
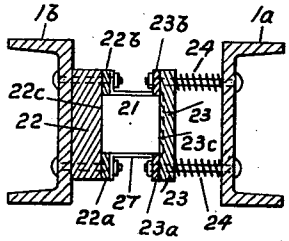


Fig. 4.



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EXPERIMENTAL GUN

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10 Claims. (Cl. 73—167)

This invention relates to an experimental gun, particularly a gun which will permit the simulation of firing conditions which exist in the barrel of a standard firearm.

It is an object of this invention to produce a gun for experimental work which will repeatedly and accurately reproduce conditions obtained in the chamber of a standard gun without the necessity of discharging a high velocity projectile.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawing in which:

Fig. 1 is a front elevation view of an experimental gun embodying this invention.

Fig. 2 is a longitudinal sectional view of the firing mechanism of the experimental gun.

Fig. 3 is a cross sectional view taken along the plane 3—3 of Fig. 1.

Fig. 4 is a cross sectional view taken along the plane 4—4 of Fig. 1.

An experimental gun embodying this invention is shown in assembled relation in Fig. 1. The frame of the gun comprises two parallel steel channels 1*a* and 1*b* which are set upright by mounting their ends in concrete. Suitable bolts 1*c* and 1*d* are provided between the channels at their bottom and top respectively to secure them rigidly together. A wooden bumper 1*e* may be mounted between the top of the frame members 1*a* and 1*b* on the bolt 1*d*.

The breech portion 2 of the gun is mounted between the two frame members by suitable bolts 2*a*. The breech comprises a rectangular block of steel having a centrally located cylindrical recess 3. The top portion 3*a* of the recess 3 is of greater diameter than the bottom portion 3*b*. Into the top portion 3*a* a barrel 4 of the material which is desired to be tested is inserted. Such barrel comprises a hollow cylindrical member fitting snugly in the chamber 3*a*. A plate 5 is secured to the top of the breech 2 by suitable bolts 5*a* and serves to anchor the barrel 4 within the breech 2. A hole 5*b* is provided in the plate overlying and coinciding with the hollow bore 4*a* of the barrel.

The lower portion 3*b* of the breech recess 3 is of suitable dimension to accommodate the powder containing portion of a small arms cartridge, for example, the case of a 12-gauge shotgun cartridge may be readily utilized in this gun. Accordingly the dimensions of recess 3*b* are such as to accommodate such case 6. On each of the sides of breech 2 which are not adjacent to the frame members, a pair of integral projections 2*f* and 2*g*, and 2*h* and 2*j* respectively, are provided. These projections define recesses 2*b* and 2*c* and are used for removably securing the breech block 7 to the breech. The breech block 7 is mounted in abutting relation immediately below the breech 2. The breech block 7 comprises a flat rectangular steel plate. The sides of the breech block 7 which are not adjacent to the frame members 1*a* and 1*b* are recessed as at 7*a* and 7*b* and the rounded heads 8*a* and 9*a* of bolt-like members 8 and 9 are respectively pivotally mounted within the recesses 7*a* and 7*b* on horizontal pins 8*c* and 9*c*. With such a mounting, the bolt-like members 8 and 9 may be pivoted upwardly in a vertical plane to respectively enter recesses 2*b* and 2*c* on breech 2. The end of bolt-like members 8 and 9 are threaded and when in the position described, nuts 8*b* and 9*b* are screwed on such threaded ends to securely lock the breech block 7 against the bottom of the breech 2.

A vertical recess 7*c* is provided in the center of breech block 7 to permit a firing pin 10 to be moved vertically into engagement with the primer 31 of the cartridge case 6. The top of the recess 7*c* is counterbored and hardened insert 11 is press fitted into this counterbored portion. Insert 11 is provided with a suitable bore 11*b* to permit passage of the end of the firing pin 10. The pin 10 extends entirely through the breech block 7. A suitable seal 12 surrounds the firing pin 10 at the base of the breech block 7. The firing pin is prevented from dropping out of the recess 7*c* by an integral shoulder 10*a* on the firing pin which rests on the top of the seal 12.

The firing pin is actuated by a solenoid 13. The coil portion of the solenoid may be supported by the breech block 7 by means of the vertical bolts 13*a* which support a solenoid bottom plate 13*b*. Extending through to the center of the solenoid is a non-magnetic hammer tube 14 which is secured by brazing to a solenoid top plate 13*c* and to the bottom plate 13*b*. Within the hammer tube 14 a magnetic hammer 16 is provided. Upon energization of the solenoid, the hammer 16 will be drawn rapidly upward by the magnetic forces generated, striking the firing pin 10 and discharging the cartridge 6.

The projectile for the experimental gun comprises a solid rod 20 which in the ready to fire position of the gun fits in the barrel 4. The end of the projectile 20 is provided with a threaded knob 20*a* by which projectile 20 is secured to a

large inertia member 21. The member 21 comprises a long rectangular block of metal of appreciable dimensions and thus a projectile unit of very large inertia is obtained. The inertia member 21 is mounted for slidable vertical movement between a pair of slide supports 22 and 23. The slide support 22 is secured to the inside of the frame member 1b by suitable bolts. On the inner surface of slide support 22, metallic guide rails 22a and 22b are respectively mounted defining a recess 22c which surrounds one side of the inertia member 21. Slide support 23 is of similar construction, having guide rails 23a and 23b defining a recess 23c into which the opposed side of inertia member 21 fits. However between the slide support 23 and the frame member 1a there is provided a plurality of horizontal compression springs 24 which bias the slide support 23 tightly against the inertia member 21. Relieving levers 25 and 26 are pivotally secured at spaced points along frame member 1a to force the slide support 23 against the bias of the springs 24 away from inertia member 21. The lever 25 comprises an arm 25a and a yoke 25b secured to the arm 25a and surrounding frame member 1a. The ends of yoke 25b extend beyond the inner surface of slide support 23 and are bent at right angles to engage the guides 23a and 23b. A bolt 25c passing through the yoke 25b and the frame member 1a provides a fulcrum whereby the application of the downward force to the end of the lever 25 will serve to move slide support 23 laterally against the bias of springs 24. The lever 26 is similarly constructed.

In order to permit convenient access to the inertia member 21 and the projectile 20, the slide support 23 is terminated an appreciable distance above the breech 2. To adequately support the bottom portion of the inertia member 21 against lateral displacement when in firing position, a strap 27 is bolted to the inside face of guides 22a and 22b and fits snugly around inertia member 21.

To operate the experimental gun, the inertia member is permitted to drop until the projectile 20 is seated within the barrel 4. The cartridge case 6 with a suitable powder charge 6a is inserted in the recess portion 3b of the breech. The breech block 7 is then secured in place by bolt members 8 and 9. Sufficient force is applied to lever 25 to insure that no braking action will be exerted on inertia member 21 until the projectile 20 passes out of barrel 4. Thus the slide support 23 assumes a wedgelike position. Solenoid 13 is then energized and the hammer 14 thereby strikes the firing pin 10 discharging the cartridge 6. The force of the explosion is of course imparted to the projectile 20 and as a result the inertia member 21 is forced upward. However due to the frictional braking action exerted by the slide support 23 by the force of the springs 24 the inertia member 21 will travel only a short distance upward until the energy received by the projectile 20 is dissipated.

The advantages of this gun for experimental work are many. Obviously various types and charges of powder may be utilized by proper loading of the cartridge case 6. Furthermore many different types of barrel material may be tested merely by making the barrel 4 of the experimental gun of the particular material. The shape and size of the barrel 4 is such as to require only a small amount of such material and very simple machining operation. Obviously the effect of various clearances between the bore and the barrel and the projectile may be simulated merely by changing the dimension of the projectile 20 with respect to the bore of the barrel 4. The combined mass of the projectile unit comprising the projectile 20 and inertia member 21 should be selected so as to impart sufficient inertia to the projectile 20 that it remains within the barrel 4 for a time equivalent to that which a real projectile remains in the barrel of the firearm which is being simulated in the test. The apparatus is particularly adaptable for testing the erosion resistance of different types of barrel materials.

The following dimensional data for an experimental gun in accordance with this invention which was designed to duplicate the firing conditions within a 37 mm. gun barrel illustrates the practicability of this type of gun. A barrel section was utilized having an inside diameter of .705" and a length of 1.000". The outside diameter was 1.25". The total surface area of the inside of the barrel and the cartridge chamber was about 22 sq. cm. A powder charge was then selected in the same proportion to the powder charge normally used in a 37 mm. gun as the ratio of internal surface area of the experimental gun bears to the 37 mm. gun. The charge for the experimental gun was then about 2.1 grams. From a knowledge of the powder charge, the volume of the powder chamber, the dimensions of the barrel and the use of tables of Interior Ballistics, the weight of the projectile and inertia member can be chosen so that the hot gases are in contact with the barrel for the same length of time as in the 37 mm. gun. The combined weight of the projectile and inertia member then was about 19 lbs. Thus the size of the components of the experimental gun embodying this invention are very reasonable.

I claim:

1. An experimental gun comprising spaced standards, a breech piece including a breech block carried by said standards, said piece having a charge receiving portion, a barrel member carried by said breech piece and aligned with said charge receiving portion with its axis parallel to said standards, guide means longitudinally of said standards, an inertia member received in said guide means, and means on the inertia member for attaching a projectile thereto adapted to be received in the barrel portion.

2. As gun as in claim 1 wherein said guide means comprise opposed tracks and resilient means biasing one of said tracks toward the other.

3. A gun as in claim 1 wherein said guide means comprise opposed tracks, resilient means biasing one of said tracks toward the other and means to relieve the biasing action.

4. An experimental gun comprising a base having a chamber adapted to receive a powder charge, a short length barrel section removably secured to said base in cooperative relation to said powder charge, a projectile unit having one portion with dimensions in excess of the bore of said barrel, another portion of said projectile unit shaped to enter said barrel, means for discharging said powder charge and braking means connected to said base operative upon said first mentioned portion of said projectile unit to arrest its movement after discharge of the powder charge.

5. An experimental gun for duplicating firing conditions within a standard gun barrel comprising a breech, a breech block and a firing mecha-

nism, said breech having a recess for the reception of a powder charge proportioned to a standard powder charge in relation to the ratio of internal breech areas, a reduced length test barrel removably secured to the breech, and a projectile unit having an end portion insertable in said barrel, the mass of said projectile unit being so related to the powder charge and the length of the barrel that the end portion of the projectile unit is discharged from the barrel in approximately the same length of time as the projectile of the standard gun.

6. An experimental gun for duplicating firing conditions within a standard gun barrel comprising in combination, a breech and a breech block and a firing mechanism, said breech being provided with a recess for the reception of a powder charge proportioned to a standard powder charge in relation to the ratio of internal breech areas, a reduced length test barrel removably secured to the breech, a projectile unit provided with a portion insertable in said barrel, the mass of said projectile unit being so related to the powder charge that the said insertable portion of the projectile unit is discharged from the barrel in approximately the same length of time as the projectile of the standard gun, and means for braking the movement of the projectile unit after it is discharged from the test barrel.

7. An experimental gun comprising in combination, spaced parallel beams, a base mounted between the beams having a powder chamber adapted to receive a powder charge, a test barrel removably secured to said base adjacent said powder chamber, a projectile unit having one portion insertable in said barrel, vertical guides mounted between said beams and adapted to engage another portion of the projectile unit, and resilient means arranged to bias one of said guides toward the other guide to thereby exert a braking action on said projectile unit.

8. An experimental gun comprising in combination, spaced parallel beams, a base mounted between said beams provided with a powder chamber adapted to receive a powder charge, a test barrel removably secured to said base adjacent said powder chamber, a projectile having one end portion insertable in said barrel, an inertia member secured to the other end portion of said projectile, vertical guides mounted between said beams and adapted to engage said inertia member, resilient means adapted to bias one of said guides toward the other guide to thereby exert a braking action on said inertia member, and means associated with one of the beams arranged to force said one guide against any biasing action of said resilient means so as to permit return of the inertia member to the firing position.

9. An experimental gun for duplicating firing conditions within a standard gun barrel comprising in combination, spaced parallel beams, a base mounted between said beams and provided with a chamber arranged to receive a powder charge proportioned to a standard powder charge in the ratio of internal breech areas, a test barrel of reduced length removably secured to said base adjacent to said powder chamber, a projectile having one end portion insertable in said barrel, an inertia member secured to the other end portion of said projectile, the combined mass of said inertia member and said projectile being so related to the powder charge that the end of said projectile is discharged from the barrel in approximately the same length of time as a projectile in a standard gun, a pair of guides mounted between said beams and adapted to engage said inertia member, resilient means arranged to bias one of said guides toward the other guide, and means associated with one of the beams for inclining said biased guide with respect to the other guide whereby a braking action is exerted on said inertia member after the said one end portion of the projectile is discharged from the barrel.

10. An experimental gun comprising a body portion having a chamber adapted to receive a propellant, means on the body adapted to receive a projectile in cooperative relation to said propellant, a projectile received by said means, an inertia member attached to said projectile exteriorly of said body portion, and means positioned to intercept said inertia member after discharge of said propellant and to brake the movement of said projectile and said inertia member.

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